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Letting November 8, 2024

Notice to Bidders, Specifications and Proposal



**Contract No. 61J87
LAKE County
Section 11-00087-02-GS (Barrington)
Route FAP 305 (Us 14)
Project WVIF-253 ()
District 1 Construction Funds**

Prepared by

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Checked by

(Printed by authority of the State of Illinois)



**Illinois Department
of Transportation**

NOTICE TO BIDDERS

1. **TIME AND PLACE OF OPENING BIDS.** Electronic bids are to be submitted to the electronic bidding system (iCX-Integrated Contractors Exchange). All bids must be submitted to the iCX system prior to 12:00 p.m. November 8, 2024 at which time the bids will be publicly opened from the iCX SecureVault.
2. **DESCRIPTION OF WORK.** The proposed improvement is identified and advertised for bids in the Invitation for Bids as:

**Contract No. 61J87
LAKE County
Section 11-00087-02-GS (Barrington)
Project WVIF-253 ()
Route FAP 305 (Us 14)
District 1 Construction Funds**

Construction of a grade separation structure to carry the CN/WCL Railroad over US 14; Pavement reconstruction of US 14, construction of a pump station, relocation of the Flint Creek Tributary, box culvert construction, retaining and noise walls, watermain, sanitary sewer, traffic signals and roadway lighting between IL 59 and Valencia Avenue in Barrington.

3. **INSTRUCTIONS TO BIDDERS.** (a) This Notice, the invitation for bids, proposal and letter of award shall, together with all other documents in accordance with Article 101.09 of the Standard Specifications for Road and Bridge Construction, become part of the contract. Bidders are cautioned to read and examine carefully all documents, to make all required inspections, and to inquire or seek explanation of the same prior to submission of a bid.

(b) State law, and, if the work is to be paid wholly or in part with Federal-aid funds, Federal law requires the bidder to make various certifications as a part of the proposal and contract. By execution and submission of the proposal, the bidder makes the certification contained therein. A false or fraudulent certification shall, in addition to all other remedies provided by law, be a breach of contract and may result in termination of the contract.
4. **AWARD CRITERIA AND REJECTION OF BIDS.** This contract will be awarded to the lowest responsive and responsible bidder considering conformity with the terms and conditions established by the Department in the rules, Invitation for Bids and contract documents. The issuance of plans and proposal forms for bidding based upon a prequalification rating shall not be the sole determinant of responsibility. The Department reserves the right to determine responsibility at the time of award, to reject any or all proposals, to re-advertise the proposed improvement, and to waive technicalities.

By Order of the
Illinois Department of Transportation

Omer Osman,
Secretary

INDEX
FOR
SUPPLEMENTAL SPECIFICATIONS
AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2024

This index contains a listing of SUPPLEMENTAL SPECIFICATIONS, frequently used RECURRING SPECIAL PROVISIONS, and LOCAL ROADS AND STREETS RECURRING SPECIAL PROVISIONS.

ERRATA Standard Specifications for Road and Bridge Construction (Adopted 1-1-22) (Revised 1-1-24)

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BDE SPECIAL PROVISIONS

The following special provisions indicated by an "X" are applicable to this contract. An * indicates a new or revised special provision for the letting.

<u>File Name</u>	<u>Pg.</u>		<u>Special Provision Title</u>	<u>Effective</u>	<u>Revised</u>
80099	966	<input checked="" type="checkbox"/>	Accessible Pedestrian Signals (APS)	April 1, 2003	Jan. 1, 2022
80274	968	<input checked="" type="checkbox"/>	Aggregate Subgrade Improvement	April 1, 2012	April 1, 2022
80192		<input type="checkbox"/>	Automated Flagger Assistance Device	Jan. 1, 2008	April 1, 2023
80173	971	<input checked="" type="checkbox"/>	Bituminous Materials Cost Adjustments	Nov. 2, 2006	Aug. 1, 2017
80426		<input type="checkbox"/>	Bituminous Surface Treatment with Fog Seal	Jan. 1, 2020	Jan. 1, 2022
80241		<input type="checkbox"/>	Bridge Demolition Debris	July 1, 2009	
50531		<input type="checkbox"/>	Building Removal	Sept. 1, 1990	Aug. 1, 2022
50261	973	<input checked="" type="checkbox"/>	Building Removal with Asbestos Abatement	Sept. 1, 1990	Aug. 1, 2022
80449	976	<input checked="" type="checkbox"/>	Cement, Type II	Aug. 1, 2023	
80384	977	<input checked="" type="checkbox"/>	Compensable Delay Costs	June 2, 2017	April 1, 2019
80198		<input type="checkbox"/>	Completion Date (via calendar days)	April 1, 2008	
80199		<input type="checkbox"/>	Completion Date (via calendar days) Plus Working Days	April 1, 2008	
80453		<input type="checkbox"/>	Concrete Sealer	Nov. 1, 2023	
80261	981	<input checked="" type="checkbox"/>	Construction Air Quality – Diesel Retrofit	June 1, 2010	Nov. 1, 2014
80434		<input type="checkbox"/>	Corrugated Plastic Pipe (Culvert and Storm Sewer)	Jan. 1, 2021	
80029	984	<input checked="" type="checkbox"/>	Disadvantaged Business Enterprise Participation	Sept. 1, 2000	Mar. 2, 2019
80229	994	<input checked="" type="checkbox"/>	Fuel Cost Adjustment	April 1, 2009	Aug. 1, 2017
80452		<input type="checkbox"/>	Full Lane Sealant Waterproofing System	Nov. 1, 2023	
80447		<input type="checkbox"/>	Grading and Shaping Ditches	Jan 1, 2023	
80433		<input type="checkbox"/>	Green Preformed Thermoplastic Pavement Markings	Jan. 1, 2021	Jan. 1, 2022
80443		<input type="checkbox"/>	High Tension Cable Median Barrier Removal	April 1, 2022	
80456	997	<input checked="" type="checkbox"/>	Hot-Mix Asphalt	Jan. 1, 2024	
80446	998	<input checked="" type="checkbox"/>	Hot-Mix Asphalt – Longitudinal Joint Sealant	Nov. 1, 2022	Aug. 1, 2023
80438		<input type="checkbox"/>	Illinois Works Apprenticeship Initiative – State Funded Contracts	June 2, 2021	April 2, 2024
80045		<input type="checkbox"/>	Material Transfer Device	June 15, 1999	Jan. 1, 2022
80450		<input type="checkbox"/>	Mechanically Stabilized Earth Retaining Walls	Aug. 1, 2023	
80441	1000	<input checked="" type="checkbox"/>	Performance Graded Asphalt Binder	Jan 1, 2023	
80451	1005	<input checked="" type="checkbox"/>	Portland Cement Concrete	Aug. 1, 2023	
80459	1006	<input checked="" type="checkbox"/>	Preformed Plastic Pavement Marking	June 2, 2024	
34261	1007	<input checked="" type="checkbox"/>	Railroad Protective Liability Insurance	Dec. 1, 1986	Jan. 1, 2022
80455	1008	<input checked="" type="checkbox"/>	Removal and Disposal of Regulated Substances	Jan. 1, 2024	April 1, 2024
80445	1010	<input checked="" type="checkbox"/>	Seeding	Nov. 1, 2022	
80457	1016	<input checked="" type="checkbox"/>	Short Term and Temporary Pavement Markings	April 1, 2024	April 2, 2024
80448	1020	<input checked="" type="checkbox"/>	Source of Supply and Quality Requirements	Jan. 2, 2023	
80340		<input type="checkbox"/>	Speed Display Trailer	April 2, 2014	Jan. 1, 2022
80127	1021	<input checked="" type="checkbox"/>	Steel Cost Adjustment	April 2, 2014	Jan. 1, 2022
80397	1024	<input checked="" type="checkbox"/>	Subcontractor and DBE Payment Reporting	April 2, 2018	
80391	1025	<input checked="" type="checkbox"/>	Subcontractor Mobilization Payments	Nov. 2, 2017	April 1, 2019
80437	1026	<input checked="" type="checkbox"/>	Submission of Payroll Records	April 1, 2021	Nov. 2, 2023
80435		<input type="checkbox"/>	Surface Testing of Pavements – IRI	Jan. 1, 2021	Jan. 1, 2023
80410		<input type="checkbox"/>	Traffic Spotters	Jan. 1, 2019	
20338	1028	<input checked="" type="checkbox"/>	Training Special Provisions	Oct. 15, 1975	Sept. 2, 2021
80429		<input type="checkbox"/>	Ultra-Thin Bonded Wearing Course	April 1, 2020	Jan. 1, 2022
80439	1031	<input checked="" type="checkbox"/>	Vehicle and Equipment Warning Lights	Nov. 1, 2021	Nov. 1, 2022
80458		<input type="checkbox"/>	Waterproofing Membrane System	Aug. 1, 2024	
80302	1032	<input checked="" type="checkbox"/>	Weekly DBE Trucking Reports	June 2, 2012	Nov. 1, 2021
80454	1033	<input checked="" type="checkbox"/>	Wood Sign Support	Nov. 1, 2023	
80427	1034	<input checked="" type="checkbox"/>	Work Zone Traffic Control Devices	Mar. 2, 2020	
80071		<input type="checkbox"/>	Working Days	Jan. 1, 2002	

GUIDE BRIDGE SPECIAL PROVISION INDEX/CHECK SHEET

Effective as of the: November 8, 2024 Letting

Pg#	√	File Name	Title	Effective	Revised
	<input type="checkbox"/>	GBSP 4	Polymer Modified Portland Cement Mortar	June 7, 1994	April 1, 2016
	<input type="checkbox"/>	*GBSP 13	High-Load Multi-Rotational Bearings	Oct 13, 1988	June 28, 2024
	<input type="checkbox"/>	GBSP 14	Jack and Remove Existing Bearings	April 20, 1994	April 13, 2018
	<input type="checkbox"/>	GBSP 16	Jacking Existing Superstructure	Jan 11, 1993	April 13, 2018
	<input type="checkbox"/>	GBSP 18	Modular Expansion Joint	May 19, 1994	Oct 27, 2023
	<input type="checkbox"/>	GBSP 21	Cleaning and Painting Contact Surface Areas of Existing Steel Structures	June 30, 2003	Oct 23, 2020
	<input type="checkbox"/>	GBSP 25	Cleaning and Painting Existing Steel Structures	Oct 2, 2001	April 15, 2022
	<input type="checkbox"/>	GBSP 26	Containment and Disposal of Lead Paint Cleaning Residues	Oct 2, 2001	Apr 22, 2016
	<input type="checkbox"/>	GBSP 28	Deck Slab Repair	May 15, 1995	Feb 2, 2024
	<input type="checkbox"/>	GBSP 29	Bridge Deck Microsilica Concrete Overlay	May 15, 1995	April 30, 2021
	<input type="checkbox"/>	GBSP 30	Bridge Deck Latex Concrete Overlay	May 15, 1995	April 30, 2021
	<input type="checkbox"/>	GBSP 31	Bridge Deck High-Reactivity Metakaolin (HRM) Conc Overlay	Jan 21, 2000	April 30, 2021
	<input type="checkbox"/>	GBSP 33	Pedestrian Truss Superstructure	Jan 13, 1998	Oct 27, 2023
	<input type="checkbox"/>	GBSP 34	Concrete Wearing Surface	June 23, 1994	Oct 4, 2016
	<input type="checkbox"/>	*GBSP 45	Bridge Deck Thin Polymer Overlay	May 7, 1997	June 28, 2024
	<input type="checkbox"/>	GBSP 53	Structural Repair of Concrete	Mar 15, 2006	Aug 9, 2019
	<input type="checkbox"/>	GBSP 55	Erection of Curved Steel Structures	June 1, 2007	
	<input type="checkbox"/>	GBSP 59	Diamond Grinding and Surface Testing Bridge Sections	Dec 6, 2004	April 15, 2022
	<input type="checkbox"/>	GBSP 60	Containment and Disposal of Non-Lead Paint Cleaning Residues	Nov 25, 2004	Apr 22, 2016
	<input type="checkbox"/>	GBSP 61	Slipform Parapet	June 1, 2007	April 15, 2022
	<input type="checkbox"/>	GBSP 67	Structural Assessment Reports for Contractor's Means and Methods	Mar 6, 2009	Oct 5, 2015
	<input type="checkbox"/>	GBSP 71	Aggregate Column Ground Improvement	Jan 15, 2009	Oct 15, 2011
	<input type="checkbox"/>	GBSP 72	Bridge Deck Fly Ash or GGBF Slag Concrete Overlay	Jan 18, 2011	April 30, 2021
	<input type="checkbox"/>	GBSP 78	Bridge Deck Construction	Oct 22, 2013	Dec 21, 2016
	<input type="checkbox"/>	GBSP 79	Bridge Deck Grooving (Longitudinal)	Dec 29, 2014	Mar 29, 2017
1036	<input checked="" type="checkbox"/>	GBSP 81	Membrane Waterproofing for Buried Structures	Oct 4, 2016	March 1, 2019
1038	<input checked="" type="checkbox"/>	GBSP 82	Metallizing of Structural Steel	Oct 4, 2016	Oct 20, 2017
	<input type="checkbox"/>	*GBSP 83	Hot Dip Galvanizing for Structural Steel	Oct 4, 2016	June 28, 2024
	<input type="checkbox"/>	GBSP 85	Micropiles	Apr 19, 1996	Oct 23, 2020
1054	<input checked="" type="checkbox"/>	GBSP 86	Drilled Shafts	Oct 5, 2015	Oct 27, 2023
	<input type="checkbox"/>	GBSP 87	Lightweight Cellular Concrete Fill	Nov 11, 2001	Apr 1, 2016
	<input type="checkbox"/>	GBSP 88	Corrugated Structural Plate Structures	Apr 22, 2016	April 13, 2018
	<input type="checkbox"/>	GBSP 89	Preformed Pavement Joint Seal	Oct 4, 2016	March 24, 2023
	<input type="checkbox"/>	GBSP 90	Three Sided Precast Concrete Structure (Special)	Dec 21, 2016	March 22, 2024
	<input type="checkbox"/>	GBSP 91	Crosshole Sonic Logging Testing of Drilled Shafts	Apr 20, 2016	March 24, 2023
	<input type="checkbox"/>	GBSP 92	Thermal Integrity Profile Testing of Drilled Shafts	Apr 20, 2016	March 24, 2023
	<input type="checkbox"/>	*GBSP 93	Preformed Bridge Joint Seal	Dec 21, 2016	June 28, 2024
	<input type="checkbox"/>	GBSP 94	Warranty for Cleaning and Painting Steel Structures	Mar 3, 2000	Nov 24, 2004
1066	<input checked="" type="checkbox"/>	GBSP 96	Erection of Bridge Girders Over or Adjacent to Railroads	Aug 9, 2019	
	<input type="checkbox"/>	GBSP 97	Folded/Formed PVC Pipeliner	April 15, 2022	
	<input type="checkbox"/>	GBSP 98	Cured-in-Place Pipe Liner	April 15, 2022	
	<input type="checkbox"/>	GBSP 99	Spray-Applied Pipe Liner	April 15, 2022	
1067	<input checked="" type="checkbox"/>	GBSP 100	Bar Splicers, Headed Reinforcement	Sept 2, 2022	Oct 27, 2023
1068	<input checked="" type="checkbox"/>	*GBSP 101	Noise Abatement Wall, Ground Wall	Dec 9, 2022	June 28, 2024
	<input type="checkbox"/>	*GBSP 102	Noise Abatement Wall, Structure Mounted	Dec 9, 2022	June 28, 2024
	<input type="checkbox"/>	GBSP 103	Noise Abatement Wall Anchor Rod Assembly	Dec 9, 2022	

An * indicates a new or revised special provision.

STATE OF ILLINOIS

SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction", adopted January 1, 2022 (hereinafter referred to as the Standard Specifications); the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD); the "Manual of Test Procedures for Materials" in effect on the date of invitation for bids; the "Standard Specifications for Water and Sewer Construction in Illinois", 7th Edition, 2014 (hereinafter referred to as the Water and Sewer Specifications); the Illinois Urban Manual, June, 2013 Edition; and the "Supplemental Specifications and Recurring Special Provisions", adopted January 1, 2024, indicated on the Check Sheet included herein which apply to and govern the construction of the US 14 reconstruction and Grade Separation, Section 11-00087-00-GS & Section 11-00087-02-GS, Contract No. 61J87, and in case of conflict with any part, or parts, of said specifications, the said Special Provisions shall take precedence and shall govern.

LOCATION OF PROJECT

This project is located in the Village of Barrington, Lake County. The project limits on US 14 (Northwest Highway) from Hough Street (IL 59) to Valencia Avenue; on Hough Street (IL 59) from 300' south of Lions Drive to US 14; and Lake Zurich Road from US 14 to 650 north of US 14. The project has a total gross and net length of 3,916.4 feet (0.74 mile).

DESCRIPTION OF PROJECT

The project consists of constructing a grade separation with US 14 going under the CN/WCL railroad. The proposed pavement will consist of concrete curb and gutter, Portland cement concrete pavement, aggregate subgrade improvement. Concrete faced sheet piling retaining walls and precast concrete post and panel noise walls will be constructed. A section of the Flint Creek tributary will be relocated to a new alignment. A pump station will be constructed. In addition, there will be storm sewer, water main, sanitary sewer, pavement marking, signing, erosion control, lighting and landscaping installation along with all incidental and collateral work necessary to complete the project as shown on the plans and as described herein.

COMPLETION DATE PLUS WORKING DAYS (D1)

Effective: September 30, 1985

Revised: January 1, 2007

Revise Article 108.05 (b) of the Standard Specifications as follows:

"When a completion date plus working days is specified, the Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on, July 31, 2026 except as specified herein.

The Contractor will be allowed to complete all clean-up work and punch list items within 5 working days after the completion date for opening the roadway to traffic. Under extenuating circumstances the Engineer may direct that certain items of work, not affecting the safe opening of the roadway to

traffic, may be completed within the working days allowed for clean up work and punch list items. Temporary lane closures for this work may be allowed at the discretion of the Engineer.

Article 108.09 or the Special Provision for "Failure to Complete the Work on Time", if included in this contract, shall apply to both the completion date and the number of working days.

AVAILABLE REPORTS (D1 LR)

Effective: July 1, 2021

☐ No project specific reports were prepared.

When applicable, the following checked reports and record information is available for Bidders' reference upon request:

- ☐ Record structural plans
- ☒ Preliminary Site Investigation (PSI) (IDOT ROW)
- ☐ Preliminary Site Investigation (PSI) (Local ROW)
- ☒ Preliminary Environmental Site Assessment (PESA) (IDOT ROW)
- ☐ Preliminary Environmental Site Assessment (PESA) (Local ROW)
- ☒ Soils/Geotechnical Report
- ☐ Boring Logs
- ☐ Pavement Cores
- ☐ Location Drainage Study (LDS)
- ☐ Hydraulic Report
- ☐ Noise Analysis
- ☒ Other: Asbestos Reports for Building Demolition

Those seeking these reports should request access from:

Civiltech Engineering, Inc.
Marcelino Cruz
630.735.7177
mcruz@civiltechinc.com

MAINTENANCE OF ROADWAYS (D1)

Effective: September 30, 1985

Revised: November 1, 1996

Beginning on the date that work begins on this project, the Contractor shall assume responsibility for normal maintenance of all existing roadways within the limits of the improvement. This normal maintenance shall include all repair work deemed necessary by the Engineer, but shall not include snow removal operations. Traffic control and protection for maintenance of roadways will be provided by the Contractor as required by the Engineer.

If items of work have not been provided in the contract, or otherwise specified for payment, such items, including the accompanying traffic control and protection required by the Engineer, will be paid for in accordance with Article 109.04 of the Standard Specifications.

STATUS OF UTILITIES (D-1)

Effective: June 1, 2016

Revised: January 1, 2020

Utility companies and/or municipal owners located within the construction limits of this project have provided the following information regarding their facilities and the proposed improvements. The tables below contain a description of specific conflicts to be resolved and/or facilities which will require some action on the part of the Department's contractor to proceed with work. Each table entry includes an identification of the action necessary and, if applicable, the estimated duration required for the resolution.

UTILITIES TO BE ADJUSTED

Conflicts noted below have been identified by following the suggested staging plan included in the contract. The company has been notified of all conflicts and will be required to obtain the necessary permits to complete their work; in some instances, resolution will be a function of the construction staging. The responsible agency must relocate, or complete new installations as noted below; this work has been deemed necessary to be complete for the Department's contractor to then work in the stage under which the item has been listed.

Pre-Stage

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	DURATION OF TIME
US 14 – STA 202+00 to 230+00.7 IL 59 – STA 70+50	6" and 2" Steel Gas Line	Existing gas lines are in conflict with proposed roadway improvements. Contractor for Nicor to install new line and cut over services.	Nicor	30 day installation

US 14 – STA 204+60 STA 213+00 STA 211+50 STA 229+75 IL 59 – STA 70+90	Coaxial Underground CATV	Existing line is in conflict with proposed roadway improvements. Contractor for Comcast to install new line and cut over services.	Comcast	14 days after ComEd's completion
US 14 – STA 216+25 IL 59 – STA 71+00 LZR – STA 505+00	Pedestal and Aerial Lines	Existing lines and pedestal are in conflict with proposed roadway improvements. Contractor for AT&T to install new line/pedestal and cut over services.	AT&T	30 days after ComEd's completion
US 14 – STA 225+00 to STA 226+80	Pedestal and Underground Telecommunication Lines	Existing line and pedestal are in conflict with proposed roadway improvements. Contractor for Verizon to install new line/pedestal and cut over services.	Verizon	14 days installation
US 14 – STA 201+77 to STA 229+99	Utility Poles and Overhead Wires	Existing utility poles and overhead wires are in conflict with proposed roadway improvements. Contractor for ComEd to install new line and relocate the utility poles.	ComEd	150 days installation

Stage 1

No conflicts to be resolved.

Stage 2

No conflicts to be resolved.

Stage 3

No conflicts to be resolved.

Pre-Stage: ___180___ Days Total Installation

The following contact information is what was used during the preparation of the plans as provided by the Agency/Company responsible for resolution of the conflict.

Agency/Company Responsible to Resolve Conflict	Name of contact	Phone	E-mail address
AT&T	Hector Garcia	630.639.8372	hg2929@att.com
ComEd	James Campbell III	630.940.6805	James.CampbellIII@comed.com
Nicor Gas	Charles "Chip" Parrott	630.388.3319	cparrott@southernco.com
Comcast	Martha Gieras	224.229.5862	Martha_Gieras@comcast.com
Verizon	Joe B. Chaney	312.617.2131	joe.chaney@verizon.com

UTILITIES TO BE WATCHED AND PROTECTED

The areas of concern noted below have been identified by following the suggested staging plan included for the contract. The information provided is not a comprehensive list of all remaining utilities, but those which during coordination were identified as ones which might require the Department's contractor to take into consideration when making the determination of the means and methods that would be required to construct the proposed improvement. In some instances, the contractor will be responsible to notify the owner in advance of the work to take place so necessary staffing on the owner's part can be secured.

Pre-Stage

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
US 14 – STA 208+75 IL 59 – STA 70+50	6" and 2" Steel Gas Line	The Contractor is alerted that there is a 6" and 2" steel gas line. There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	Nicor
US 14 – STA 204+60 STA 213+00 STA 211+50 STA 229+75	Coaxial Underground CATV	The Contractor is alerted that there are coaxial underground CATV cables. There are no conflicts with the proposed improvements,	Comcast

IL 59 – STA 70+90 STA 229+75		however the contractor shall watch and protect facilities in this area.	
US 14 – STA 216+25 IL 59 – STA 71+00 LZR – STA 505+00	Pedestal and Aerial Lines	The Contractor is alerted that there is a pedestal and aerial Lines. There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	AT&T
US 14 – STA 225+00 STA 226+80	Pedestal and Underground Telecommunication Lines	The Contractor is alerted that there is a pedestal and underground telecommunication lines. There are no conflicts with the proposed improvements, however the contractor shall watch and protect	Verizon
US 14 – STA 201+77 to STA 229+99	Utility Poles and Overhead Wires	The Contractor is alerted that there are utility poles and overhead wires. There are no conflicts with the proposed improvements, but all workers should follow the current OSHA rules and other applicable guidelines regarding working safely around electrical power lines.	ComEd

Stage 1

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
US 14 – STA 208+75 IL 59 – STA 70+50	6" and 2" Steel Gas Line	The Contractor is alerted that there is a 6" and 2" steel gas line. There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	Nicor
US 14 – STA 204+60 STA 213+00	Coaxial Underground CATV	The Contractor is alerted that there are coaxial underground CATV cables.	Comcast

STA 211+50 STA 229+75 IL 59 – STA 70+90 STA 229+75		There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	
US 14 – STA 216+25 IL 59 – STA 71+00 LZR – STA 505+00	Pedestal and Aerial Lines	The Contractor is alerted that there is a pedestal and aerial Lines. There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	AT&T
US 14 – STA 225+00 STA 226+80	Pedestal and Underground Telecommunication Lines	The Contractor is alerted that there is a pedestal and underground telecommunication lines. There are no conflicts with the proposed improvements, however the contractor shall watch and protect	Verizon
US 14 – STA 201+77 to STA 229+99	Utility Poles and Overhead Wires	The Contractor is alerted that there are utility poles and overhead wires. There are no conflicts with the proposed improvements, but all workers should follow the current OSHA rules and other applicable guidelines regarding working safely around electrical power lines.	ComEd

Stage 2

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
US 14 – STA 208+75 IL 59 – STA 70+50	6" and 2" Steel Gas Line	The Contractor is alerted that there is a 6" and 2" steel gas line. There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	Nicor
US 14 – STA 204+60 STA 213+00	Coaxial Underground CATV	The Contractor is alerted that there are coaxial underground CATV cables.	Comcast

STA 211+50 STA 229+75 IL 59 – STA 70+90 STA 229+75		There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	
US 14 – STA 216+25 IL 59 – STA 71+00 LZR – STA 505+00	Pedestal and Aerial Lines	The Contractor is alerted that there is a pedestal and aerial Lines. There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	AT&T
US 14 – STA 225+00 STA 226+80	Pedestal and Underground Telecommunication Lines	The Contractor is alerted that there is a pedestal and underground telecommunication lines. There are no conflicts with the proposed improvements, however the contractor shall watch and protect	Verizon
US 14 – STA 201+77 to STA 229+99	Utility Poles and Overhead Wires	The Contractor is alerted that there are utility poles and overhead wires. There are no conflicts with the proposed improvements, but all workers should follow the current OHSA rules and other applicable guidelines regarding working safely around electrical power lines.	ComEd

Stage 3

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
US 14 – STA 208+75 IL 59 – STA 70+50	6" and 2" Steel Gas Line	The Contractor is alerted that there is a 6" and 2" steel gas line. There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	Nicor
US 14 – STA 204+60 STA 213+00	Coaxial Underground CATV	The Contractor is alerted that there are coaxial underground CATV cables.	Comcast

STA 211+50 STA 229+75 IL 59 – STA 70+90 STA 229+75		There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	
US 14 – STA 216+25 IL 59 – STA 71+00 LZR – STA 505+00	Pedestal and Aerial Lines	The Contractor is alerted that there is a pedestal and aerial Lines. There are no conflicts with the proposed improvements, however the contractor shall watch and protect facilities in this area.	AT&T
US 14 – STA 225+00 STA 226+80	Pedestal and Underground Telecommunication Lines	The Contractor is alerted that there is a pedestal and underground telecommunication lines. There are no conflicts with the proposed improvements, however the contractor shall watch and protect	Verizon
US 14 – STA 201+77 to STA 229+99	Utility Poles and Overhead Wires	The Contractor is alerted that there are utility poles and overhead wires. There are no conflicts with the proposed improvements, but all workers should follow the current OSHA rules and other applicable guidelines regarding working safely around electrical power lines.	ComEd

The following contact information is what was used during the preparation of the plans as provided by the owner of the facility.

Agency/Company Responsible to Resolve Conflict	Name of contact	Phone	E-mail address
AT&T	Hector Garcia	630.639.8372	hg2929@att.com
ComEd	James Campbell III	630.940.6805	James.CampbellIII@comed.com
Nicor Gas	Charles "Chip" Parrott	630.388.3319	cparrott@southernco.com
Comcast	Martha Gieras	224.229.5862	Martha_Gieras@comcast.com
Verizon	Joe B. Chaney	312.617.2131	joe.chaney@verizon.com

The above represents the best information available to the Department and is included for the convenience of the bidder. The days required for conflict resolution should be considered in the bid

as this information has also been factored into the timeline identified for the project when setting the completion date. The applicable portions of the Standard Specifications for Road and Bridge Construction shall apply.

Estimated duration of time provided above for the first conflicts identified will begin on the date of the executed contract regardless of the status of the utility relocations. The responsible agencies will be working toward resolving subsequent conflicts in conjunction with contractor activities in the number of days noted.

The estimated relocation duration must be part of the progress schedule submitted by the contractor. A utility kickoff meeting will be scheduled between the Department, the Department's contractor and the utility companies when necessary. The Department's contractor is responsible for contacting J.U.L.I.E. prior to all excavation work.

PUBLIC CONVENIENCE AND SAFETY (D-1)

Effective: May 1, 2012

Revised: July 15, 2012

Add the following to the end of the fourth paragraph of Article 107.09:

"If the holiday is on a Saturday or Sunday, and is legally observed on a Friday or Monday, the length of Holiday Period for Monday or Friday shall apply."

Add the following sentence after the Holiday Period table in the fourth paragraph of Article 107.09:

"The Length of Holiday Period for Thanksgiving shall be from 5:00 AM the Wednesday prior to 11:59 PM the Sunday After"

Delete the fifth paragraph of Article 107.09 of the Standard Specifications:

"On weekends, excluding holidays, roadways with Average Daily Traffic of 25,000 or greater, all lanes shall be open to traffic from 3:00 P.M. Friday to midnight Sunday except where structure construction or major rehabilitation makes it impractical."

TEMPORARY PAVEMENT (D1)

Effective: March 1, 2003

Revised: April 10, 2008

Description. This work shall consist of constructing a temporary pavement at the locations shown on the plans or as directed by the engineer.

The contractor shall use either Portland cement concrete according to Sections 353 and 354 of the Standard Specifications or HMA according to Sections 355, 356, 406 of the Standard Specifications, and other applicable HMA special provisions as contained herein. The HMA mixtures to be used shall be specified in the plans. The thickness of the Temporary Pavement shall be as described in the plans. The contractor shall have the option of constructing either material type if both Portland cement concrete and HMA are shown in the plans.

Articles 355.08 and 406.11 of the Standard Specifications shall not apply.

The removal of the Temporary Pavement, if required, shall conform to Section 440 of the Standard Specification.

Method of Measurement. Temporary pavement will be measured in place and the area computed in square yards (square meters).

Basis of Payment. This work will be paid for at the contract unit price per square yard (square meter) for TEMPORARY PAVEMENT and TEMPORARY PAVEMENT (INTERSTATE).

Removal of temporary pavement will be paid for at the contract unit price per square yard (square meter) for PAVEMENT REMOVAL.

AGGREGATE SURFACE COURSE FOR TEMPORARY ACCESS (D1)

Effective: April 1, 2001

Revised: January 2, 2007

Revise Article 402.10 of the Standard Specifications to read:

“402.10 For Temporary Access. The contractor shall construct and maintain aggregate surface course for temporary access to private entrances, commercial entrances and roads according to Article 402.07 and as directed by the Engineer.

The aggregate surface course shall be constructed to the dimensions and grades specified below, except as modified by the plans or as directed by the Engineer.

- (a) Private Entrance. The minimum width shall be 12 ft (3.6 m). The minimum compacted thickness shall be 6 in. (150 mm). The maximum grade shall be eight percent, except as required to match the existing grade.
- (b) Commercial Entrance. The minimum width shall be 24 ft (7.2 m). The minimum compacted thickness shall be 9 in. (230 mm). The maximum grade shall be six percent, except as required to match the existing grade.
- (c) Road. The minimum width shall be 24 ft (7.2 m). The minimum compacted thickness shall be 9 in. (230 mm). The grade and elevation shall be the same as the removed pavement, except as required to meet the grade of any new pavement constructed.

Maintaining the temporary access shall include relocating and/or regrading the aggregate surface course for any operation that may disturb or remove the temporary access. The same type and gradation of material used to construct the temporary access shall be used to maintain it.

When use of the temporary access is discontinued, the aggregate shall be removed and utilized in the permanent construction or disposed of according to Article 202.03.”

Add the following to Article 402.12 of the Standard Specifications:

“Aggregate surface course for temporary access will be measured for payment as each for every private entrance, commercial entrance or road constructed for the purpose of temporary access. If a residential drive, commercial entrance, or road is to be constructed under multiple stages, the aggregate needed to construct the second or subsequent stages will not be measured for payment but shall be included in the cost per each of the type specified.”

Revise the second paragraph of Article 402.13 of the Standard Specifications to read:

“Aggregate surface course for temporary access will be paid for at the contract unit price per each for TEMPORARY ACCESS (PRIVATE ENTRANCE), TEMPORARY ACCESS (COMMERCIAL ENTRANCE) or TEMPORARY ACCESS (ROAD).

Partial payment of the each amount bid for temporary access, of the type specified, will be paid according to the following schedule:

- (a) Upon construction of the temporary access, sixty percent of the contract unit price per each, of the type constructed, will be paid.
- (b) Subject to the approval of the Engineer for the adequate maintenance and removal of the temporary access, the remaining forty percent of the pay item will be paid upon the permanent removal of the temporary access.”

HOT-MIX ASPHALT BINDER AND SURFACE COURSE (D1)

Effective: November 1, 2019

Revised: December 1, 2021

Revise Article 1004.03(c) to read:

“(c) Gradation. The coarse aggregate gradations shall be as listed in the following table.

Use	Size/Application	Gradation No.
Class A-1, A-2, & A-3	3/8 in. (10 mm) Seal	CA 16 or CA 20
Class A-1	1/2 in. (13 mm) Seal	CA 15
Class A-2 & A-3	Cover Coat	CA 14
HMA High ESAL	IL-19.0; Stabilized Subbase IL-19.0	CA 11 ^{1/}
	SMA 12.5 ^{2/}	CA 13 ^{4/} , CA 14, or CA 16
	SMA 9.5 ^{2/}	CA 13 ^{3/4/} or CA 16 ^{3/}
	IL-9.5	CA 16, CM 13 ^{4/}
	IL-9.5FG	CA 16
HMA Low ESAL	IL-19.0L	CA 11 ^{1/}
	IL-9.5L	CA 16

1/ CA 16 or CA 13 may be blended with the CA 11.

2/ The coarse aggregates used shall be capable of being combined with the fine aggregates and mineral filler to meet the approved mix design and the mix requirements noted herein.

3/ The specified coarse aggregate gradations may be blended.

4/ CA 13 shall be 100 percent passing the 1/2 in. (12.5mm) sieve.”

Revise Article 1004.03(e) of the Supplemental Specifications to read:

“(e) Absorption. For SMA the coarse aggregate shall also have water absorption
≤ 2.0 percent.”

Revise the “High ESAL” portion of the table in Article 1030.01 to read:

“High ESAL	Binder Courses	IL-19.0, IL-9.5, IL-9.5FG, IL-4.75, SMA 12.5, Stabilized Subbase IL-19.0
	Surface Courses	IL-9.5, IL-9.5FG, SMA 12.5, SMA 9.5”

Revise Note 2. and add Note 6 to Article 1030.02 of the Standard Specifications to read:

“Item	Article/Section
(g)Performance Graded Asphalt Binder (Note 6)	1032
(h)Fibers (Note 2)	

Note 2. A stabilizing additive such as cellulose or mineral fiber shall be added to the SMA mixture according to Illinois Modified AASHTO M 325. The stabilizing additive shall meet the Fiber Quality Requirements listed in Illinois Modified AASHTO M 325. Prior to approval and use of fibers, the Contractor shall submit a notarized certification by the producer of these materials stating they meet these requirements. Reclaimed Asphalt Shingles (RAS) may be used in Stone Matrix Asphalt (SMA) mixtures designed with an SBA polymer modifier as a fiber additive if the mix design with RAS included meets AASHTO T305 requirements. The RAS shall be from a certified source that produces either Type I or Type 2. Material shall meet requirements noted herein and the actual dosage rate will be determined by the Engineer.

Note 6. The asphalt binder shall be an SBS PG 76-28 when the SMA is used on a full-depth asphalt pavement and SBS PG 76-22 when used as an overlay, except where modified herein. The asphalt binder shall be a SBS PG 76-22 for IL-4.75, except where modified herein..”

Revise table in Article 1030.05(a) of the Standard Specifications to read:

"MIXTURE COMPOSITION (% PASSING)" ^{1/}												
Sieve Size	IL-19.0 mm		SMA 12.5		SMA 9.5		IL-9.5mm		IL-9.5FG		IL-4.75 mm	
	min	max	min	max	min	max	min	max	min	max	min	max
1 1/2 in. (37.5 mm)												
1 in. (25 mm)		100										
3/4 in. (19 mm)	90	100		100								
1/2 in. (12.5 mm)	75	89	80	100		100		100		100		100
3/8 in. (9.5 mm)				65	90	100	90	100	90	100		100
#4 (4.75 mm)	40	60	20	30	36	50	34	69	60	75 ^{6/}	90	100
#8 (2.36 mm)	20	42	16	24 ^{4/}	16	32 ^{4/}	34 ^{5/}	52 ^{2/}	45	60 ^{6/}	70	90
#16 (1.18 mm)	15	30					10	32	25	40	50	65
#30 (600 µm)			12	16	12	18			15	30		
#50 (300 µm)	6	15					4	15	8	15	15	30
#100 (150 µm)	4	9					3	10	6	10	10	18
#200 (75 µm)	3.0	6.0	7.0	9.0 ^{3/}	7.5	9.5 ^{3/}	4.0	6.0	4.0	6.5	7.0	9.0 ^{3/}
#635 (20 µm)			≤ 3.0		≤ 3.0							
Ratio Dust/Asphalt Binder		1.0		1.5		1.5		1.0		1.0		1.0

1/ Based on percent of total aggregate weight.

2/ The mixture composition shall not exceed 44 percent passing the #8 (2.36 mm) sieve for surface courses with Ndesign = 90.

3/ Additional minus No. 200 (0.075 mm) material required by the mix design shall be mineral filler, unless otherwise approved by the Engineer.

4/ When establishing the Adjusted Job Mix Formula (AJMF) the percent passing the #8 (2.36 mm) sieve shall not be adjusted above the percentage stated on the table.

5/ When establishing the Adjusted Job Mix Formula (AJMF) the percent passing the #8 (2.36 mm) sieve shall not be adjusted below 34 percent.

6/ When the mixture is used as a binder, the maximum shall be increased by 0.5 percent passing."

Revise Article 1030.05(b) of the Standard Specifications to read:

(b) Volumetric Requirements. The target value for the air voids of the HMA shall be 4.0 percent, for IL-4.75 and SMA mixtures it shall be 3.5 percent and for Stabilized Subbase it shall be

3.0 percent at the design number of gyrations. The voids in the mineral aggregate (VMA) and voids filled with asphalt binder (VFA) of the HMA design shall be based on the nominal maximum size of the aggregate in the mix and shall conform to the following requirements.

Mix Design	Voids in the Mineral Aggregate (VMA), % Minimum for Ndesign				
	30	50	70	80	90
IL-19.0		13.5	13.5		13.5
IL-9.5		15.0	15.0		
IL-9.5FG		15.0	15.0		
IL-4.75 ^{1/}		18.5			
SMA-12.5 ^{1/2/5/}				17.0 ^{3/} /16.0 ^{4/}	
SMA-9.5 ^{1/2/5/}				17.0 ^{3/} /16.0 ^{4/}	
IL-19.0L	13.5				
IL-9.5L	15.0				

- 1/ Maximum draindown shall be 0.3 percent according to Illinois Modified AASHTO T 305.
- 2/ The draindown shall be determined at the JMF asphalt binder content at the mixing temperature plus 30°F.
- 3/ Applies when specific gravity of coarse aggregate is ≥ 2.760 .
- 4/ Applies when specific gravity of coarse aggregate is < 2.760 .
- 5/ For surface course, the coarse aggregate can be crushed steel slag, crystalline crushed stone or crushed sandstone. For binder course, coarse aggregate shall be crushed stone (dolomite), crushed gravel, crystalline crushed stone, or crushed sandstone"

Revise the last paragraph of Article 1102.01 (a) (5) of the Standard Specifications to read:

"IL-4.75 and Stone Matrix Asphalt (SMA) mixtures which contain aggregate having absorptions greater than or equal to 2.0 percent, or which contain steal slag sand, shall have minimum surge bin storage plus haul time of 1.5 hours."

Add after third sentence of Article 1030.09(b) to read:

"If the Contractor and Engineer agree the nuclear density test method is not appropriate for the mixture, cores shall be taken at random locations determined according to the QC/QA document "Determination of Random Density Test Site Locations". Core densities shall be determined using the Illinois Modified AASHTO T 166 or T 275 procedure."

Revise Table 1 and Note 4/ of Table 1 in Article 406.07(a) of the Standard Specifications to read:

	Breakdown/Intermediate Roller (one of the following)	Final Roller (one or more of the following)	Density Requirement
IL-9.5, IL-9.5FG, IL-19.0 ^{1/}	V _D , P, T _B , 3W, O _T , O _B	V _S , T _B , T _F , O _T	As specified in Section 1030
IL-4.75 and SMA ^{3/ 4/}	T _B , 3W, O _T	T _F , 3W	As specified in Section 1030
Mixtures on Bridge Decks ^{2/}	T _B	T _F	As specified in Articles 582.05 and 582.06.

“4/ The Contractor shall provide a minimum of two steel-wheeled tandem rollers (T_B), and/or three-wheel (3W) rollers for breakdown, except one of the (T_B) or (3W) rollers shall be 84 inches (2.14 m) wide and a weight of 315 pound per linear inch (PLI) (5.63 kg/mm) and one of the (T_B) or (3W) rollers can be substituted for an oscillatory roller (O_T). T_F rollers shall be a minimum of 280 lb/in. (50 N/mm). The 3W and T_B rollers shall be operated at a uniform speed not to exceed 3 mph (5 km/h), with the drive roll for T_B rollers nearest the paver and maintain an effective rolling distance of not more than 150 ft (45 m) behind the paver.”

Add the following after the fourth paragraph of Article 406.13 (b):

“The plan quantities of SMA mixtures shall be adjusted using the actual approved binder and surface Mix Design’s G_{mb}.”

Revise first paragraph of Article 1030.10 of the Standard Specifications to read:

“A test strip of 300 ton (275 metric tons), except for SMA mixtures it will be 400 ton (363 metric ton), will be required for each mixture on each contract at the beginning of HMA production for each construction year according to the Manual of Test Procedures for Materials “Hot Mix Asphalt Test Strip Procedures”. At the request of the Producer, the Engineer may waive the test strip if previous construction during the current construction year has demonstrated the constructability of the mix using Department test results.”

Revise third paragraph of Article 1030.10 of the Standard Specifications to read:

“When a test strip is constructed, the Contractor shall collect and split the mixture according to the document “Hot-Mix Asphalt Test Strip Procedures”. The Engineer, or a representative, shall deliver split sample to the District Laboratory for verification testing. The Contractor shall complete mixture tests stated in Article 1030.09(a). Mixture sampled shall include enough material for the Department to conduct mixture tests detailed in Article 1030.09(a) and in the document “Hot-Mix Asphalt Mixture Design Verification Procedure” Section 3.3. The mixture test results shall meet the requirements of Articles 1030.05(b) and 1030.05(d), except Hamburg wheel tests will only be conducted on High ESAL mixtures during production.”

WINTERIZED TEMPORARY ACCESS (D1)

Effective: January 1, 2012

Revised: March 5, 2012

Description. This work shall consist of constructing, maintaining and removing winterized temporary access for private and commercial entrances and side roads designed for use throughout the winter months.

Materials. Materials shall be according to the following.

ITEM	ARTICLE/SECTION
Hot-Mix Asphalt	1030

Construction Requirements

For projects lasting longer than one construction season, the contractor shall construct and maintain temporary access composed of an HMA surface course over an existing aggregate temporary access. The contractor shall install the winterized temporary access prior to winter shut down at the direction of the engineer. The top 2" of the existing aggregate temporary access should be removed and replaced with 2" of Hot-Mix Asphalt. Compensation will be given for the winterized temporary access at the time of the installation of the Hot-Mix Asphalt surface course.

HMA Surface Course. The Hot-Mix Asphalt surface course shall be 2 in. thick when compacted. HMA Surface Course, Mix "D", N50 shall be used except as modified by the plans or as directed by the Engineer. This work shall be constructed in accordance with the applicable portions of Section 406 of the Standard Specifications and as directed by the Engineer. The material shall conform to the applicable portions of Section 1030 of the Standard Specifications.

The winterized temporary access shall be constructed to the dimensions and grades of the existing aggregate temporary access.

Maintaining the winterized temporary access shall include repairing the HMA surface course after any operation that may disturb or remove the winterized temporary access to the satisfaction of the Engineer.

When use of the winterized temporary access is discontinued, the winterized temporary access shall be removed according to Article 440.03 of the Standard Specifications. The material shall be disposed of according to Article 202.03 of the Standard Specifications or may be utilized in the permanent construction with the approval of the Engineer.

Method of Measurement. Winterized temporary access for private and commercial entrances and roads will be measured for payment at the contract unit price per square yard for every private entrance, commercial entrance or road constructed for the purpose of winterized temporary access.

Basis of Payment. Winterized temporary access for private and commercial entrances and roads will be paid for at the contract unit price per square yard for TEMPORARY ACCESS (WINTERIZE) as specified in the plans.

Partial payment of the square yard amount bid for each winterized temporary access will be paid according to the following schedule:

(a) Upon construction of the winterized temporary access, sixty percent of the contract unit price per square yard will be paid.

(b) Subject to the approval of the Engineer for the adequate maintenance and removal of the winterized temporary access, the remaining forty percent of the pay item will be paid upon the permanent removal of the temporary access.

STORM SEWER ADJACENT TO OR CROSSING WATER MAIN (D1)

Effective: February 1, 1996

Revised: January 1, 2007

This work consists of constructing storm sewer adjacent to or crossing a water main, at the locations shown on the plans. The material and installation requirements shall be according to the latest edition of the "Standard Specifications for Water and Sewer Main Construction in Illinois", and the applicable portions of Section 550 of the Standard Specifications; which may include concrete collars and encasing pipe with seals if required.

Pipe materials shall meet the requirements of Sections 40 and 41-2.01 of the "Standard Specifications for Water and Sewer Main Construction in Illinois", except PVC pipe will not be allowed. Ductile-Iron pipe shall meet the minimum requirements for Thickness Class 50.

Encasing of standard type storm sewer, according to the details for "Water and Sewer Separation Requirements (Vertical Separation)" in the "STANDARD DRAWINGS" Division of the "Standard Specifications for Water and Sewer Main Construction in Illinois", may be used for storm sewers crossing water mains.

Basis of Payment: This work will be paid according to Article 550.10 of the Standard Specifications, except the pay item shall be STORM SEWER (WATER MAIN REQUIREMENTS), of the diameter specified.

ADJUSTMENTS AND RECONSTRUCTIONS (D1)

Effective: March 15, 2011

Revised: October 1, 2021

Revise the first paragraph of Article 602.04 to read:

"602.04 Concrete. Cast-in-place concrete for structures shall be constructed of Class SI concrete according to the applicable portions of Section 503. Cast-in-place concrete for pavement patching around adjustments and reconstructions shall be constructed of Class PP-2 concrete, unless otherwise noted in the plans, according to the applicable portions of Section 1020."

Revise the third, fourth and fifth sentences of the second paragraph of Article 602.11(c) to read:

"Castings shall be set to the finished pavement elevation so that no subsequent adjustment will be necessary, and the space around the casting shall be filled with Class PP-2 concrete, unless otherwise noted in the plans, to the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e)(3)b."

Revise Article 603.05 to read:

"603.05 Replacement of Existing Flexible Pavement. After the castings have been adjusted, the surrounding space shall be filled with Class PP-2 concrete, unless otherwise noted in the plans, to

the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e)(3)b.”

Revise Article 603.06 to read:

“603.06 Replacement of Existing Rigid Pavement. After the castings have been adjusted, the pavement and HMA that was removed, shall be replaced with Class PP-2 concrete, unless otherwise noted in the plans, not less than 9 in. (225 mm) thick. The pavement may be opened to traffic according to Article 701.17(e)(3)b.

The surface of the Class PP concrete shall be constructed flush with the adjacent surface.”

Revise the first sentence of Article 603.07 to read:

“603.07 Protection Under Traffic. After the casting has been adjusted and the Class PP concrete has been placed, the work shall be protected by a barricade and two lights according to Article 701.17(e)(3)b.”

DRAINAGE AND INLET PROTECTION UNDER TRAFFIC (D1)

Effective: April 1, 2011

Revised: April 2, 2011

Add the following to Article 603.02 of the Standard Specifications:

- “(i) Temporary Hot-Mix Asphalt (HMA) Ramp (Note 1) 1030
- (j) Temporary Rubber Ramps (Note 2)

Note 1. The HMA shall have maximum aggregate size of 3/8 in. (95 mm).

Note 2. The rubber material shall be according to the following.

Property	Test Method	Requirement
Durometer Hardness, Shore A	ASTM D 2240	75 ±15
Tensile Strength, psi (kPa)	ASTM D 412	300 (2000) min
Elongation, percent	ASTM D 412	90 min
Specific Gravity	ASTM D 792	1.0 - 1.3
Brittleness, °F (°C)	ASTM D 746	-40 (-40)”

Revise Article 603.07 of the Standard Specifications to read:

“603.07 Protection Under Traffic. After the casting has been adjusted and the Class PP concrete has been placed, the work shall be protected by a barricade and two lights according to Article 701.17(e)(3)b.

When castings are under traffic before the final surfacing operation has been started, properly sized temporary ramps shall be placed around the drainage and/or utility castings according to the following methods.

- (a) Temporary Asphalt Ramps. Temporary hot-mix asphalt ramps shall be placed around the casting, flush with its surface and decreasing to a featheredge in a distance of 2 ft (600 mm) around the entire surface of the casting.
- (b) Temporary Rubber Ramps. Temporary rubber ramps shall only be used on roadways with permanent posted speeds of 40 mph or less and when the height of the casting to be protected meets the proper sizing requirements for the rubber ramps as shown below.

Dimension	Requirement
Inside Opening	Outside dimensions of casting + 1 in. (25 mm)
Thickness at inside edge	Height of casting \pm 1/4 in. (6 mm)
Thickness at outside edge	1/4 in. (6 mm) max.
Width, measured from inside opening to outside edge	8 1/2 in. (215 mm) min

Placement shall be according to the manufacturer's specifications.

Temporary ramps for castings shall remain in place until surfacing operations are undertaken within the immediate area of the structure. Prior to placing the surface course, the temporary ramp shall be removed. Excess material shall be disposed of according to Article 202.03."

ENGINEER'S FIELD OFFICE TYPE A (SPECIAL) (D1)

Effective: December 1, 2011

Revised: May 1, 2013

Revise the first paragraph of Article 670.02 to read:

670.02 Engineer's Field Office Type A (Special). Type A (Special) field offices shall have a ceiling height of not less than 7 feet and a floor space of not less than 3000 square feet with a minimum of two separate offices. The office shall also have a separate storage room capable of being locked for the storage of the nuclear measuring devices. The office shall be provided with sufficient heat, natural and artificial light, and air conditioning. Doors and windows shall be equipped with locks approved by the Engineer.

Revise the first sentence of the second paragraph of Article 670.02 to read:

An electronic security system that will respond to any breach of exterior doors and windows with an on-site alarm shall be provided.

Revise the last sentence of the third paragraph of Article 670.02 to read:

Adequate all-weather parking space shall be available to accommodate a minimum of twelve vehicles.

Revise the fifth paragraph of Article 670.02 to read:

Sanitary facilities shall include hot and cold potable running water, lavatory and toilet as an integral part of the office where available. Solid waste disposal consisting of seven waste baskets and an outside trash container of sufficient size to accommodate a weekly provided pick-up service. A weekly cleaning service for the office shall be provided.

Revise subparagraph (a) of Article 670.02 to read:

- (a) Twelve desks with minimum working surface 42 inch x 30 inch each and twelve non-folding chairs with upholstered seats and backs.

Revise the first sentence of subparagraph (c) of Article 670.02 to read:

- (c) Two four-post drafting tables with minimum top size of 37-½ inch x 48 inch.

Revise subparagraph (d) of Article 670.02 to read:

- (d) Eight free standing four-drawer legal size file cabinets with lock and an underwriters' laboratories insulated file device 350 degrees one hour rating.

Revise subparagraph (e) of Article 670.02 to read:

- (e) Twenty folding chairs and two conference tables with minimum top size of 44 inch x 96 inch.

Revise subparagraph (h) of Article 670.02 to read:

- (h) Three electric desk type tape printing calculator and two pocket scientific notation calculators with a 1000 hour battery life or with a portable recharger.

Revise subparagraph (i)(2) of Article 670.02 to read:

- (i)(2) Telephones lines. Five separate telephone lines including one line for the fax machine, and two lines for the exclusive use of the Engineer. All telephone lines shall include long distance service and all labor and materials necessary to install the phone lines at the locations directed by the Engineer. The TELCOM company shall configure ROLL/HUNT features as specified by the engineer.

Revise subparagraph (j) of Article 670.02 to read:

- (j) Two plain paper network multi-function printer/copier/scanner machines capable of reproducing prints up to 11 inch x 17 inch within automatic feed tray capable of sorting 30 sheets of paper. Letter size and 11 inch x 17 inch paper shall be provided. The contractor shall provide the multi-function machines with IT support for setup and maintenance.

Revise subparagraph (k) of Article 670.02 to read:

- (k) One plain paper fax machine including maintenance and supplies.

Revise subparagraph (l) of Article 670.02 to read:

- (l) Six four-line telephones, with touch tone, where available, and two digital answering machines, for exclusive use by the Engineer.

Revise subparagraph (m) of Article 670.02 to read:

- (m) One electric water cooler dispenser including water service.

Add the following subparagraphs to Article 670.02:

- (s) One 4 foot x 6 foot chalkboard or dry erase board.
- (t) One 4 foot x 6 foot framed cork board.

Add the following to Article 670.07 Basis of Payment.

The building or buildings, fully equipped, will be paid for at the contract unit price per calendar month or fraction thereof for ENGINEER'S FIELD OFFICE, TYPE A (SPECIAL).

TRAFFIC CONTROL AND PROTECTION (ARTERIALS) (D1)

Effective: February 1, 1996

Revised: March 1, 2011

Specific traffic control plan details and Special Provisions have been prepared for this contract. This work shall include all labor, materials, transportation, handling and incidental work necessary to furnish, install, maintain and remove all traffic control devices required as indicated in the plans and as approved by the Engineer.

When traffic is to be directed over a detour route, the Contractor shall furnish, erect, maintain and remove all applicable traffic control devices along the detour route according to the details shown in the plans.

Method of Measurement: All traffic control (except "Traffic Control and Protection (Expressways)" and temporary pavement markings) indicated on the traffic control plan details and specified in the Special Provisions will be measured for payment on a lump sum basis.

Basis of Payment: All traffic control and protection will be paid for at the contract lump sum price for TRAFFIC CONTROL AND PROTECTION (SPECIAL).

Temporary pavement markings will be paid for separately unless shown on a Standard.

TRAFFIC CONTROL PLAN (D1)

Effective: September 30, 1985

Revised: January 1, 2007

Traffic Control shall be according to the applicable sections of the Standard Specifications, the Supplemental Specifications, the "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways", any special details and Highway Standards contained in the plans, and the Special Provisions contained herein.

Special attention is called to Article 107.09 of the Standard Specifications and the following Highway Standards, Details, Quality Standard for Work Zone Traffic Control Devices, Recurring Special Provisions and Special Provisions contained herein, relating to traffic control.

The Contractor shall contact the District One Bureau of Traffic at least 72 hours in advance of beginning work.

STANDARDS:

701001-02	Off Road Operations, 2L2W More than 15' (4.5m) away
701006-05	Off-Road Operations, 2L, 2W, 15' to 24" from Pavement Edge
701011-04	Off-Road Moving Operations, 2L, 2W, Day Only
701106-02	Off-Road Operations, Multilane, More than 15' (4.5m) Away
701301-04	Lane Closure, 2L, 2W, Short Time Operations
701311-03	Lane Closure, 2L, 2W, Moving Operations - Day Only
701427-05	Lane Closure, Multilane, Intermittent or Moving Oper., for Speeds <=40 mph
701501-06	Urban Lane Closure, 2L, 2W, Undivided
701502-09	Urban Lane Closure, 2L, 2W, with Bidirectional Left Turn Lane
701601-09	Urban Lane Closure, Multilane, 1W or 2W with Nontraversable Median
701602-10	Urban Lane Closure, Multilane, 2W with Bidirectional Left Turn Lane
701606-10	Urban Single Lane Closure, Multilane, 2W with Mountable Median
701701-10	Urban Lane Closure, Multilane Intersection
701801-06	Sidewalk, Corner or Crosswalk Closure
701901-09	Traffic Control Devices

DETAILS:

Traffic Control and Protection for Side Roads, Intersections, and Driveways (TC-10)
Raised Reflective Pavement Markers (Snow Plow Resistant) (TC-11)
District One Typical Pavement Markings (TC-13)
Traffic Control and Protection at Turn Bays (to Remain Open to Traffic) (TC-14)
Short-Term Pavement Marking Letters and Symbols (TC-16)
Detour Signing for Closure State Highways (TC-21)
Arterial Road Information Sign (TC-22)
Driveway Entrance Signing (TC-26)

SPECIAL PROVISIONS:

"Temporary Information Signing" (D-1)
"Public Convenience and Safety" (D-1)
"Keeping Arterial Roadways Open to Traffic (Lane Closures Only)" (D-1)
"Raised Reflective Pavement Marker, Reflector Removal" (D-1)
"Raised Reflective Pavement Marker, Reflector Replacement" (D-1)
"Maintenance of Roadways (D-1)"
"Keeping Roads Open to Traffic"
"Vehicle and Equipment Warning Lights" (BDE)
"Work Zone Traffic Control Devices" (BDE)
"Short Term and Temporary Pavement Markings" (BDE)

FRICTION AGGREGATE (D1)

Effective: January 1, 2011

Revised: December 1, 2021

Revise Article 1004.03(a) of the Standard Specifications to read:

“1004.03 Coarse Aggregate for Hot-Mix Asphalt (HMA). The aggregate shall be according to Article 1004.01 and the following.

(a) Description. The coarse aggregate for HMA shall be according to the following table.

Use	Mixture	Aggregates Allowed
Class A	Seal or Cover	<u>Allowed Alone or in Combination</u> ^{5/} : Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete
HMA Low ESAL	Stabilized Subbase or Shoulders	<u>Allowed Alone or in Combination</u> ^{5/} : Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{1/} Crushed Concrete
HMA High ESAL Low ESAL	Binder IL-19.0 or IL-19.0L SMA Binder	<u>Allowed Alone or in Combination</u> ^{5/ 6/} : Crushed Gravel Carbonate Crushed Stone ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Concrete ^{3/}

Use	Mixture	Aggregates Allowed	
HMA High ESAL Low ESAL	C Surface and Binder IL-9.5 IL-9.5FG or IL-9.5L	<u>Allowed Alone or in Combination</u> ^{5/} : Crushed Gravel Carbonate Crushed Stone ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{4/} Crushed Concrete ^{3/}	
HMA High ESAL	D Surface and Binder IL-9.5 or IL-9.5FG	<u>Allowed Alone or in Combination</u> ^{5/} : Crushed Gravel Carbonate Crushed Stone (other than Limestone) ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{4/}	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		25% Limestone	Dolomite
		50% Limestone	Any Mixture D aggregate other than Dolomite
		75% Limestone	Crushed Slag (ACBF) or Crushed Sandstone
HMA High ESAL	E Surface IL-9.5 SMA Ndesign 80 Surface	<u>Allowed Alone or in Combination</u> ^{5/ 6/} : Crushed Gravel Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag No Limestone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		50% Dolomite ^{2/}	Any Mixture E aggregate

Use	Mixture	Aggregates Allowed	
		75% Dolomite ^{2/}	Crushed Sandstone, Crushed Slag (ACBF), Crushed Steel Slag, or Crystalline Crushed Stone
		75% Crushed Gravel ^{2/}	Crushed Sandstone, Crystalline Crushed Stone, Crushed Slag (ACBF), or Crushed Steel Slag
HMA High ESAL	F Surface IL-9.5 SMA Ndesign 80 Surface	<u>Allowed Alone or in Combination</u> ^{5/ 6/} :	
		Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag No Limestone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		50% Crushed Gravel ^{2/} or Dolomite ^{2/}	Crushed Sandstone, Crushed Slag (ACBF), Crushed Steel Slag, or Crystalline Crushed Stone

- 1/ Crushed steel slag allowed in shoulder surface only.
- 2/ Carbonate crushed stone (limestone) and/or crushed gravel shall not be used in SMA Ndesign 80.
- 3/ Crushed concrete will not be permitted in SMA mixes.
- 4/ Crushed steel slag shall not be used as binder.
- 5/ When combinations of aggregates are used, the blend percent measurements shall be by volume."
- 6/ Combining different types of aggregate will not be permitted in SMA Ndesign 80."

SLIPFORM PAVING (D1)

Effective: November 1, 2014

Revise Article 1020.04 Table 1, Note (5) of Standard Specifications to read:

"The slump range for slipform construction shall be 1/2 to 1 1/2 in."

Revise Article 1020.04 Table 1 (metric), Note (5) of Standard Specifications to read:

"The slump range for slipform construction shall be 13 to 40 mm."

HOT-MIX ASPHALT – MIXTURE DESIGN VERIFICATION AND PRODUCTION (D1)

Effective: January 1, 2019

Revised: December 1, 2021

Add to Article 1030.05 (d)(3) of the Standard Specifications to read:

“ During mixture design, prepared samples shall be submitted to the District laboratory by the Contractor for verification testing. The required testing, and number and size of prepared samples submitted, shall be according to the following tables.

High ESAL – Required Samples for Verification Testing	
Mixture	Hamburg Wheel and I-FIT Testing ^{1/ 2/}
Binder	total of 3 - 160 mm tall bricks
Surface	total of 4 - 160 mm tall bricks

Low ESAL – Required Samples for Verification Testing	
Mixture	I-FIT Testing ^{1/ 2/}
Binder	1 - 160 mm tall brick
Surface	2 - 160 mm tall bricks

1/ The compacted gyratory bricks for Hamburg wheel and I-FIT testing shall be 7.5 ± 0.5 percent air voids.

2/ If the Contractor does not possess the equipment to prepare the 160 mm tall brick(s), twice as many 115 mm tall compacted gyratory bricks will be acceptable.

Revise the fourth paragraph of Article 1030.10 of the Standard Specifications to read:

“When a test strip is not required, each HMA mixture shall still be sampled on the first day of production: I-FIT and Hamburg wheel testing for High ESAL; I-FIT testing for Low ESAL. Within two working days after sampling the mixture, the Contractor shall deliver gyratory cylinders to the District laboratory for Department verification testing. The High ESAL mixture test results shall meet the requirements of Articles 1030.05(d)(3) and 1030.05(d)(4). The Low ESAL mixture test results shall meet the requirements of Article 1030.05(d)(4). The required number and size of prepared samples submitted for the Hamburg wheel and I-FIT testing shall be according to the “High ESAL - Required Samples for Verification Testing” table in Article 1030.05(d)(3) above.”

Add the following to the end of Article 1030.10 of the Standard Specifications to read:

“Mixture sampled during first day of production shall include approximately 60 lb (27 kg) of additional material for the Department to conduct Hamburg wheel testing and approximately 80 lb (36 kg) of additional material for the Department to conduct I-FIT testing. Within two working days after sampling, the Contractor shall deliver prepared samples to the District laboratory for verification testing. The required number and size of prepared samples submitted for the Hamburg wheel and I-FIT testing shall be according to the “High ESAL - Required Samples for Verification Testing” table in Article 1030.05(d)(3) above.”

TEMPORARY INFORMATION SIGNING

Effective: November 13, 1996

Revised: January 29, 2020

Description.

This work shall consist of furnishing, installing, maintaining, relocating for various states of construction and eventually removing temporary informational signs. Included in this item may be ground mount signs, skid mount signs, truss mount signs, bridge mount signs, and overlay sign panels which cover portions of existing signs.

Materials.

Materials shall be according to the following Articles of Section 1000 - Materials:

	<u>Item</u>	<u>Article/Section</u>
a.)	Sign Base (Note 1)	1090
b.)	Sign Face (Note 2)	1091
c.)	Sign Legends	1091
d.)	Sign Supports	1093
e.)	Overlay Panels (Note 3)	1090.02

Note 1. The Contractor may use 5/8 inch (16 mm) instead of 3/4 inch (19 mm) thick plywood.

Note 2. The sign face material shall be in accordance with the Department's Fabrication of Highway Signs Policy.

Note 3. The overlay panels shall be 0.08 inch (2 mm) thick.

GENERAL CONSTRUCTION REQUIREMENTS

Installation.

The sign sizes and legend sizes shall be verified by the Contractor prior to fabrication.

Signs which are placed along the roadway and/or within the construction zone shall be installed according to the requirements of Article 701.14 and Article 720.04. The signs shall be 7 ft (2.1 m) above the near edge of the pavement and shall be a minimum of 2 ft (600 mm) beyond the edge of the paved shoulder. A minimum of two (2) posts shall be used.

The attachment of temporary signs to existing bridges, sign structures or sign panels shall be approved by the Engineer. Any damage to the existing signs and/or structures due to the Contractor's operations shall be repaired or signs replaced, as determined by the Engineer, at the Contractor's expense.

Method of Measurement.

This work shall be measured for payment in square feet (square meters) edge to edge (horizontally and vertically).

All hardware, posts or skids, supports, bases for ground mounted signs, connections, which are required for mounting these signs will be included as part of this pay item.

Basis Of Payment.

This work shall be paid for at the contract unit price per square foot (square meter) for TEMPORARY INFORMATION SIGNING.

KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (LANE CLOSURES ONLY)

Effective: January 22, 2003

Revised: August 10, 2017

The Contractor shall provide the necessary traffic control devices to warn the public and to delineate the work zone as required in these Special Provisions, the Standard Specifications, the State Standards, and the District Details.

Arterial lane closures shall be in accordance with the Standard Specifications, Highway Standards, District Details, and the direction of the Engineer. The Contractor shall request and gain approval from the Engineer seventy-two (72) hours in advance of all long-term (24 hrs. or longer) lane closures.

Arterial lane closures not shown in the staging plans will not be permitted during **peak traffic volume hours**.

Peak traffic volume hours are defined as weekdays (Monday through Friday) from
6:00 AM to 8:30 AM and 4:30 PM to 6:00 PM.

Private vehicles shall not be parked in the work zone. Contractor's equipment and/or vehicles shall not be parked on the shoulders or in the median during non-working hours. The parking of equipment and/or vehicles on State right-of-way will only be permitted at locations approved by the Engineer in accordance with Articles 701.08 and 701.11 of the Standard Specifications.

Should the Contractor fail to completely open and keep open all the traffic lanes to traffic in accordance with the limitations specified above, the Contractor shall be liable to the Department for the amount of:

One lane or ramp blocked = \$ 1,000

Two lanes blocked = \$ 2,500

Not as a penalty but as liquidated and ascertained damages for each and every 15 minute interval or a portion thereof that a lane is blocked outside the allowable time limitations. Such damages may be deducted by the Department from any monies due the Contractor. These damages shall apply during the contract time and during any extensions of the contract time.

RAISED REFLECTIVE PAVEMENT MARKER, REFLECTOR REMOVAL

Effective: August 1, 2023

Revised:

Description: This work shall be completed in accordance with Section 783 of the Standard Specifications for Road and Bridge Construction. This work shall consist of removing the reflector unit from existing raised reflector pavement markers that will remain in place at the end of construction activities. Existing reflectors that conflict with revised traffic patterns shall be removed immediately to

facilitate a change in lane assignment. If darkness or inclement weather prohibits the removal operations, such operation shall be resumed the next morning or when weather permits.

The base casting shall remain in place in areas where no pavement rehabilitation is required, therefore only the reflector shall be removed. Debris from the removal operations shall be removed from the pavement prior to opening the roadway to traffic.

Basis of Payment: This work will be measured for payment at the contract unit price per each for RAISED REFLECTIVE PAVEMENT MARKER, REFLECTOR REMOVAL. Payment shall be full compensation for materials, labor and equipment required to complete this work.

RAISED REFLECTIVE PAVEMENT MARKER, REFLECTOR REPLACEMENT

Effective: August 1, 2023

Revised:

Description: This work shall be completed in accordance with Section 781 of the Standard Specifications for Road and Bridge Construction. This work shall consist of reinstallation of reflectors into the raised pavement marker castings upon completion of staging in which the markers were in conflict with temporary lane usage.

Basis of Payment: This work will be measured for payment at the contract unit price per each for RAISED REFLECTIVE PAVEMENT MARKER, REFLECTOR REPLACEMENT. Payment shall be full compensation for materials, labor and equipment required to complete this work.

CONCRETE WASHOUT FACILITY

Description. The Contractor shall take sufficient precautions to prevent pollution of streams, lakes, reservoirs, and wetlands with fuels, oils, bitumens, calcium chloride, or other harmful materials according to Article 107.23 of the Standard Specifications.

General. To prevent pollution by residual concrete and/or the by-product of washing out the concrete trucks, concrete washout facilities shall be constructed and maintained on any project which includes cast-in-place concrete items. The concrete washout shall be constructed, maintained, and removed according to this special provision.

The concrete washout facility shall be constructed on the job site in accordance with Illinois Urban Manual practice standard for Temporary Concrete Washout Facility (Code 954). The Contractor may elect to use a pre-fabricated portable concrete washout structure. The Contractor shall submit a plan for the concrete washout facility, to the Engineer for approval, a minimum of 10 calendar days before the first concrete pour. The working concrete washout facility shall be in place before any delivery of concrete to the site. The Contractor shall ensure that all concrete washout activities are limited to the designated area.

The concrete washout facility shall be located no closer than 50 feet from any environmentally sensitive areas, such as water bodies, wetlands, and/or other areas indicated on the Plans. Adequate signage shall be placed at the washout facility and elsewhere as necessary to clearly indicate the location of the concrete washout facility to the operators of concrete trucks.

The concrete washout facility shall be adequately sized to fully contain the concrete washout needs of the project. The contents of the concrete washout facility shall not exceed 75% of the facility capacity. Once the 75% capacity is reached, concrete placement shall be discontinued until the facility is cleaned out. Hardened concrete shall be removed and properly disposed of outside the right-of-way. Slurry shall be allowed to evaporate, or shall be removed and properly disposed of outside the right-of-way. The Contractor shall immediately replace damaged basin liners or other washout facility components to prevent leakage of concrete waste from the washout facility. Concrete washout facilities shall be inspected by the Contractor after each use. Any and all spills shall be reported to the Engineer and cleaned up immediately. The Contractor shall remove the concrete washout facility when it is no longer needed.

Basis of Payment. This work will not be paid for separately, but shall be included in the cost of the concrete work items included in the contract.

OPERATION OF WATER DISTRIBUTION FACILITIES

Contractor shall not operate any water distribution facilities, including, but not limited to, valves or hydrants. If Contractor requires the operation of such facilities, Contractor shall provide a minimum of 48 hours notice to the Village and the Village will operate such facilities.

PROTECTION OF EXISTING DRAINAGE FACILITIES DURING CONSTRUCTION

Unless otherwise noted in the contract plans, the existing drainage facilities shall remain in use during the period of construction.

Locations of existing drainage structures and sewers as shown on the contract plans are approximate. Prior to commencement of work, the Contractor, at his own expense, shall determine the exact location of existing structures which are within the proposed construction site.

All drainage structures are to be kept free from any debris resulting from construction operations. All work and materials necessary to prevent accumulation of debris in the drainage structure resulting from construction operations shall be removed at the Contractor's own expense, and no extra compensation will be allowed.

Unless reconstruction or adjustment of an existing manhole, catch basin, or inlet is called for in the contract plans or ordered by the Engineer, the proposed work shall meet the existing elevations of these structures. Should reconstruction or adjustment of a drainage structure be required by the Engineer in the field, the necessary work and payment shall be done in accordance with Section 602 and Article 104.02 respectively, of the Standard Specifications.

Existing frames and grates are to remain unless otherwise noted in the contract plans or as directed by the Engineer. Frames and grates that are missing or damaged prior to construction shall be replaced. The type of replacements frame or grate shall be determined by the Engineer, and replacement and payment for same shall be in accordance with Section 604 and Article 104.02 respectively, of the Standard Specifications unless otherwise noted in the plans or special provisions.

HOT-MIX ASPHALT DRIVEWAY PAVEMENT

Description. This work shall consist of paving hot-mix asphalt driveway aprons, of the thickness specified, which composition will be of a binder course and surface course as shown in the Hot-Mix Asphalt Mixture Requirements table in the plans and according to Section 406 of the Standard Specifications, with the following modifications:

For an HMA driveway pavement thickness of less than 6", the aggregate base course, type b will be 6" thick. For an HMA driveway pavement thickness of 6" or more, the aggregate base course, type b will be 8" thick.

Excavation and disposal of materials required to construct the proposed driveway pavement with aggregate base course will be included in this work.

Method of Measurement. This work will be measured for payment as follows:

- (a) Contract Quantities. The requirements for the use of contract quantities shall conform to Article 202.07(a) in the Standard Specifications.
- (b) Measured Quantities. Hot-Mix Asphalt Driveway Pavement will be measured for payment in place and the quantity computed in square yards. The width of measurement shall be the width of the top HMA lift as shown on the plans or as directed by the Engineer.

Excavation and disposal of materials will not be measured for payment but shall be considered as included in the cost of HOT-MIX ASPHALT DRIVEWAY PAVEMENT, of the thickness specified.

Basis of Payment. This work will be paid for at the contract unit price per square yard for HOT-MIX ASPHALT DRIVEWAY PAVEMENT, of the thickness specified.

PORTLAND CEMENT CONCRETE SIDEWALK

Description. This work shall consist of constructing portland cement concrete (PCC) sidewalk, of the thickness specified, on a prepared aggregate base as shown in the plans or as directed by the Engineer according to Sections 351 and 424 of the Standard Specifications, with the following modifications:

All constructed sidewalk shall comply with the slope and grade tolerances specified in the construction details shown in the plans and according to the latest edition of the Public Right-of-Way Accessibility Guidelines (PROWAG). The extent of sidewalk replacement shown in the plans at roadway intersections is approximate. The final limits of sidewalk replacement will be determined by the Engineer in the field in order to comply with the slopes and grades dictated by PROWAG. This work shall include re-grading, excavation and disposal of materials as directed by the Engineer to conform to these accessibility guidelines.

All joints on the proposed shared-use path shall be sawed. Tool joints will not be allowed.

For a PCC sidewalk thickness of less than 8", the aggregate base course, type b will be 4" thick. For a PCC sidewalk thickness of 8" or more, the aggregate base course, type b will be 6" thick. Aggregate base course shall be paid for separately.

When constructing PCC sidewalk through a residential driveway entrance, the thickness of the PCC sidewalk shall be 6" regardless of the actual thickness called off by the plan pay item.

Method of Measurement. This work will be measured for payment in place and the area computed in square feet (square meters). Curb ramps, including side curbs and side flares, will be measured for payment as sidewalk. No deduction will be made for detectable warnings located within the ramp.

Basis of Payment. This work will be paid for at the contract unit price per square foot for PORTLAND CEMENT CONCRETE SIDEWALK, of the thickness specified.

SCULPTURE REMOVAL AND RELOCATE, LOCATION 1

Description. This work shall consist of removing the sculpture as shown on the plans and relocating the sculpture to a new location on the library property. Coordination with the library will be required to determine the new location. If the new location is to be within the work zone the sculpture shall be temporarily located to a location on the property agreed upon by the library. The sculpture shall then be relocated to the final location at the end of construction. Proper care shall be taken that the sculpture is not damaged in the process. The Engineer shall approve method of moving prior to beginning work.

No additional compensation will be paid if the sculpture is moved more than one time.

Basis of Payment. This work will be paid for at the contract unit price per each for SCULPTURE REMOVAL AND RELOCATE, LOCATION 1.

EXPLORATION TRENCH, SPECIAL

Description. This work shall be done in accordance with Section 213 of the Standard Specifications except as modified herein. This item shall consist of excavating a trench at the locations directed by the Engineer for the purpose of locating existing TILE LINES, GAS LINES, UNDERGROUND ELECTRIC LINES, UNDERGROUND TELEPHONE LINES, UNDERGROUND CABLE TV LINES, and other UTILITIES within the construction limits of the proposed improvement.

The trench shall be deep enough to expose the utility, and the width of the trench shall be sufficient to allow proper investigation of the utility.

Method of Measurement. The exploration trench within the roadway width shall be backfilled with trench backfill at the direction of the Engineer in accordance with Section 208 of the Standard Specifications. Trench backfill will not be measured separately but shall be included in the cost of EXPLORATION TRENCH, SPECIAL.

The exploration trench outside of the roadway width shall be backfilled according to Article 550.07.

An estimated length of exploration trench has been shown in the summary of quantities to establish a unit price only, and payment shall be based on the actual length of trench explored without a change in unit price because of adjustment in plan quantities.

Basis of Payment. This work will be paid for at the contract unit price per foot (regardless of depth) for EXPLORATION TRENCH, SPECIAL, and no extra compensation will be allowed for any delays, inconveniences or damage sustained by the Contractor in performing the work.

PRECAST CONCRETE BOX CULVERTS (SPECIAL)

Description. This work shall consist of furnishing all labor, materials, tools, and equipment necessary to construct the precast concrete box culverts as shown on the plans or as directed by the Engineer, in accordance with the applicable portions of Sections 502, 503, and 540 of the Standard Specifications.

Included in this work are all the excavation, backfilling, dewatering, Class SI Concrete, reinforcement bars, and all other incidental hardware as specified and detailed on the plans.

Method of Measurement. This work will be measured for payment per foot for PRECAST CONCRETE BOX CULVERTS (SPECIAL) of the size shown on the plans, installed in place.

Basis of Payment. This work will be paid for at the contract unit price per foot for PRECAST CONCRETE BOX CULVERTS (SPECIAL) for the size shown on the plans, which price shall include all labor, equipment and materials necessary to complete the work as specified herein.

PRECAST CONCRETE JUNCTION CHAMBER

Description: This work shall consist of furnishing all labor, materials, tools, and equipment necessary to construct the junction chambers as shown on the plans or as directed by the Engineer, in accordance with the applicable portions of Sections 502, 503, 508, and 602 of the Standard Specifications.

Included in this work are all the excavation, backfilling, dewatering, Class SI Concrete, reinforcement bars, and all other incidental hardware as specified and detailed on the plans. Frames, grates or lids and risers shall be included in the cost of the junction chamber.

Method of Measurement: This work will be measured for payment for each PRECAST CONCRETE JUNCTION CHAMBER at each location as shown on the plans, installed in place.

Basis of Payment: This work will be paid for at the contract unit price per each for each PRECAST CONCRETE JUNCTION CHAMBER at each location as shown on the plans including the type of frames, grates or lids specified, which price shall include all labor, equipment and materials necessary to complete the work as specified herein.

TEMPORARY DRAINAGE STRUCTURES

Description. This work shall consist of installing, maintaining, and removing temporary inlets and catch basins. Inlets and catch basins used as drainage structures for proposed temporary connections and detour roads shall be furnished, installed, maintained, and removed as specified. The temporary drainage structures shall be furnished with Type 1 Frame and Open Lid. All work shall be performed at the direction of the Engineer.

General: The work shall be performed according to Section 602 of the "Standard Specifications"

Basis of Payment. This work will be paid for at the contract unit price each for TEMPORARY INLETS and CATCH BASINS regardless of the diameter and shall include the specified frame and grate or lid.

TEMPORARY STORM SEWER

Description. This work shall consist of installing, maintaining, and removing temporary storm sewer of the required inside diameter. Storm sewer used for proposed temporary connections and detour roads shall be furnished, installed, maintained, and removed as specified. All work shall be performed at the direction of the Engineer.

Materials. The storm sewer materials shall meet the requirements of Article 550.02 of the "Standard Specifications".

General. The work shall be performed according to Section 550 of the "Standard Specifications".

Method of Measurement. Temporary Storm Sewers shall be measured in place, in feet, of actual pipe installed.

Basis of Payment. This work will be paid for at the contract unit price per foot for TEMPORARY STORM SEWER of the size specified. The unit price shall include all materials, equipment and labor required to install the temporary storm sewers, including concrete collars and drilling and grouting for connections to culverts, and/or drainage structures.

PIPE DRAINS (SPECIAL)

Description: This work shall consist of furnishing and installing the pipe drains behind the abutments of SN 049-0014 including all connections and fittings as shown on the plans, as specified herein, and as directed by the Engineer. This work shall be performed in accordance with Sections 523 and 601 of the Standard Specifications, except as modified herein.

Materials: Solid pipe drains behind the abutments shall be bituminous coated corrugated metal pipe conforming to the requirements of Article 1006.01(a) of the Standard Specifications.

Method of Measurement: Pipe Drains (Special) will be measured for payment in feet, in place.

Basis of Payment: This work will be paid for at the contract unit price per foot for PIPE DRAINS (SPECIAL), of the diameter specified.

PIPE UNDERDRAINS

Description: This work shall be in accordance with Section 601 of the Standard Specifications, except as modified herein.

Materials: Pipe underdrains must be polyethylene pipe per Article 601.02. No other pipe materials will be accepted.

Method of Measurement: pipe underdrains will be measured per Article 601.07 of the Standard Specifications.

Basis of Payment: This work will be paid for per Article 601.08 of the Standard Specifications.

TURBIDITY CURTAIN

Description. This work shall consist of furnishing, installing, and maintaining a flotation turbidity curtain, designed to collect sediment from in stream work areas at locations shown on the plans, or as directed by the Engineer.

Materials. The Turbidity Curtain shall be of appropriate size to perform the required function of isolating the work area from the rest of the stream, with length being at least 1 ft. greater than the depth of water in all locations. The curtain assembly shall consist of the silt barrier with flotation segments or appropriate suspension devices and weighing devices and all required anchorage devices. It shall be in good working condition and meet the approval of the Engineer. A detail drawing in the plans depicts the curtain assembly.

The turbidity curtain shall meet the following physical and performance properties

	Testing Method	Requirement
Grab tensile warp strength	ASTM D-4632	≥ 240 lbs.
Elongation @ Break	ASTM D-4632	≥ 60%
Trapezoidal Tear	ASTM D-4533	≥ 90 lbs.
Puncture Strength	ASTM D-4833	≥ 65 lbs.
UV Stability @ 500 hrs	ASTM D-4355	≥ 70%
Permittivity	ASTM D-4491	≥ 0.1 sec ⁻¹
Water Flow Rate	ASTM D-4491	≥ 11 gpm/ft ²
AOS (US sieve #)	ASTM D-4751	≥ 140 sieve
Material construction		Nonwoven

All values are minimum average roll values

Installation.

The turbidity curtain shall be installed according to the manufacturer directions, and in a manner approved by the Engineer. Additional anchorage may be required as shown on the plans.

Construction Requirements. The Contractor shall inspect the work site to review the stream characteristics where the work is to occur.

The curtain assembly shall be installed in the stream in a configuration that prevents silt from traveling beyond the work area, but does not cause flooding upstream of the work area. The turbidity curtain shall be installed in a manner sufficient to withstand ten-year flood water levels. The turbidity curtain shall not be installed across the entire stream.

Routine maintenance includes continually maintaining a properly working turbidity curtain. Also included is the regular removal and disposal of excess sediment in contact with either side of the curtain, as directed by the Engineer.

Pumping of water contained within the silt curtain or any other structure shall be done in a manner approved by the Engineer. Direct pumping of water back into the stream shall not be permitted. All water pumping operations must be approved by the Engineer.

The turbidity curtain assembly shall remain in place through the end of the contract.

Method of Measurement. The Turbidity Curtain will be measured for payment in square yards along the centerline of the curtain, in place. Only properly working turbidity curtains will be measured for payment.

Basis of Payment. Turbidity Curtain shall be paid for at the contract unit price per square yard and shall include furnishing, installing, and maintaining.

DEWATERING

Description: This work shall consist of providing labor, tools, equipment, and materials necessary for dewatering work areas to construct the proposed Flint Creek Tributary waterway and to maintain suitable working conditions and sediment control. The work shall also consist of the preparation of an in-stream/wetland work plan to isolate the work area from water within regulated wetlands and Waters of the U.S. (WOUS) in accordance with the authorized U.S. Army Corps of Engineers (USACE) Section 404 Permit and the General Conditions of the current Nationwide Permit Program. The cost of dewatering any other construction areas (i.e. storm sewer, roadway, etc.) shall be included in the cost of that item being constructed.

Materials. Materials shall be in accordance with the USACE Section 404 Permit and General Conditions of the current Nationwide Permit Program.

Construction Requirements. Construction shall be in accordance with the authorized USACE Section 404 Permit.

The Contractor shall be responsible for diverting the water flow from the construction area using a method meeting the approval of the Engineer and in accordance with the authorized USACE Section 404 Permit and General Conditions of the current Nationwide Permit Program.

This project requires a USACE Section 404 Permit prior to the start of work. All conditions of the Section 404 Permit must be followed. As a condition of the Section 404 Permit, the Contractor will be required to submit an In-Stream/Wetland Work Plan to the Department for approval. The USACE defines and determines in-stream/wetland work within the WOUS.

Guidelines on acceptable In-Stream/Wetland work techniques can be found on the USACE website: <https://www.lrc.usace.army.mil/Missions/Regulatory/Regional-Permit-Program>

Bypass Pumping. Bypass pumping of waterways, to keep the work areas relatively dry, shall meet the above requirements. The cost of this work is included in the cost of DEWATERING.

Method of Measurement and Basis of Payment. This work will be measured and paid for at the contract unit price per lump sum for DEWATERING.

MANHOLES, TYPE A, 6'-DIAMETER, TYPE 1 FRAME, CLOSED LID, RESTRICTOR PLATE

Description: This work shall consist of constructing a type A manhole, with a type 1 frame, closed lid, and a restrictor plate.

Materials: The materials shall meet the requirements of Article 602.02 of the "Standard Specifications".

General: The work shall be performed according to Section 602 of the “Standard Specifications”, IDOT Standard Drawing 602401 and the following: The restrictor plate shall be furnished and installed as shown on the plans.

Basis of Payment: This work will be paid for at the contract unit price per each for MANHOLES, TYPE A, 6'-DIAMETER, TYPE 1 FRAME, CLOSED LID, RESTRICTOR PLATE. The unit price shall include all equipment, labor and materials required to furnish and install the manhole, frame and lid, and restrictor plate.

POROUS GRANULAR EMBANKMENT, SPECIAL

Description. This work shall consist of furnishing and placing porous granular embankment.

Materials. The aggregate shall meet the requirements of Article 1004.05 of the “Standard Specifications” except as follows:

1. *Crushed Stone meeting the requirements of the following table will be permitted.*

Sieve Size	Percent Passing
8"	100
6"	97 +/- 3
4"	90+/- 10
2"	45 +/- 25
#4	20+/-20
#200	5 +/- 5

2. *Crushed Gravel meeting the requirements of the following table will be permitted.*

Sieve Size	Percent Passing
8"	100
6"	97 +/- 3
4"	90+/- 10
2"	55 +/- 25
#4	30 +/- 20
#200	5 +/- 5

Crushed Gravel shall be defined as meeting a target of 97% with +/-3% variance for one-face or more crushed according to Crushed Particle Content: ASTM D 5821 (Illinois Modified).

Method of Measurement. Porous Granular Embankment, Special will be measured for payment in tons according to Article 311.08(b) of the “Standard Specifications”.

Basis of Payment. This work will be paid for at the contract unit price per TON for POROUS GRANULAR EMBANKMENT, SPECIAL. The unit price shall include all equipment and labor required to furnish and place the porous granular embankment.

IN-STREAM STRUCTURES

Description. This work shall consist of furnishing and installing aggregate in-stream structures where shown on the plans or as directed by the Engineer. In-stream structures shall include Cross Vanes, Streambank Revetments, Riffles, and the Channel Bed. This work shall conform to the applicable

portions of the US Route 14 Grade Separation Project Tributary to the Flint Creek Realignment plans and details.

Materials. Materials for in-stream structures shall be in accordance with the following.

- A. Filter fabric shall be in accordance with Section 282 of the Standard Specifications.
- B. Bedding material shall be in accordance with Section 281 of the Standard Specifications.
- C. Stone riprap shall be in accordance with Section 281 and Article 1005.01 of the Standard Specifications, except that all stone with gradation size A3 or larger shall be natural granite fieldstone. Limestone riprap and concrete riprap shall not be allowed. The riprap shall be reasonably free of shale and shaley stone. The stone shall be reasonably free of laminations, seams, cracks, and other structural defects or imperfections which may tend to destroy its resistance to weather and stream flows. The stone shall be naturally rounded in shape, and neither breadth nor thickness of a single stone shall be less than one-third its length.

Samples of the specified material shall be submitted to the Engineer for approval prior to delivery and installation.

- D. Boulders shall be stone gradation as depicted on the plans conforming to Section 1005 of the Standard Specifications. Each load of boulders shall be reasonably well graded from the smallest to the maximum size specified. Stones smaller than specified 10 percent size and spall will not be permitted in excess of 10 percent by weight of each load.
- E. Porous Granular Embankment, Special shall be in accordance with the special provision for POROUS GRANULAR EMBANKMENT, SPECIAL.
- F. Channel bed aggregate shall be stone that is naturally rounded in shape and has a naturally smooth surface such as stream or river stone. Channel bed stone shall be hard and durable stone. Bulk density shall not be less than 165 pounds per dry cubic foot. The least dimension of any one piece shall not be less than 1/3 the greatest dimension. Shot quarry stone, crushed rock, broken concrete, or recycled construction products will not be allowed. Each load of channel bed stone shall be reasonably well graded from the smallest to the maximum size specified. Stone size gradation for channel bed stone shall conform to the following gradation:

Channel Bed Aggregate, Gradation Table	
Size*	Smaller by Weight
8 inch	100%
4 inch	80%
3 inch	60%
2 inch	40%
1 inch	20%
* The size is measured along the B-axis. Assuming length, width, and height dimensions to describe the stone, A-axis is the length and the longest dimension, and B-axis is the longer of the height and width dimension.	

Samples of all materials shall be submitted to the Engineer for approval prior to delivery and installation.

Construction. Installation of in-stream structures shall be completed by a contractor with experience constructing stream channels and stream features. Placement of all in-stream structures shall be supervised by the Engineer and shall be performed accordance with the details included in the plans and the following:

The existing channel shall remain in place. The temporary stream channel shall remain in place and shall be filled after the proposed stream channel and in-stream structure installation.

Slopes to be protected by boulders and rock shall be free of brush, trees, stumps, and other objectionable materials and shall be dressed to smooth surface. All soft or spongy material shall be removed to the depth shown on the plans or as directed by the Engineer and replaced with approved material. Filled areas will be compacted as specified in the Standard Specifications for embankments.

A. Cross Vane Installation:

- 1) All boulder layers shall be precisely positioned by the Contractor and placed with an excavator to minimize gaps. Placing boulder layers by dumping into chutes or similar methods will not be allowed.
- 2) A bedding layer of STONE RIPRAP, CLASS A2 shall be 12 inches in depth placed over FILTER FABRIC.
- 3) POROUS GRANULAR EMBANKMENT, SPECIAL shall be used as backfill material and shall be spread over each layer of boulder placement prior to sequential boulder layer placement. Backfill shall be manually spread to fill gaps in and around placed boulders. Sequential boulder layers shall be positioned directly on placed boulders, minimizing backfill between boulder layers.
- 4) Footer Boulders (STONE RIPRAP, CLASS A7 (SPECIAL)) shall be placed first with the Header Boulders (STONE RIPRAP, CLASS A6 (SPECIAL)) placed upstream and overlapping the top 1/3 of the Footer Boulders prior to backfilling gaps and the trench.

B. Streambank Revetment Installation:

- 1) Installation of side vane shall be completed prior to placement of stone for remaining revetment area.
- 2) All boulder layers shall be precisely positioned Contractor and placed with an excavator to minimize gaps. Placing boulder layers by dumping into chutes or similar methods will not be allowed.
- 3) A bedding layer of STONE RIPRAP, CLASS A2 for side vane shall be 10 inches in depth placed over FILTER FABRIC. A bedding layer of STONE RIPRAP, CLASS A2 for the remaining revetment area shall be 6 inches in depth placed over FILTER FABRIC.
- 4) POROUS GRANULAR EMBANKMENT, SPECIAL shall be used as backfill

material and shall be spread over each layer of boulder placement prior to sequential boulder layer placement. Backfill shall be manually spread to fill gaps in and around placed boulders. Sequential boulder layers shall be positioned directly on placed boulders, minimizing backfill between boulder layers.

- 5) Footer Boulders (STONE RIPRAP, CLASS A6 (SPECIAL)) shall be placed first with the Header Boulders (STONE RIPRAP, CLASS A5 (SPECIAL)) placed upstream and overlapping the top 1/3 of the Footer Boulders prior to backfilling gaps and the trench.
- 6) Proper STONE RIPRAP, CLASS A4 (SPECIAL) placement requires beginning at the toe and proceeding up the slope. Stone shall not be dropped from height greater than 1 foot.
- 7) Boulder layer thickness should not be less than the spherical diameter of the D100 (W100) stone or less than 1.5 times the spherical diameter of the D50 (W50) stone, whichever results in the greater thickness. The thickness shall not be less than 18 inches for practical placement.
- 8) Boulders shall be placed on the prepared slope or area in a manner that will produce a reasonably well-graded mass of stone with minimum practicable percentage of voids. The entire mass of stone shall be placed so as to be in conformance with the lines, grades, and thicknesses shown on the plans.
- 9) Boulders shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of boulders in layers by dumping into chutes or by similar methods will not be permitted.
- 10) Larger stones shall be well distributed and the entire mass of stone shall conform to the gradation specified. All materials used in streambank revetment slope areas shall be placed and distributed so that there will be no large accumulations of either larger or smaller sizes of stone.
- 11) It is the intent of these specifications to produce a fairly compact streambank protection in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to the extent necessary to secure the results specified.

C. Riffle Installation:

- 1) Installation of Upstream Side Vanes shall be completed prior to placement of Riffle Rock.
 - a. All boulder layers shall be precisely positioned by Contractor and placed with an excavator to minimize gaps. Placing boulder layers by dumping into chutes or similar methods will not be allowed.
 - b. A bedding layer of STONE RIPRAP, CLASS A2 for upstream side vane shall be 10 inches in depth and shall be placed on top of FILTER FABRIC.

- c. POROUS GRANULAR EMBANKMENT, SPECIAL shall be used as backfill material and shall be spread over each layer of boulder placement prior to sequential boulder layer placement. Backfill shall be manually spread to fill gaps in and around placed boulders. Sequential boulder layers shall be positioned directly on placed boulders, minimizing backfill between boulder layers.
 - d. Footer Boulders (STONE RIPRAP, CLASS A5 (SPECIAL)) shall be placed first with the Header Boulders (STONE RIPRAP, CLASS A4 (SPECIAL)) placed upstream and overlapping the top 1/3 of the Footer Boulders prior to backfilling gaps and trench.
- 2) Installation of Downstream Side Vanes shall be completed after installation of Upstream Side Vanes and prior to placement of Riffle Rock:
- a. Header Boulder (STONE RIPRAP, CLASS 4A (SPECIAL)) layer shall be precisely positioned by Contractor and placed with an excavator to minimize gaps. Placing boulder layers by dumping into chutes or similar methods will not be allowed.
 - b. POROUS GRANULAR EMBANKMENT, SPECIAL shall be used as backfill material and shall be manually spread to fill gaps in and around placed boulders.
- 3) Riffle Rock shall be STONE RIPRAP, CLASS A3 (SPECIAL) with POROUS GRANULAR EMBANKMENT, SPECIAL backfill. Stone shall not be dropped from a height greater than 1 foot.
- 4) Boulder layer thickness shall not be less than the spherical diameter of the D100 (W100) stone or less than 1.5 times the spherical diameter of the D50 (W50) stone, whichever results in the greater thickness. It shall not be less than 12 inches for practical placement.
- 5) When boulders and backfill material are dumped under water, the Engineer shall be notified so that thickness of the layers will be increased and methods shall be employed that will minimize segregation.
- 6) Boulders and Riffle Rock shall be placed on the prepared riffle area in a manner that will produce a reasonably well-graded mass of stone with minimum practicable percentage of voids. The entire mass of stone shall be placed so as to be in conformance with the lines, grades, and thicknesses shown on the plans.
- 7) Boulders and Riffle Rock shall be placed to its full course thickness at one operation and in such a manner as to avoid displacing the underlying material. Placing of boulders and Riffle Rock in layers by dumping into chutes or by similar methods will not be permitted.
- 8) Larger stones shall be well distributed and the entire mass of stone shall conform to the gradation specified by the Engineer. All materials going into riffle areas shall be placed and distributed so that there will be no large

accumulations of either larger or smaller sizes of stone.

- 9) It is the intent of these specifications to produce a fairly compact riffle area in which all sizes of material are placed in their proper proportions. Hand placing or rearranging of individual stones by mechanical equipment may be required to the extent necessary to secure the results specified.

D. Channel Bed Installation:

- 1) CHANNEL BED AGGREGATE shall be placed in the channel area to provide a gravel and cobble bottom. Stone will be placed to the approximate grade and in the locations shown on the plans.
- 2) CHANNEL BED AGGREGATE thickness shall be 8 inches, which is the largest rock size allowable, and placed at locations indicated on the plans and details.
- 3) Streambed stone materials shall be carefully placed to avoid disturbing the streambank and channel bed areas that have been constructed.
- 4) The channel bed stone shall be placed to match upstream and downstream channel grades or to the elevation of the pre-disturbance streambed conditions.
- 5) The streambed stone shall be placed in the channel so that once placed it will not be further adjusted with heavy equipment by spreading, pushing, digging, or other means.

Method of Measurement. Stone riprap will be measured for payment in tons. Filter fabric and channel bed aggregate will be measured for payment in place and the area computed in square yards.

Basis of Payment. This work will be paid for at the contract unit price per TON for STONE RIPRAP, of the class (stone quality and gradation) specified (SPECIAL), at the contract unit price per SQ YD for FILTER FABRIC, and at the contract unit price per SQ YD for CHANNEL BED AGGREGATE, which prices shall constitute full compensation for furnishing all materials, labor, tools, equipment, and incidentals necessary to complete work specified.

Earth excavation required for installation of the in-stream structures shall be paid for separately as EARTH EXCAVATION.

Porous granular embankment, special shall be paid for separately in accordance with the special provisions for POROUS GRANULAR EMBANKMENT, SPECIAL.

SEEDING

Description. This work shall consist of preparing the seed bed and furnishing and placing the seed and other materials required in seeding operations at the locations shown on the plans. This work shall be performed in accordance with Section 250 of the Standard Specifications with the following modifications:

Materials. Seeding species shall be supplied as pure live seed (PLS). Seed species and seeding rates are shown below. Materials shall be according to the following:

- 1) All native seed material shall be true to genus and species, and shall be of Midwestern genotype. Unless otherwise approved in writing by the Engineer, native plant seed shall have an origin within 150 miles of the project site.
- 2) Native seed shall meet the requirements of Article 1081.02 of the Standard Specifications and the applicable sections of the following references:
 - a. American Association of Nurserymen, Inc. (AAN) Standard; American Standard for Nursery Stock (ANSI Z60.1-1990);
 - b. American Joint Committee on Horticultural Nomenclature, Standardized Plant Names, second edition, 1942; and
 - c. Wilhelm, G., and L. Rericha, Flora of the Chicago Region; A Floristic and Ecological Synthesis, 2017.

If a discrepancy between these reference standards and this special provision persists, the more restrictive requirement shall govern.

- 3) Species substitution requests must be submitted to the Engineer a minimum of two weeks prior to delivery and application.
- 4) All seed packaging shall be tagged showing seed species, sources, and weights. The seed weights shall be based on PLS percentage for all species. All seed shall be furnished in sealed containers and protected from moisture.
- 5) All native seed shall be handled and packed as appropriate per plant species, with regard to: soil and climate conditions present at the time and place of packing; soil and climate conditions present at the project site; length of transit time to the project site; and length of time the seed will be stored at the project site.
- 6) The Engineer shall inspect native seed at the time of delivery for disease and insect infestation.
- 7) On-site storage of native seed shall be at the Contractor's own risk. All native plant seed shall be applied within one week after delivery. Delayed seeding shall require precautions to protect and maintain healthy conditions of native seed. Seed shall be stored in a shaded area when ambient temperatures exceed 72 degrees F. Damage to native seed stock while stored on-site shall be Contractor's responsibility and no additional compensation will be accepted for replacement.

SEEDING, CLASS 4B (SPECIAL)

Mix of:

- o Wetland Emergent Seed Mix; and

○ Wet Prairie Seed Mix.

Wetland Emergent Seed Mix

SCIENTIFIC NAME	COMMON NAME	OZ./ACRE
Grasses:		
<i>Calamagrostis canadensis</i>	BLUE JOINT GRASS	1.25
<i>Carex comosa</i>	BRISTLY SEDGE	5.00
<i>Carex crinita</i>	FRINGED SEDGE	2.00
<i>Carex hystericina</i>	PORCUPINE SEDGE	5.00
<i>Glyceria grandis</i>	REED MANNA GRASS	3.00
<i>Glyceria striata</i>	FOUL MANNA GRASS	2.00
<i>Juncus effusus</i>	COMMON RUSH	0.30
<i>Leersia oryzoides</i>	RICE CUT GRASS	4.00
<i>Scirpus acutus</i>	HARD-STEMMED BULRUSH	1.00
<i>Scirpus atrovirens</i>	DARK GREEN RUSH	2.00
<i>Scirpus cyperinus</i>	WOOL GRASS	0.75
<i>Scirpus fluviatilis</i>	RIVER BULRUSH	2.50
<i>Scirpus pendulus</i>	RED BULRUSH	1.00
<i>Scirpus validus creber</i>	GREAT BULRUSH	2.50
<i>Spartina pectinata</i>	PRAIRIE CORDGRASS	13.00
TOTAL:		45.30
		2.83 lbs/acre
Forbes:		
<i>Acorus calamus</i>	SWEET FLAG	5.00
<i>Alisma subcordatum</i>	MUD PLANTAIN	2.00
<i>Iris virginica shrevei</i>	SOUTHERN BLUE FLAG IRIS	3.50
<i>Mimulus ringens</i>	MONKEY FLOWER	0.20
<i>Sagittaria latifolia</i>	COMMON ARROWHEAD	2.00
<i>Sparganium eurycarpum</i>	GREAT BUR REED	6.00
TOTAL:		18.70
		1.27 lbs/acre
Cover:		
<i>Lolium multiflorum</i>	ITALIAN RYE GRASS (Spring)	160.00
<i>Secale cereale</i>	RYE (Fall)	160.00
TOTAL:		320.00
		20.00 lbs/acre

Wet Prairie Seed Mix

SCIENTIFIC NAME	COMMON NAME	OZ./ACRE
Grasses:		
<i>Bromus ciliatus</i>	FRINGED BROME	32.00
<i>Carex bebbii</i>	BEBB'S OVAL SEDGE	1.00
<i>Carex crawfordii</i>	CRAWFORD'S SEDGE	0.40
<i>Carex crinita</i>	FRINGED SEDGE	1.00
<i>Carex scoparia</i>	LANCE-FRUITED SEDGE	0.50
<i>Carex stipata</i>	COMMON FOX SEDGE	3.00
<i>Carex vulpinoidea</i>	BROWN FOX SEDGE	1.50
<i>Elymus virginicus</i>	VIRGINIA WILD RYE	48.00
<i>Glyceria canadensis</i>	RATTLESNAKE GRASS	3.00

Glyceria grandis	REED MANNA GRASS	2.50
Scirpus pendulus	RED BULRUSH	0.50
TOTAL:		93.40
		5.84 lbs/acre
Forbes:		
Anemone canadensis	MEADOW ANEMONE	0.50
Asclepias incarnata	MARSH (RED) MILKWEED	4.00
Aster novae-angliae	NEW ENGLAND ASTER	1.00
Aster puniceus	SWAMP ASTER	1.00
Baptisia leucantha (alba)	WHITE WILD INDIGO	2.00
Cassia hebecarpa	WILD SENNA	6.00
Eupatorium maculatum	SPOTTED POE PYE WEED	0.40
Eupatorium perfoliatum	BONESET	0.50
Gentiana andrewsii	BOTTLE GENTIAN	0.10
Helenium autumnale	SNEEZEWOOD	0.25
Heliopsis helianthoides	EARLY SUNFLOW	1.50
Liatris spicata	MARSH BLAZING STAR	1.00
Lobelia siphilitica	GREAT BLUE LOBELIA	0.50
Mimulus ringens	MONKEY FLOWER	0.25
Monarda fistulosa	WILD BERGAMOT	2.00
Parthenium integrifolium	WILD QUININE	1.00
Pycnanthemum virginianum	MOUNTAIN MINT	0.25
Ratibida pinnata	YELLOW CONEFLOWER	3.00
Silphium terebinthinaceum	PRARIE DOCK	1.00
Solidago graminifolia	GRASS-LEAVED GOLDENROD	0.10
Solidago ohioensis	OHIO GOLDENROD	1.00
Solidago riddellii	RIDDELL'S GOLDENROD	1.50
Verbena hastata	BLUE VERVAIN	1.50
Veronicastrum virginicum	CULVER'S ROOT	0.25
Zizia aurea	GOLDEN ALEXANDERS	4.00
TOTAL:		34.6
		2.16 lbs/acre
Cover:		
Lolium multiflorum	ITALIAN RYE GRASS (Spring)	160.00
Secale cereale	RYE (Fall)	160.00
TOTAL:		320.00
		20.00 lbs/acre

SEEDING, CLASS 4 (MODIFIED)

Mix of:

- o Tallgrass Prairie for Wet-Mesic Soils Seed Mix; and
- o Shortgrass Prairie for Medium Soils Seed Mix.

Tallgrass Prairie For Wet-Mesic Soils Seed Mix

SCIENTIFIC NAME	COMMON NAME	OZ./ACRE
Grasses:		
Andropogon gerardii	BIG BLUESTEM	16.00
Bromus ciliatus	FRINGE BROME	20.00
Calamagrostis canadensis	BLUE JOINT GRASS	0.75
Carex bebbii	BEBB'S OVAL SEDGE	0.50

Carex crawfordii	CRAWFORD'S SEDGE	0.20
Carex crinita	FRINGE SEDGE	1.00
Carex scoparia	LANCE-FRUITED OVAL SEDGE	1.00
Carex vulpinoidea	BROWN FOX SEDGE	1.00
Elymus canadensis	CANADA WILD RYE	32.00
Elymus virginicus	VIRGINIA WILD RYE	32.00
Panicum virgatum	SWITCHGRASS	2.00
Scirpus atrovirens	DARK-GREEN BULRUSH	0.50
Scirpus cyperinus	WOOL GRASS	0.30
Scirpus pendulus	RED BULRUSH	0.50
Sorghastrum nutans	INDIAN GRASS	10.00
Spartina pectinata	PRAIRIE CORDGRASS	4.00
TOTAL:		121.75
		7.61 lbs/acre

Forbes:		
Asclepias incarnata	MARSH (RED) MILKWEED	3.00
Aster novae-angliae	NEW ENGLAND ASTER	2.00
Aster puniceus	SWAMP ASTER	1.00
Baptisia leucantha (alba)	WHITE WILD INDIGO	4.00
Cassia hebecarpa	WILD SENNA	4.00
Desmodium canadense	CANADA TICK TREFOIL	1.00
Echinacea pallida	PURPLE CONEFLOWER	4.00
Eupatorium maculatum	SPOTTED JOE PYE WEED	0.50
Eupatorium perfoliatum	BONSET	0.20
Helenium autumnale	SNEEZEWEED	0.25
Helianthus grosseserratus	SAWTOOTH SUNFLOWER	0.25
Hypericum pyramidatum	GREAT ST. JOHN'S WORT	0.10
Liatris spicata	MARSH BLAZING STAR	0.75
Mimulus ringens	MONKEY FLOWER	0.20
Monarda fistulosa	WILD BERGAMOT	1.00
Parthenium integrifolium	WILD QUININE	1.50
Pycnanthemum virginianum	MOUNTAIN MINT	0.25
Ratibida pinnata	YELLOW CONEFLOWER	3.00
Rudbeckia hirta	BLACK-EYED SUSAN	4.00
Rudbeckia subtomentosa	SWEET BLACK-EYED SUSAN	2.00
Silphium integrifolium	ROSIN WEED	1.00
Silphium perfoliatum	CUP PLANT	3.00
Silphium terebinthinaceum	PRAIRIE DOCK	1.50
Solidago ohioensis	OHIO GOLDENROD	1.00
Solidago riddellii	RIDDELL'S GOLDENROD	2.00
Solidago rigida	STIFF GOLDENROD	0.75
Tradescantia ohiensis	OHIO SPIDERWORT	0.75
Verbena hastata	BLUE VERVAIN	0.75
Vernonia fasciculata	IRONWEED	2.50
Veronicastrum virginicum	CULVER'S ROOT	0.50
Zizia aurea	GOLDEN ALEXANDERS	3.50
TOTAL:		50.25
		3.14 lbs/acre

Cover:		
Avena sativa	OATS (Spring)	160.00
Secale cereale	RYE (Fall)	160.00
TOTAL:		320.00
		20.00 lbs/acre

Shortgrass Prairie For Medium Soils Seed Mix

SCIENTIFIC NAME	COMMON NAME	OZ./ACRE
Grasses (6 lbs/acre):		
Bouteloua curtipendula	SIDE-OATS GRAMA	42.00
Carex bicknellii	COPPER-SHOULDERED OVAL SEDGE	1.00
Elymus canadensis	CANADA WILD RYE	32.00
Elymus virginicus	VIRGINIA WILD RYE	32.00
Koeleria cristata (macrantha)	JUNE GRASS	2.00
Schizachyrium scoparium	LITTLE BLUESTEM	32.00
TOTAL:		141.00
		8.81 lbs/acre
Forbes:		
Allium cernuum	NODDING ONION	6.00
Amorpha canescens	LEADPLANT	2.50
Asclepias tuberosa	BUTTERFLY WEED	1.50
Aster azureus	SKY-BLUE ASTER	1.50
Aster laevis	SMOOTH BLUE ASTER	2.00
Aster novae-angliae	NEW ENGLAND ASTER	2.50
Chamaecrista fasciculata	PARTRIDGE PEA	10.00
Coreopsis palmata	PRAIRIE COREOPSIS	6.00
Dalea candida	WHITE PRAIRIE CLOVER	4.00
Dalea purpurea	PURPLE PRAIRIE CLOVER	3.00
Echinacea pallida	PALE PURPLE CONEFLOWER	2.50
Echinacea purpurea	PURPLE CONEFLOWER	6.00
Eryngium yuccifolium	RATTLESNAKE MASTER	3.00
Heliopsis helianthoides	EARLY SUNFLOWER	10.00
Liatris pycnostachya	PRAIRIE BLAZING STAR	2.50
Monarda fistulosa	WILD BERGAMOT	1.50
Penstemon digitalis	FOXGLOVE BEARD TONGUE	2.50
Potentilla arguta	PRAIRIE CINQUEFOIL	0.20
Pycnanthemum virginianum	MOUNTAIN MINT	0.20
Ratibida pinnata	YELLOW CONEFLOWER	4.00
Rudbeckia hirta	BLACK-EYED SUSAN	2.50
Rudbeckia subtomentosa	SWEET BLACK-EYED SUSAN	2.00
Silphium laciniatum	COMPASS PLANT	2.50
Solidago speciosa	SHOWY GOLDENROD	1.00
Tradescantia ohiensis	OHIO SPIDERWORT	1.50
Veronicastrum virginicum	CULVER'S ROOT	0.10
TOTAL:		81.00
		5.06 lbs/acre
Cover:		
Avena sativa	OATS (Spring)	160.00
Secale cereale	RYE (Fall)	160.00
TOTAL:		320.00
		20.00 lbs/acre

SEEDING, CLASS 4A, (MODIFIED)

Mix of:

- o Bird and Butterfly Seed Mix; and
- o Shortgrass Prairie for Dry Soils Seed Mix.

Bird and Butterfly Seed Mix

SCIENTIFIC NAME	COMMON NAME	OZ./ACRE
Grasses (6 lbs/acre):		
Bouteloua curtipendula	SIDE-OATS GRAMA	32.00
Bromus kalmii	PRAIRIE BROME	20.00
Elymus canadensis	CANADA WILD RYE	32.00
Koeleria cristata (macrantha)	JUNE GRASS	2.00
Schizachyrium scoparium	LITTLE BLUESTEM	16.00
Sporobolus heterolepis	PRAIRIE DROPSEED	8.00
TOTAL:		110.00
		6.88 lbs/acre
Forbes:		
Agastache foeniculum	LAVENDER HYSSOP	0.50
Allium cernuum	NODDING ONION	2.00
Amorpha canescens	LEADPLANT	1.00
Anemone cylindrica	THIMBLEWEED	0.75
Aquilegia canadensis	WILD COLUMBINE	0.60
Asclepias incarnata	MARSH (RED) MILKWEED	1.50
Asclepias syriaca	COMMON MILKWEED	0.75
Asclepias tuberosa	BUTTERFLY WEED	2.50
Aster azureus	SKY-BLUE ASTER	0.75
Aster novae-angliae	NEW ENGLAND ASTER	0.75
Aster sagittifolius	ARROW-LEAVED ASTER	0.50
Astragalus canadensis	CANADA MILK VETCH	3.00
Baptisia australis	BLUE WILD INDIGO	4.00
Chamaecrista fasciculata	PARTRIDGE PEA	8.00
Coreopsis lanceolata	LANCE-LEAF (SAND) COREOPSIS	2.50
Coreopsis palmata	PRAIRIE COREOPSIS	2.50
Dalea candida	WHITE PRAIRIE CLOVER	3.00
Dalea purpurea	PURPLE PRAIRIE CLOVER	3.00
Echinacea pallida	PALE PURPLE CONEFLOWER	6.00
Echinacea purpurea	PURPLE CONEFLOWER	4.00
Eryngium yuccifolium	RATTLESNAKE MASTER	3.00
Eupatorium maculatum	SPOTTED JOE PYE WEED	0.50
Helianthus grosseserratus	SAWTOOTH SUNFLOWER	0.50
Heliopsis helianthoides	EARLY SUNFLOWER	8.00
Kuhnia eupatorioides	FALSE BONESET	1.00
Liatis aspera	ROUGH BLAZING STAR	0.75
Liatis pycnostachya	PRAIRIE BLAZING STAR	4.00
Lobelia cardinalis	CARDINAL FLOWER	0.25
Lobelia siphilitica	GREAT BLUE LOBELIA	0.50
Lupinus perennis	WILD LUPINE	6.00
Monarda fistulosa	WILD BERGAMOT	1.00
Penstemon digitalis	FOXGLOVE BEARD TONGUE	0.50
Physostegia virginiana	OBEDIENT PLANT	0.50
Ratibida pinnata	YELLOW CONEFLOWER	2.50
Rosa arkansana	PRAIRIE WILD ROSE	1.00
Rudbeckia hirta	BLACK-EYED SUSAN	3.00
Rudbeckia subtomentosa	SWEET BLACK-EYED SUSAN	2.50
Rudbeckia triloba	BROWN-EYED SUSAN	1.50
Silene regia	ROYAL CATCHFLY	1.00
Silphium laciniatum	COMPASS PLANT	2.00
Solidago rigida	STIFF GOLDENROD	0.75

Solidago speciosa	SHOWY GOLDENROD	1.00
Tradescantia ohiensis	OHIO SPIDERWORT	2.00
Verbena stricta	HOARY VERVAIN	1.50
Vernonia fasciculata	IRONWEED	1.00
Veronicastrum virginicum	CULVER'S ROOT	0.15
Zizia aurea	GOLDEN ALEXANDERS	4.00
TOTAL:		98.00
		6.13 lbs/acre
Cover:		
Avena sativa	OATS (Spring)	160.00
Secale cereale	RYE (Fall)	160.00
TOTAL:		320.00
		20.00 lbs/acre

Shortgrass Prairie For Dry Soils Seed Mix

SCIENTIFIC NAME	COMMON NAME	OZ./ACRE
Grasses (6 lbs/acre):		
Bouteloua curtipendula	SIDE-OATS GRAMA	16.00
Bromus kalmii	PRAIRIE BROME	8.00
Carex bicknellii	COPPER-SHOULDERED OVAL SEDGE	1.50
Elymus canadensis	CANADA WILD RYE	48.00
Koeleria cristata (macrantha)	JUNE GRASS	2.00
Schizachyrium scoparium	LITTLE BLUESTEM	20.00
Sporobolus heterolepis	PRAIRIE DROPSEED	4.00
TOTAL:		99.50
		6.22 lbs/acre
Forbes:		
Agastache foeniculum	LAVENDER HYSSOP	1.00
Allium cernuum	NODDING ONION	4.00
Amorpha canescens	LEADPLANT	2.00
Asclepias tuberosa	BUTTERFLY WEED	2.00
Aster azureus	SKY-BLUE ASTER	1.25
Aster ericoides	HEATH ASTER	0.10
Aster laevis	SMOOTH BLUE ASTER	1.25
Chamaecrista fasciculata	PARTRIDGE PEA	8.00
Coreopsis lanceolata	LANCE-LEAF (SAND) COREOPSIS	2.50
Coreopsis palmata	PRAIRIE COREOPSIS	2.00
Dalea candida	WHITE PRAIRIE CLOVER	3.00
Dalea purpurea	PURPLE PRAIRIE CLOVER	2.50
Echinacea pallida	PALE PURPLE CONEFLOWER	8.00
Eryngium yuccifolium	RATTLESNAKE MASTER	3.00
Heliopsis helianthoides	EARLY SUNFLOWER	6.00
Liatris aspera	ROUGH BLAZING STAR	1.00
Liatris cylindracea	DWARF BLAZING STAR	1.00
Lupinus perennis	WILD LUPINE	6.00
Monarda fistulosa	WILD BERGAMOT	2.00
Monarda punctata	DOTTED MINT	0.25
Potentilla arguta	PRAIRIE CINQUEFOIL	0.50

Ratibida pinnata	YELLOW CONEFLOWER	3.00
Rudbeckia hirta	BLACK-EYED SUSAN	4.00
Solidago rigida	STIFF GOLDENROD	0.70
Solidago speciosa	SHOWY GOLDENROD	0.70
Tradescantia ohiensis	OHIO SPIDERWORT	0.75
Verbena stricta	HOARY VERVAIN	2.00
TOTAL:		68.50
		4.28 lbs/acre
Cover:		
Avena sativa	OATS (Spring)	160.00
Secale cereale	RYE (Fall)	160.00
TOTAL:		320.00
		20.00 lbs/acre

Construction Requirements. Conservation tillage or no till planting methods shall be used for seedbed preparation. Methods may include Grain Drill Type R, no till drill, or broadcast seeding into a lightly tilled soil surface, of which shall be followed by impressing seed into soil with a cultipacker roller.

Spring seeding shall require proper stratification and/or scarification to break seed dormancy. Spring seeding times shall be preferentially conducted in early spring, as soon as the soil is free of frost and in a workable condition, but no later than June 15th. Fall seeding times shall be conducted in late September, October, or November allowing seed to stratify naturally in soil. Outside these seeding times, the cover crop seed matrix shall be applied, and the permanent seed matrix shall then be applied in the first available planting season. Application of the cover crop shall not be paid for separately but shall be included in the cost of the permanent seeding.

All plugs shall maintain at least 1" of vegetative growth above the existing water line between the time of installation and final acceptance. Plants shall not be submerged under water. Engineer may adjust planting layout if a site condition changes.

Erosion Control Blanket shall be placed on SEEDING, CLASS 4B (SPECIAL), SEEDING CLASS 4 (MODIFIED), SEEDING, CLASS 4A (MODIFIED), and SEEDING, CLASS 2A areas as indicated on the plans.

Fertilizers shall not be applied within 35 feet of the Tributary to Flint Creek, or in the PERENNIAL PLANTS, WETLAND TYPE, 2" DIAMETER BY 4" DEEP PLUG and the SEEDING, CLASS 4B (SPECIAL) areas as indicated on the plans.

When planting installation of an area has been completed, the area shall be cleared of all debris, soil piles, and containers within 24 hours.

Fertilizers should not be used in mitigation and naturalized areas and immediately adjacent to these areas.

A mycorrhizal inoculant should be used when installing native seed.

Method of Measurement. Seeding of the class specified will be measured in acres of surface area seeded. Erosion control will be measured in square yards on surface area covered.

Fertilizer nutrients will not be measured for payment but shall be included in the cost of SEEDING of the class specified.

Basis of Payment. This work will be paid for at the contract unit price per ACRE for SEEDING of the Class specified.

PERENNIAL PLANTS

Description. This work shall consist of preparing the planting bed and furnishing and installing perennial plant plugs at the locations shown on the plans. This work shall be performed in accordance with Section 254 of the Standard Specifications with the following modifications:

Materials. Plug species shall be supplied as 2-inch-diameter by 4-inch-deep plugs. Plug species shall be provided in accordance with the Standard Specifications as modified herein:

- 1) Plugs shall be inoculated with vesicular arbuscular mycorrhizae endomycorrhizal fungi.
- 2) All plugs shall have a native source within 150 miles of the project site and shall be of straight species; no horticultural varieties shall be allowed.
- 3) Plugs shall meet the requirements of Article 1081.02 of the Standard Specifications and the applicable sections of the following references:
 - a. American Association of Nurserymen, Inc. (AAN) Standard; American Standard for Nursery Stock (ANSI Z60.1-1990);
 - b. American Joint Committee on Horticultural Nomenclature, Standardized Plant Names, second edition, 1942; and
 - c. Wilhelm, G., and L. Rericha, Flora of the Chicago Region; A Floristic and Ecological Synthesis, 2017.

If a discrepancy between these reference standards and this special provision persists, the more restrictive requirement shall govern.

- 4) The planting stock shall be nursery propagated according to good horticultural practices. Collected stock or nursery grown wild plants will not be permitted. Planting stocks from which plant propagation is taken may have been wild collected.
- 5) All plugs shall be handled and packed as appropriate per species, with regard to: soil and climate conditions present at the time and place of packing; soil and climate conditions present at the project site; length of transit time to the project site; and length of time the plugs will be stored at the project site.
- 6) All plugs shall be legibly tagged with the scientific name and shall be true to the species specified in the plans.

- 7) All plugs shall be planted within four hours after delivery. Delayed planting shall require precautions to protect and maintain healthy conditions of plugs. Live plugs shall be stored in a shaded area when ambient temperatures exceed 72 degrees F.
- 8) On-site storage of live plugs shall be at the Contractor's own risk. The Contractor shall protect live plugs from grazing animals (e.g., geese) and from frost during temporary storage. Live plugs may require regular watering and supplemental nutrition while in temporary storage and the Contractor shall ensure that live plugs are maintained in a healthy vigorous state. Damage to plant stock while stored on-site shall be Contractor's responsibility and no additional compensation will be accepted for replacement.
- 9) At time of planting, plugs shall be alive, healthy, and properly hydrated. Plugs shall be free of all fungi (except arbuscular mycorrhizae endomycorrhizal fungi), bacterial discoloration, and deformities. Plugs shall have well developed root systems. Plugs shall be subject to approval by the Engineer prior to installation.

PERENNIAL PLANTS, WETLAND TYPE, 2" DIAMETER BY 4" DEEP PLUG

SCIENTIFIC NAME	COMMON NAME
<i>Acorus calamus</i>	SWEET FLAG
<i>Calamagrostis canadensis</i>	BLUE JOINT GRASS
<i>Carex comosa</i>	BRISTLY SEDGE
<i>Carex emoryi</i>	RIVERBANK SEDGE
<i>Carex hystericina</i>	PORCUPINE SEDGE
<i>Iris virginica shrevei</i>	BLUE FLAG IRIS
<i>Peltandra virginica</i>	ARROW ARUM
<i>Pontedaria cordata</i>	PICKEREL WEED
<i>Sagittaria latifolia</i>	COMMON ARROWHEAD
<i>Schoenoplectus pungens</i>	CHAIRMAKERS RUSH
<i>Scirpus pendulus</i>	NODDING BULRUSH
<i>Sparganium eurycarpum</i>	COMMON BUR REED
<i>Spartina pectinata</i>	PRAIRIE CORDGRASS

Construction Requirements. Plugs shall be evenly distributed among groups. Each species shall be planted in pods of 32, 38, or 49 plants. These pods are to be placed randomly within specified locations for each mix, as shown on the plans and details. The plantings shall be placed at average 24-inch spacing on triangular grid. The plants shall be stored properly upon receipt in a cool, moist location, where exposure to sun is minimized.

Plugs shall be installed within one week of seeding. Alternate planting time must be approved in writing by Engineer.

Protective planting enclosures shall be installed for protection against herbivores within 24 hours of completed plantings.

No fertilizers shall be used for work in the SEEDING, CLASS 4B (SPECIAL) area or PERENNIAL PLANTS, WETLAND TYPE, 2" DIAMETER BY 4" DEEP PLUG area.

When planting installation of an area has been completed, the area shall be cleared of all debris, soil piles, and containers within 24 hours.

Period of Establishment. The period of establishment shall be defined in Article 254.08 of the Standard Specifications.

Method of Measurement. This work will be measured for payment in units of 100 perennial plants (1 UNIT = 100 perennial plants) of the type specified.

Basis of Payment. This work will be paid for at the contract unit price per UNIT for PERENNIAL PLANTS, WETLAND TYPE, 2" DIAMETER BY 4" DEEP PLUG of the type specified which shall include the cost of handling, storing, preparation, and planting; watering before and after planting; plant care and all labor, tools, and incidentals necessary to complete the work specified.

PROTECTIVE PLANTING ENCLOSURES

Description. This work shall consist of furnishing, installing, and removing Protective Planting Enclosures within the PERENNIAL PLANTS, WETLAND TYPE, 2" DIAMETER BY 4" DEEP PLUG area according to the special provisions, plan details, and the Engineer's recommendation.

General. Protective Planting Enclosures shall consist of four-foot-long steel "U" posts, 20-gauge chicken wire, and monofilament line (minimum 30 lb test). The Contractor shall not use snow fence.

Protective Planting Enclosures shall be installed around plug planted material at the direction of the Engineer.

The Contractor shall monitor the condition of the fence and string monthly, making any repairs or replacements, as necessary. Additionally, the Contractor shall make repairs and/or replace the enclosure when notified by the Engineer that such action is necessary.

The Protective Planting Enclosures shall remain in place for the duration of the contract. Maintenance shall continue until the completion of the contract, at which time all fencing shall be removed unless directed to remain by the Engineer. The Enclosures shall be removed and disposed of without damage to the protected plants or the surrounding area. The removed materials shall be disposed of, outside the right-of-way, according to Article 202.03 of the "Standard Specifications".

Method of Measurement and Basis of Payment. PROTECTIVE PLANTING ENCLOSURES shall not be measured separately but shall be included in the contract unit price for PERENNIAL PLANTS, WETLAND TYPE, 2" DIAMETER BY 4" DEEP PLUG of the type specified. Repairs/replacement (maintenance) as are necessary shall not be paid for separately but shall be included in the contract unit price for PERENNIAL PLANTS, WETLAND TYPE, 2" DIAMETER BY 4" DEEP PLUG of the type specified.

ABANDON EXISTING WATER MAIN, FILL WITH CLSM

This item shall include all labor, material, and equipment necessary to complete filling and abandoning existing utilities noted on the drawings in accordance with Section 593 of the Standard Specifications, as shown on the plans and as specified herein.

This work shall consist of filling existing utilities to be abandoned with Controlled Low Strength Material (CLSM). The utility shall be plugged on all ends with a plug material meeting approval of the Engineer. The plug shall be adequate to withstand the hydrostatic load created during the filling operation. If the plugs fail during the filling operation, the Contractor shall be responsible for the cost of repairing the plugs and filling the remainder of the pipe. CLSM shall be placed to completely fill all voids and crevices within the abandoned pipe. CLSM shall be placed by low pressure pumping with a maximum length of flow limited only by the safe allowable load that may be applied to the abandoned utility. Additional access holes, where required, or as directed by the Engineer, shall be opened to assure the complete filling of the utility.

The capping and/or plugging required to fill the pipe as described will be included with this pay item.

The Contractor shall submit to the Engineer a mix design for the flowable fill used on the project.

This work will be measured and paid for at the contract unit price per cubic yard (CY) for ABANDON EXISTING WATER MAIN, FILL WITH CLSM.

SANITARY SEWER CONNECTION

This item shall include all labor, material, and equipment necessary to complete Connect Existing Sanitary Sewer Pipe to New, Connect New Sanitary Sewer Pipe to Existing in accordance with Section 550 and 551 of the Standard Specifications, Division III of the Standard Specifications for Water and Sewer Construction in Illinois, and as specified herein.

For all new and existing sanitary sewer pipe connection to a structure, the structure shall be cored to a distance not to exceed three inches (3") beyond the outside circumference of the new pipe, unless otherwise specified. The material for all sewer repairs shall match the existing sewer size. Connections of dissimilar materials shall be made with stainless steel non-shear mission couplings. If applicable, the existing concrete bench shall be repaired to the satisfaction of the Engineer.

Connections to existing structures shall be booted meeting ASTM C-923 and per the detail on the plans.

For all new and existing sanitary/storm connection to a sewer pipe shall be made with stainless steel non-shear mission couplings, unless otherwise specified.

This work will be measured and paid for at the contract unit price per each (EA) for SANITARY SEWER CONNECTION.

CONNECTION TO EXISTING WATER MAIN, OF THE SIZE SPECIFIED

This item shall include all labor, material, and equipment necessary to complete the "dry" connection of the new water main to the existing water main in accordance with the Section 41 of the Standard Specifications for Water and Sewer Construction in Illinois, as shown on the plans and as specified herein.

"Dry" Connection to Existing Water Main shall consist of all labor, material, and equipment required to connect the proposed water main to the existing main at locations indicated on the Plans of the size specified. The work shall include pipe, reducer, fittings, solid sleeve, excavation, concrete blocks beneath the connection point, and legal disposal of all excess material. Trench Backfill will be paid for

separately under the TRENCH BACKFILL pay item. Connection of ductile iron water main to existing cast iron water main will require the use of a Tyler Long Pattern Duo Solid Sleeve. The use of 441 Transition Couplings will not be allowed. This work shall also include capping the abandoned main.

After pressure testing, chlorination, and all service transfers have been completed, the existing main shall be shut down and the connections shall then be completed. Because these connections cannot be pressure tested or chlorinated, the Contractor must swab all pipe fittings with a 2% hypochlorite solution using a new clean long-string mop, and the new section of water main must be pressurized prior to backfilling.

This pay item is intended for use for ALL connections to existing. All connections shall be MJ. A tee fitting being cut into an existing main for a hydrant lead will have two connections to existing water main. Cutting in tees for directionally drilled pipe is included in the cost of the directionally drilled pipe and will not be paid for separately. This pay item also includes the removal of the existing main as necessary to install the proposed improvements as shown on the plans. All ductile iron pipe will be paid for separately to the connection point at the existing main.

This work will be measured and paid for at the contract unit price per each (EA) for CONNECTION TO EXISTING WATER MAIN, of the size specified

VALVE VAULTS TO BE REMOVED

This item shall include all labor, material, and equipment necessary to complete Abandon Valve Vault in accordance with Section 605 of the Standard Specifications, as shown on the plans and as specified herein.

Prior to removal of the valve vault the Contractor shall carefully remove the frame and valve and deliver them to the Village of Barrington Public Works yard. Delivery shall be coordinated with the Village.

This work will be measured and paid for at the contract unit price per each (EA) for VALVE VAULTS TO BE REMOVED.

FIRE HYDRANTS TO BE REMOVED

This item shall include all labor, material, equipment and delivery of the valves and hydrants to the public works yard to complete Remove Fire Hydrant Assembly. This work shall in accordance with Section 45 of the Standard Specifications, as shown on the plans and as specified herein.

The existing auxiliary valve and fire hydrant shall be removed and delivered to the Village of Barrington's Public Works yard. All piping shall then be sealed with brick and mortar, MJ Cap, or as directed by Engineer.

This work shall be measured and paid for at the contract unit price per each (EA) for FIRE HYDRANTS TO BE REMOVED.

FIRE HYDRANTS

This work shall consist of furnishing, transporting, labor, material and equipment necessary for installing new fire hydrants of the size and type specified in accordance with Section 45 of the Standard Specifications for Water and Sewer Construction in Illinois, as shown on the plans and as specified herein.

Fire Hydrants to be supplied as stated in the plans.

SPECIFICATIONS

National Standard thread on all nozzles

5 ¼ inch main valve opening, valve attached

6-foot bury (or as specified on the plans)

1 ½ inch pentagon operating nut (counter-clock wise operation)

Safety break flange construction

Flanged 6 inch inlet connection with 6 inch auxiliary valve (attached) and valve box

16" traffic barrel section

Factory painted red

The hydrant shall be installed on one (1) cubic yard of gravel having a CA7 in accordance with Section 1000 of the Standard Specifications and the base of the hydrant shall be firmly seated on a solid concrete block. One-half cubic yard of washed stone (no fines, ¾" size) shall also be placed around drain holes to insure proper drainage of the fire hydrants. Stone shall be placed to a height of 24" above the drain holes. Stone shall be covered with a filter fabric. The hydrant and connecting pipe shall be securely blocked with concrete masonry units to preserve the position of the hydrant. The hydrant and valve shall be laid to the line and grade specified on the plans or established by the Engineer. All shutdowns required for this work shall be approved prior to cutting into the main for installation of the tee. The Village will assist the Contractor in shutting down the main. It is the Contractor's responsibility to notify residents/business owners when their water will be shut off and approximately how long the main is expected to be down. All this work needs to be coordinated in advance with the Public Works Department.

All pipe from the main to the auxiliary valve will be paid for separately. All pipe from the auxiliary valve to the hydrant shall be included in the cost of the hydrant.

If the hydrant assembly comes pre-assembled the Contractor shall inspect the hydrant and retighten any bolts that may have become loose during transportation of the hydrant from the factory to the site.

This work shall be paid for at the contract unit price bid per each (EA) for FIRE HYDRANTS.

FIRE HYDRANT EXTENSION

This work shall consist of furnishing, transporting, labor, material and equipment necessary for installing Fire Hydrant Extension of the size and type specified in accordance with Section 45 of the Standard Specifications for Water and Sewer Construction in Illinois, as shown on the plans and as specified herein.

Fire Hydrant Extension shall be installed per specifications and includes all material above and beyond the installation of a standard fire hydrant, per detail.

Method of measurement: This work will be measured in vertical foot.

Basis of Payment: This work shall be paid for at the contract unit price bid per foot for FIRE HYDRANT EXTENSION.

WATER VALVES, OF THE SIZE SPECIFIED

This item shall include all labor, material, and equipment necessary to complete the installation of the gate valve. All work shall be in accordance with Section 42 and Section 44 of the Standard Specifications, as shown on the plans and as specified herein.

All valves shall be installed with the nut centered under the valve vault lid. The valve shall be supported inside the vault or against concrete blocks against undisturbed subgrade. All valves shall be per specifications listed in plans. All trim including nuts and bolts shall be stainless steel. No substitutes will be allowed.

This work shall be paid for at the contract unit price per each (EA) for WATER VALVES, 8", WATER VALVES, 12".

CUT AND CAP EXISTING WATER MAIN

This item shall include all labor, material, and equipment necessary to locate, cut and cap existing water that will remain active in accordance with the plans and as specified herein.

This work effort shall include locating the existing water main at locations shown on the plans, removing sections as required, cutting and capping the existing water main with materials allowed in accordance with the Department of Public Works Materials List. All materials will be paid for at the contract unit prices for the various pay items except the cap and fittings for this work will be included in the contract pay item.

The open excavations shall be backfilled and paid for with applicable trench backfill contract pay items.

This work will be measured and paid for at the contract unit price per each (EA) for CUT AND CAP EXISTING WATER MAIN.

SANITARY MANHOLES TO BE REMOVED

This item shall include all labor, material, and equipment necessary to complete the work in accordance with Section 605 of the Standard Specifications, as shown on the plans and as specified herein.

The Contractor shall carefully remove the frame and deliver them to the Village of Barrington Public Works yard. Delivery shall be coordinated with the Village.

This work will be measured and paid for at the contract unit price per each (EA) for SANITARY MANHOLES TO BE REMOVED.

SANITARY SEWER MH, OF THE SIZE SPECIFIED

This item shall include all labor, material, and equipment necessary to install sanitary manholes in accordance with Division III of the Standard Specifications for Water and Sewer Construction in Illinois, as shown on the plans and as specified herein.

All sanitary manholes shall be in accordance with the plans and specifications.

This work will be measured and paid for at the contract unit price per EACH measured in place for MANHOLES, SANITARY, 4'-DIAMETER, TYPE 1 FRAME, CLOSED LID.

WATER MAIN IN CASING, 12"

This item shall include all labor, material, and equipment necessary to install water main in casing in accordance with Division III of the Standard Specifications for Water and Sewer Construction in Illinois, as shown on the plans and as specified herein.

This work shall consist of furnishing and installing water main inside casing pipe and shall follow the pipe requirements in the ductile iron water main special provision. All joints within casing pipe shall be of the restrained type.

This work shall be measured and paid for at the Contract unit price per foot (FT) for WATER MAIN IN CASING, 12".

STEEL CASING PIPE, BORED AND JACKED, 20"

This item shall include all labor, material, and equipment necessary to install Steel Casing Pipe, Auger and Jack in accordance with 550 and 551 of the Standard Specifications, as shown on the plans and as specified herein.

Furnish and install smooth steel casing pipe jacked in place by bored and jacked installation at the locations shown on the drawings.

References:

- AWWAM-II - Steel Pipe - A Guide for Design and Installation.
- ANSIAWS D1.1 - Structural Welding Code.
- ASTM A139 - Electric-Fusion-Welded Steel Pipe.
- ASTM A569 - Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality.

Quality Assurance: Welding materials and procedures:

- Conform to ANSIIASME Section 9, AWWA C206 and applicable State Labor Regulations.
- In accordance with ANSIIASME Boiler and Pressure Vessel Code Section IX, or ANSIAWS D.1.1. Structural Welding Code.

Submit to the Engineer in writing that all materials furnished under this Specification are in conformance with the materials and mechanical requirements specified herein. Complete shop drawings on all proprietary materials and accessories shall be submitted to the Engineer for review.

PRODUCTS

- Smooth Steel Casing Pipe:
 - The water main or storm sewer shall be installed in steel casing at the locations shown on the Drawings.
 - The Smooth Steel Pipe shall conform to ASTM A 139, Grade B. Hydrostatic Shop Test of the pipe is not required. Steel Plate with yield strength of 36,000 psi (ASTM A-36, A570 GR.36) shall be used. The pipe ends shall be beveled for field butt welding.
 - The steel casing pipe shall be smooth steel pipe. The minimum wall thickness required for smooth steel pipe shall be as follows, except where different thickness is specified for special applications.

SMOOTH STEEL CASING PIPE UNDER RAILROADS

<u>Diameter of Casing (Inches)</u>	<u>Minimum Wall Thickness of Smooth Steel Pipe (Inches)</u>
20"	0.34375"

Notes:

1. The wall thickness was designed for 30 feet of soil cover over the casing. For any loading combination of external load exceeding 30 feet of soil load Contractor shall submit casing design calculations to Engineer for review.

a. Wall thickness for smooth pipe may be calculated using AWWA M11, "Steel Pipe - A Guide for Design and Installation", Equations (6-7) and (6-8) with B' in accordance with the proposed change of June 1986 and a factor of safety of 2.5.

b. Ring deflection for smooth pipe shall not exceed 2% of the nominal diameter of casing. The Iowa Deflection Formula shall be used to calculate the deflection.

- Casing Insulators:
 - Casing insulators shall be made of ASTM-304 Stainless Steel. The connecting flanges shall be ribbed and the shell lined with PVC. All nuts and bolts shall be ASTM-304 stainless steel. Runners shall be mig welded to the shell and have a runner made of ultra high molecular weight polymer with high abrasion resistance and low coefficient of friction. The casing insulators are to be installed and spaced as recommended by the manufacturer. As a minimum, each pipe length shall be provided with three insulators. Casing insulator shall be restrained type with 1" clearance between runner and top of casing pipe and provide a minimum separation between the pipeline and casing of 4 inches at all points. Cascade CCS standard spacers or approved equal.

EXECUTION

- Installation of Steel Casing Pipe (Bored & Jacked):

- The Contractor shall be responsible for field verification of all utility clearance prior to beginning installation. The contractor shall adjust casing elevation and/or alignment to avoid any conflict without additional cost to the Contract. The contractor shall not make claims for additional costs and likewise the Owner shall not seek credit.
 - The installation of a water main / storm sewer within casing shall be carried out in strict accordance with the pipe manufacturer's recommendations. At no time shall the Contractor be allowed to pull or push the pipe through the casing without taking proper and, in the judgment of the Engineer, adequate measures to protect the pipe from any structural damage.
 - Casing pipe shall not be installed where the water table is above the bottom of the push pit without dewatering the length of the casing. The contractor shall submit a dewatering plan for review by the Engineer before the Work can proceed. All dewatering required shall be included in the auger and jack pay item.
 - Machine augering will not be allowed in soils that contain large rocks and boulders. Instead, hand mining shall be used.
 - Each end of the casing shall be sealed with a manufactured rubber end seal with stainless steel bands and fittings
- o Quality Assurance:
 - The Contractor shall furnish to the Engineer, one (1) calibrated pressure gauge to be used to check pressure in the field.
 - The Contractor shall also furnish suitable devices for determining the accuracy of all volumetric and flow rate measuring devices, as required.

MEASUREMENT AND PAYMENT

- o Payment for steel casing pipe, auger and jack shall be paid at the contract price per FOOT for STEEL CASING PIPE, BORED AND JACKED, 20". The length of steel casing to be paid under this item shall be measured along the horizontal projection of the centerline of the casing completed in place.
- o The Contract unit prices shall be payment in full for all materials, labor, and equipment required for: site preparation, including removal, replacement and/or repair of fences and other site objects; trench and pit excavation, including removal and disposal of existing pipes, structures, and excess excavated materials; grouting, backfilling, and all labor, materials, tools, and equipment necessary to install the casing pipe as specified above.
- o Carrier pipe installed inside the casing shall be paid for under the appropriate pay item.

STORM SEWERS, TYPE 1, WATER MAIN QUALITY PIPE, OF THE SIZE SPECIFIED

This item shall include all labor, material, and equipment necessary to install Storm Sewer, WM Class Pipe in accordance with 550 and 551 of the Standard Specifications, as shown on the plans and as specified herein.

All storm sewer labelled water main class on the drawings shall be one of the following materials. If the pipe material does not come in the size specified the Contractor shall use the next up available size at no additional cost.

-PVC SDR 26 pipe meeting ASTM D-2241 pipe with ASTM D-3139 joints and F-477 gaskets.

-PVC C900 DR21 pipe meeting AWWA C900 or C905 with ASTM D-3139 joints and F-477 gaskets.

This work will be measured and paid for at the contract unit price per foot (FT) for STORM SEWERS, TYPE 1, WATER MAIN QUALITY PIPE, OF THE SIZE SPECIFIED.

VALVE VAULTS, TY A, OF THE SIZE SPECIFIED, TY 1 FR & LID

This item shall include all labor, material, and equipment necessary to complete the work in accordance with Section 44 of the Standard Specifications for Water and Sewer Construction in Illinois, as shown on the plans and as specified herein.

Structure specifications are stated in the approved Department of Public Works Material List.

This work will be measured and paid for at the contract unit price per each (EA) for VALVE VAULTS, TYPE A, of the size specified, TYPE 1 FRAME, CLOSED LID.

DUCTILE IRON WATER MAIN, OF THE SIZE SPECIFIED

This item shall include all labor, material, and equipment necessary to complete of the work in accordance with the plans, Section 41 of the Standard Specifications for Water and Sewer Construction in Illinois and as specified herein.

All water main shall be installed as shown on the plans or as directed by the Engineer in the field. Where identified on the plans directional drilling shall be utilized to install the water main. All installation shall conform to the following requirements.

Open Cut Installation

The requirements of Section 40-2.03 of the Standard Specifications for Water and Sewer Construction in Illinois are modified as follows: Water main shall be cement lined ductile iron pipe with "push on" single gasket joints and shall be thickness class 52. The pipe shall conform to ANSI A-21 .51 and ANSI A-21.4, and AWWA C104 with joints meeting ANSI A-21.11. Fittings shall be ductile iron, 250 psi pressure rating, cement lined, with restrained push-on joints and shall meet ANSI A-21.10. All mechanical joints outside of valve vaults shall have ductile iron bolts, washers and nuts.

Mega-Lug retainer glands shall be required at all connections of ductile iron water main with bends, tees, crosses, reducers and other fittings.

Any joints within the IDOT Right of Way shall be restrained type.

All testing and chlorination shall conform to Sections 41-2.12 and 41-2.13 of the Standard Specifications for Water and Sewer Construction in Illinois and the requirements of the Municipality. Chlorination, re-chlorination, testing and re-testing will not be measured for payment, but shall be considered incidental to the cost of water main.

Water mains and water services shall be polyethylene encased as described in ANSI/AWWA C105.A21.5 and ANSI/AWWA C600. The polyethylene wrap shall be installed as shown by the Ductile Iron Pipe Research Association publication "Polyethylene Encasement Installation Guide". The guide can be found at:
<http://www.dipra.org/content/uploads/PolyethyleneEncasementGuide.pdf>

This Work will be paid for at the Contract Unit Price per foot (FT) for DUCTILE IRON WATER MAIN, of the size specified.

WATER SERVICE CONNECTION

This item shall include all labor, material, and equipment necessary to complete the connection of the new water service piping to the existing water service in accordance with Section 41 with special attention to Article 41.2.13 of the Standard Specifications for Water and Sewer Construction in Illinois, as shown on the plans and as specified herein.

All service boxes will be replaced. The existing water service piping is unknown and may include lead, copper, galvanized iron, or other material types. The Contractor shall provide all the necessary fittings to connect new water service to the existing water service including a new curb stop and service box.

House connections to proposed main shall be made individually and in as short of time as possible after testing and disinfection. No water customer shall be without water in excess of two (2) hours and shall be notified prior to disconnecting service.

The Contractor shall refer to the Village of Barrington material requirements shown in the plans. All work as listed and as shown on the plan and details shall be included with this pay item.

If larger than one and a quarter inch (1.25") services are encountered during construction unless otherwise noted on the plans the Contractor shall match the existing service size. This additional work will be paid for in accordance with Article 109.04 Payment for Extra Work of the Standard Specifications for Road and Bridge Construction.

This work will be measured and paid for at the contract unit price per each (EA) for WATER SERVICE CONNECTION, of the size specified.

WATER SERVICE LINE, 1"

This item shall include all labor, material, and equipment necessary to complete installation of the water service in accordance with Section 41 and 44 with special attention to Articles 41-2.11 and 41-2.13 of the Standard Specifications for Water and Sewer Construction in Illinois, as shown on the plans and as specified herein.

This pay item shall include all material and excavation to connect into existing water main. All service

taps shall be done with a full circle saddle as specified in the Village of Barrington Materials list. The polywrap shall be sufficiently wrapped around the saddle after installation. After making the tap the casement shall be inspected for damage and any repairs shall be made. The corporation stop and three feet (3') of the new water service piping shall be wrapped with additional polyethylene casement.

Trench backfill required for excavations to make connections under sidewalks or driveways will be paid for separately. All service piping shall be Type K copper.

The Contractor shall refer to the Department of Public Works Materials List for all material requirements. All work as listed and as shown on the plan and details shall be included with this pay item.

This work will be measured and paid for at the contract unit price per each (EA) for WATER SERVICE LINE 1".

WATER MAIN REMOVAL

Description. This work shall consist of the removal and disposal of existing water mains at locations as shown on the plans or as directed by the Engineer. The existing water mains to remain in service shall first be cut and capped according to the Plans and Specifications. The water mains shall be removed and disposed of as specified in the applicable portions of Section 501 of the Standard Specifications.

Trench backfill for the excavated area shall not be paid for separately but shall be considered included in this pay item.

Basis of Payment. This work will be paid for at the contract unit price per Foot for WATER MAIN REMOVAL of the diameter specified. Restoration and cutting / capping of the existing mains to remain in service shall not be paid for separately but shall be included in the cost of the work.

SANITARY SEWER REMOVAL

This work shall include all labor, material, and equipment necessary to remove existing sanitary at locations shown on the Engineering plans in accordance with Article 551 of the Standard Specifications and as specified herein.

Sanitary sewer pipe shall be removed completely and not crushed in place; material not suitable for salvage shall be disposed according to Article 202.03. Excavation of trenches shall be performed according to the applicable requirements of Article 550.04. Backfill of trenches shall be performed according to the applicable requirements of Article 208.03. All measurements shall be the internal diameter of the sewer pipe.

This work will be measured in place and paid for at the contract unit price per foot (FT) for SANITARY SEWER REMOVAL, of the size specified, which shall include all labor, material, and equipment required to complete the work as specified herein.

SANITARY SEWER SERVICE

This work shall include all labor, material, and equipment necessary to furnish and install sanitary sewer service lines, of the diameter, material and strength class specified in accordance with Section 550 of the Standard Specifications and as specified herein.

The material used for pipe and fittings shall be exclusively PVC SDR 26, of the diameter specified, conforming to ASTM D-3034 pipe standards with rubber gasket joints conforming to ASTM D-3212.

All connections to existing sewer shall be made with appropriately sized non-shear mission couplings conforming to ASTM C-1173-91. All fittings, accessories and shear rings shall be 316 grade stainless steel in accordance with ASTM A-167-91. This work will be included in the cost of this item.

The trench shall be backfilled, where applicable, with IDOT certified Class B course aggregate material meeting the gradation of CA-11 in accordance with Section 1004 of the Standard Specifications. All aggregate must be crushed, rounded aggregate will not be permitted. The backfill material shall be compacted to 95% modified proctor density as required by ASTM D1557 or AASHTO T-180.

This work shall also include the removal of the existing sanitary sewer service and shall be disposed of off-site according to Article 202.03 of the Standard Specifications.

Sanitary sewer services will be measured for payment in place in feet along the horizontal length from the top of the riser bend to the connection to the existing sewer service. The existing sanitary sewer service line elevations are unknown.

This work will be measured in place and paid for at the contract unit price per EACH (EA) for SANITARY SEWER SERVICE, of the diameter and material type specified, COMPLETE, which shall include all labor, material, and equipment required to complete the work as specified herein.

SANITARY SEWERS

This work shall include all labor, material, and equipment necessary to furnish and install sanitary sewer, of the diameter, material and strength class specified in accordance with Section 550 of the Standard Specifications and as specified herein.

The material used for pipe and fittings shall be exclusively PVC SDR 26, of the diameter specified, conforming to ASTM D-3034 pipe standards with rubber gasket joints conforming to ASTM D-3212.

All sanitary sewer shall be tested in accordance with the Standard Specifications for Water and Sewer Construction in Illinois. All flexible sanitary sewer pipe shall be tested by Method D and either Method A, B, or C as outlined in Section 31-1.12. All sanitary sewer must also be tested by Method E. The Contractor shall provide the Engineer a copy of the video on a digital video disc. The video must be in color and proceed no faster than one (1) foot per second.

The trench shall be backfilled, where applicable, with IDOT certified Class B course aggregate material meeting the gradation of CA-11 in accordance with Section 1004 of the Standard Specifications. All aggregate must be crushed, rounded aggregate will not be permitted. The backfill material shall be compacted to 95% modified proctor density as required by ASTM D1557 or AASHTO T-180.

Sanitary sewer will be measured for payment in place in feet along the length from end to end, including sanitary sewer service wye fittings, but excluding through manholes.

This work will be measured in place and paid for at the contract unit price per foot (FT) for SANITARY SEWER, of the diameter specified, which shall include all labor, material, and equipment required to complete the work as specified herein.

DELINEATOR SYSTEM

Description. This work shall consist of furnishing, installing, and removing a channelizing system adjacent to the CN/WCL Railroad on both the east and west sides. The system shall include yellow interlocking continuous curb with reflective marker panels (minimum 42" height) mounted on reboundable connections. Any delineator system provided must meet the approval of the Federal Railroad Administration as a quiet zone traffic channelization and median supplemental safety measure. The system shall be fully anchored to the pavement. Panels shall be placed roughly every 6'-8".

The delineator system shall be installed in accordance with manufacturer instructions.

The delineators, curb, panels and hardware shall be removed and disposed of once the railroad crossing is not longer active.

The delineator system shall consist of 100 feet of curb on the west side and 100 feet of curb on the east side for a total of 200 feet. Each terminal end of curbing shall have a formed, tapered end curb piece.

Method of Measurement. Delineator System shall be measured for each system furnished and installed.

Basis of Payment. This work will be paid for at the contract unit price per each for DELINEATOR SYSTEM.

WOOD FENCE TO BE REMOVED AND RE-ERECTED

Description. This work shall consist of removing the fence, installing new posts in temporary fence location and re-erecting the existing fence panels on the new posts.

Construction Requirements: The Contractor shall remove the wood fence with components in such a manner as to not cause it damage as directed by the Engineer.

The new posts shall be 4"x6" treated pine. The posts shall be installed per the detail in the plans.

The existing posts shall be removed and disposed of by the Contractor.

Method of Measurement. This work will be measured for payment in place in feet.

Basis of Payment. This work will be paid for at the contract unit price per foot for WOOD FENCE TO BE REMOVED AND RE-ERECTED which price shall include all labor, equipment, and materials necessary to complete the work as specified.

FENCE (SPECIAL)

Description. This work shall consist of furnishing and installing a wood stockade fence according to Section 641 of the Standard Specifications, the details in the plans and as stated below.
The delineator system shall be installed in accordance with manufacturer instructions.

The fence shall be 8' in height.

The posts shall be backfilled with concrete.

Method of Measurement. Wooden fence will be measured for payment in fee, along the top of the fence from center to center of end posts.

Basis of Payment. This work will be paid for at the contract unit price per foot for FENCE (SPECIAL).

TEMPORARY FENCE (SPECIAL)

Description. This work shall consist of furnishing and installing a wood stockade fence according to Section 641 of the Standard Specifications, the details in the plans and as stated below.
The delineator system shall be installed in accordance with manufacturer instructions.

The fence shall be 8' in height.

The posts shall be backfilled with CA-6 aggregate.

Method of Measurement. Wooden fence will be measured for payment in fee, along the top of the fence from center to center of end posts.

Basis of Payment. This work will be paid for at the contract unit price per foot for TEMPORARY FENCE (SPECIAL).

MAST ARM SIGN PANELS

Effective: May 22, 2002

Revised: July 1, 2015

720.01TS

Add the following to Article 720.02 of the Standard Specifications:

Sign stiffening channel systems shall be aluminum and meet the requirements of ASTM 6261-T5.
Sign mounting banding, buckles and buckle straps shall be manufactured from AISI 201 stainless steel.

TRAFFIC SIGNAL GENERAL REQUIREMENTS

Effective: May 22, 2002

Revised: March 1, 2024

800.01TS

These Traffic Signal Special Provisions and the "District One Standard Traffic Signal Design Details" supplement the requirements of the State of Illinois "Standard Specifications for Road and Bridge Construction." The intent of these Special Provisions is to prescribe the materials and construction methods commonly used for traffic signal installations.

All material furnished shall be new unless otherwise noted herein. Traffic signal construction and maintenance work shall be performed by personnel holding current International Municipal Signal Association (IMSA)/Illinois Public Service Institute (IPSI) Traffic Signal Technician Level II certification. A copy of the certification shall be immediately available upon request of the Engineer. The work to be done under the Contract consists of furnishing, installing, and maintaining all traffic signal work and items as specified in the plans and as specified herein in a manner acceptable and approved by the Engineer.

Definitions of Terms.

Add the following to Section 101 of the Standard Specifications:

101.56 Manufacturer. Company that sells a particular type of product directly to the Contractor or the Vendor.

101.57 Vendor. Company that supplies, represents, and provides technical support for IDOT District One approved traffic signal controllers and other related equipment. The Vendor shall be located within IDOT District One and shall:

- (1) Be full service with on-site facilities to assemble, test and troubleshoot traffic signal controllers and cabinet assemblies.
- (2) Maintain an inventory of IDOT District One approved controllers and cabinets.
- (3) Be staffed with permanent sales and technical personnel able to provide traffic signal controller and cabinet expertise and support.
- (4) Have technical staff that hold current IMSA/IPSI Traffic Signal Technician Level III certification and shall attend traffic signal turn-ons as well as cabinet and/or controller modifications.

Submittals.

Revise Article 801.05 of the Standard Specifications to read:

"All material approval requests shall be submitted electronically following District guidelines unless directed otherwise by the Engineer. Submittal requirements shall include, but not limited to the following:

- (1) All material approval requests shall be made prior to or no later than the date of the preconstruction meeting. A list of major traffic signal items can be found in Article 801.05. Material or equipment which is similar or identical shall be the product of the same manufacturer, unless necessary for system continuity. Traffic signal materials and equipment shall bear the U.L. label whenever such labeling is available.

- (2) Product data and shop drawings shall be assembled by pay item. Only the top sheet of each pay item submittal will be stamped by the Department with the review status, except shop drawings for mast arm pole assemblies and the like will be stamped with the review status on each sheet.
- (3) Original manufacturer published product data and shop drawing sheets with legible dimensions and details shall be submitted for review.
- (4) When hard copy submittals are necessary, four (4) complete copies of the manufacturer's descriptive literatures and technical data for the traffic signal materials shall be submitted. For hard copy or electronic submittals, the descriptive literature and technical data shall be adequate for determining whether the materials meet the requirements of the plans and specifications. If the literature contains more than one item, the Contractor shall indicate which item or items will be furnished.
- (5) When hard copy submittals are necessary for structural elements, four (4) complete copies of the shop drawings for the mast arm assemblies and poles, and the combination mast arm assemblies and poles showing, in detail, the fabrication thereof and the certified mill analyses of the materials used in the fabrication, anchor rods, and reinforcing materials shall be submitted.
- (6) Partial or incomplete submittals will be returned without review.
- (7) Certain non-standard mast arm poles and special structural elements will require additional review from IDOT's Central Office. Examples include ornamental/decorative, non-standard length mast arm pole assemblies and monotube structures.
- (8) The Contract number or Permit number, project location/limits, and corresponding pay code number must be on each sheet of correspondence, material approval, and mast arm poles and assemblies drawings.
- (9) Where certifications and/or warranties are specified, the information submitted for approval shall include certifications and warranties. Certifications involving inspections and/or tests of material shall be complete with all test data, dates, and times.
- (10) After the Engineer reviews the submittals for conformance with the design concept of the project, the Engineer will stamp the drawings indicating their status as 'Approved', 'Approved-As-Noted', 'Disapproved', or 'Incomplete'. Since the Engineer's review is for conformance with the design concept only, it is the Contractor's responsibility to coordinate the various items into a working system as specified. The Contractor shall not be relieved from responsibility for errors or omissions in the shop, working, layout drawings, or other documents by the Department's approval thereof. The Contractor must still be in full compliance with Contract and specification requirements.
- (11) The Contractor shall secure approved materials in a timely manner to assure construction schedules are not delayed.
- (12) All submitted items reviewed and marked 'APPROVED AS NOTED', 'DISAPPROVED', or 'INCOMPLETE' are to be resubmitted in their entirety, unless otherwise indicated within the submittal comments, with a disposition of previous comments to verify Contract compliance at no additional cost to the Contract.

- (13) Exceptions to and deviations from the requirements of the Contract Documents will not be allowed. It is the Contractor's responsibility to note any deviations from Contract requirements at the time of submittal and to make any requests for deviations in writing to the Engineer. In general, substitutions will not be acceptable. Requests for substitutions must demonstrate that the proposed substitution is superior to the material or equipment required by the Contract Documents. No exceptions, deviations or substitutions will be permitted without the approval of the Engineer.
- (14) The Contractor shall not order major equipment such as mast arm assemblies prior to Engineer approval of the Contractor marked proposed traffic signal equipment locations to assure proper placement of Contract required traffic signal displays, push buttons and other facilities. Field adjustments may require changes in proposed mast arm length and other coordination.
- (15) Revised cabinet wiring diagrams shall be submitted whenever any wiring modifications are made to the traffic signal cabinet."

Marking Proposed Locations.

Revise "Marking Proposed Locations for Highway Lighting System" of Article 801.09 to read "Marking Proposed Locations for Highway Lighting System and Traffic Signals."

Add the following to Article 801.09 of the Standard Specifications:

"It shall be the Contractor's responsibility to verify all dimensions and conditions existing in the field prior to ordering materials and beginning construction. This shall include locating the mast arm foundations and verifying the mast arms lengths."

Inspection of Electrical Systems.

Add the following to Article 801.10 of the Standard Specifications:

- (c) All cabinets, including temporary traffic signal cabinets, shall be assembled by an approved Vendor in District One. The Department reserves the right to request any controller and cabinet to be tested at the Vendor's facility prior to field installation at no extra cost to the Contract.

Maintenance and Responsibility of Traffic Signal and Flashing Beacon Installations.

Replace Article 801.11(b) of the Standard Specifications to read:

- (b) Traffic Signals and Flashing Beacons. The Contractor shall be responsible for maintaining the traffic signal/flashing beacon installation in proper operating condition.

(1) General.

- a. The Contractor must notify the Area Traffic Signal Maintenance and Operations Engineer of their intent to begin any physical construction work on the Contract or any portion thereof. This notification must be made a minimum of seven (7) working days prior to the start of construction to allow sufficient time for inspection of the existing traffic signal installation(s) and transfer of maintenance to the Contractor. The Department will attempt to fulfill the Contractor's inspection date request(s); however, workload and other

conditions may prevent the Department from accommodating specific dates or times. The Contractor shall not be entitled to any other compensation if the requested inspection date(s) cannot be scheduled by the Department.

- b. Full maintenance responsibility shall start upon the successful completion of a maintenance transfer inspection, or as directed by the Engineer. If the Contractor begins any physical work on the Contract or any portion thereof prior to a traffic signal inspection, maintenance of the traffic signal installation(s) will be transferred to the Contractor without an inspection. The Contractor will become responsible for repairing or replacing all equipment that is not operating properly or is damaged at the time of transfer at no cost to the owner of the traffic signal equipment. Final repairs or replacement of damaged equipment must meet the approval of the Engineer prior to or at the time of final inspection, otherwise the traffic signal installation will not be accepted.
- c. All traffic signals within the limits of the Contract or those which have the item "MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION," "TEMPORARY TRAFFIC SIGNAL INSTALLATION", "TEMPORARY BRIDGE TRAFFIC SIGNAL INSTALLATION", "TEMPORARY PORTABLE BRIDGE TRAFFIC SIGNAL INSTALLATION", and/or "MAINTENANCE OF EXISTING FLASHING BEACON INSTALLATION" shall become the full responsibility of the Contractor. Maintenance responsibility shall end upon issuance of final acceptance by the Engineer.
- d. The Contractor shall have electricians with IMSA/IPSI Traffic Signal Technician Level II certification on staff to provide signal maintenance. A copy of the certification shall be immediately available upon request by the Engineer.
- e. This item shall include maintenance of all traffic signal equipment and other connected and related equipment such as flashing beacons, emergency vehicle preemption (EVP) equipment, master controllers, network switches, uninterruptable power supply (UPS) and batteries, pan-tilt-zoom (PTZ) cameras, vehicle detection, handholes, lighted signs, telephone service installations, cellular modems, radios, communication cables, and other traffic signal equipment. All conduit and related equipment to adjacent intersections shall be maintained to the far back handhole, or as directed by the Engineer. If adjacent intersections are part of Contract work, then maintenance of all conduit and related equipment shall be included in this item.
- f. Regional transit, County, and other agencies may also have equipment connected to existing traffic signal or peripheral equipment such as network switches and transit signal priority (TSP, SCP, and BRT) servers, radios, and other devices, where maintenance shall be coordinated with the owner.
- g. Maintenance shall not include automatic traffic enforcement equipment such as red light enforcement cameras, detectors, or peripheral equipment. This equipment is operated and maintained by others and shall be deactivated while on Contractor maintenance.
- h. The energy charges for the operation of the traffic signal installation shall be paid for by the Contractor.

(2) Maintenance.

- a. The Contractor shall inspect all traffic signal equipment and appurtenances every two (2) weeks to ensure they are functioning properly. Signal heads shall be properly adjusted, including plumb, and tightly mounted. All controller cabinets, signal posts, and controller pedestals shall be tight on their foundations and in alignment. Deficient equipment shall be repaired or replaced as necessary. The Contractor shall check signal system communications and phone lines to assure proper operation. This item includes, as routine maintenance, all portions of EVP equipment. The Contractor shall always maintain enough materials and equipment in stock to provide effective temporary and permanent repairs. The Contractor shall supply a detailed maintenance log monthly that includes dates, locations, names of electricians performing the required checks and inspections, and any other information requested by the Engineer. The Contractor shall attend any additional inspections as requested by the Engineer. The Contractor shall check the controllers, relays, and detectors after receiving complaints or calls to ascertain that they are functioning properly and make all necessary repairs and replacement.
- b. The Contractor is advised that the existing and/or temporary traffic signal installation must remain in operation during all construction stages, except for the most essential down time. Any shutdown of the traffic signal installation which exceeds fifteen (15) minutes must have prior approval from the Engineer. Approval to shut down the traffic signal installation will only be granted during the period extending from 9:00 a.m. to 3:00 p.m. on weekdays. Shutdowns shall not be allowed during inclement weather or holiday periods.
- c. The Contractor shall provide immediate corrective action when any part(s) of the signal fail to function properly. Two far side heads facing each approach shall be considered the minimum acceptable signal operation pending permanent repairs. When repairs at a signalized intersection require that the controller be disconnected or otherwise removed from normal operation, and power is available, the Contractor shall place the traffic signal installation in flashing operation. The signals shall flash RED for all directions unless a different indication has been specified by the Engineer. The Contractor shall install cones on all lane lines at the stop bar on each approach, R1-1 (36 in. minimum) "STOP" signs at the stop bar on each approach on the right side and on raised medians (where applicable), and black on fluorescent orange "SIGNALS OUT AHEAD" warning signs followed by fluorescent orange W3-1 symbolic stop ahead warning signs on all approaches to the intersection.
- d. Temporary replacement of a damaged or knocked down mast arm pole assembly shall require construction of a full or partial span wire signal installation or other method approved by the Engineer to assure signal heads are located overhead and over traveled pavement. Temporary replacement of mast arm mount signals with post mount signals is not permitted.

- e. The Contractor shall provide the Engineer with two (2) 24-hour telephone numbers for the maintenance of the traffic signal installation and for emergency calls by the Engineer.
- f. Traffic signal equipment which is lost, damaged, or not returned to the Department for any reason shall be replaced with new equipment meeting the requirements of the Standard Specifications and these special provisions.
- g. The Contractor shall be fully responsible for the safe and efficient operation of the traffic signals and other equipment noted herein. The Contractor shall respond to all emergency calls from the Department or others within one (1) hour after notification and provide immediate corrective action. When equipment has been damaged or becomes faulty beyond repair, the Contractor shall replace it with new equipment meeting current District One traffic signal specifications. The cost of furnishing and installing the replaced equipment shall be borne by the Contractor at no additional cost to the Contract. The Contractor may institute action to recover damages from a responsible third party. If at any time the Contractor fails to perform all work as specified herein to keep the traffic signal installation in proper operating condition, or if the Engineer cannot contact the Contractor's designated personnel, the Engineer shall have the Department's Electrical Maintenance Contractor perform the maintenance work. The Contractor shall be responsible for all of the Department's Electrical Maintenance Contractor's costs and liquidated damages of \$1,000 per day per occurrence. The Department's Electrical Maintenance Contractor shall bill the Contractor for the total cost of the work. The Contractor shall pay this bill within thirty (30) days of the date of receipt of the invoice or the cost of such work will be deducted from the amount due the Contractor. The Contractor shall allow the Electrical Maintenance Contractor to inspect the traffic signal installation that has been transferred to the Contractor for maintenance. Final replacement of damaged equipment must meet the approval of the Engineer prior to or at the time of final inspection, otherwise the traffic signal installation will not be accepted. Cable splices outside the controller cabinet shall not be allowed. The Department may inspect any signaling device on the Department's highway system at any time without notification. The Contractor shall not install padlocks on traffic signal cabinets or otherwise restrict the Department's access to the cabinet or controller.
- h. Any proposed activity in the vicinity of a highway-rail grade crossing must adhere to the guidelines set forth in the current edition of the Manual on Uniform Traffic Control Devices (MUTCD) regarding work in temporary traffic control zones in the vicinity of highway-rail grade crossings which states that lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the railroad tracks. If the queuing of vehicles across the tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

- i. The Contractor shall be responsible to clear snow, ice, dirt, debris, vegetation, temporary fence, or other condition that obstructs visibility of any traffic signal display or access to traffic signal equipment.
 - j. The Contractor shall maintain the traffic signal in normal operation during any loss of utility or battery backup power. Temporary power to the traffic signal must meet applicable NEC and OSHA guidelines and may include portable generators and/or replacement batteries. Temporary power shall not be paid for separately but shall be included in the Contract.
- (3) Basis of Payment. This work will be paid for at the Contract unit price per each for MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION, TEMPORARY TRAFFIC SIGNAL INSTALLATION, TEMPORARY BRIDGE TRAFFIC SIGNAL INSTALLATION, or TEMPORARY PORTABLE BRIDGE TRAFFIC SIGNAL INSTALLATION. Each location will be paid for separately. Maintenance of a flashing beacon shall be paid for at the Contract unit price for MAINTENANCE OF EXISTING FLASHING BEACON INSTALLATION. Each flashing beacon will be paid for separately.

Damage to Traffic Signal System.

Add the following to Article 801.12(b) of the Standard Specifications:

“Any traffic signal control equipment that is damaged and non-repairable or not operating properly from any cause shall be replaced with new equipment meeting current District One traffic signal specifications and provided by the Contractor at no additional cost to the Contract and/or owner of the traffic signal system, all as approved by the Engineer. Final replacement of damaged equipment must meet the approval of the Engineer prior to or at the time of final inspection. Repair or replace any equipment damaged within the time shown in the table below:

ITEM	RESPONSE TIME	SERVICE RESTORATION	PERMANENT REPAIR (calendar days)
Cabinet	1 hour	24 hours	21 days
Controllers and Peripheral Equipment	1 hour	4 hours	21 days
System Detector Loop	1 hour	N/A	7 days
All Other Detectors	1 hour	N/A	21 days
Signal Head and Lenses	1 hour	4 hours	7 days
Aviation Red Beacon	1 hour	4 hours	7 days
Mast Arm Assembly and Pole	1 hour	4 hours	7 days
Traffic Signal Post	1 hour	4 hours	7 days
Cable and Conduit	1 hour	4 hours	7 days
Interconnect and Telemetry	1 hour	4 hours	7 days
Graffiti Removal	N/A	N/A	7 days
Misalignment of Signal Heads	1 hour	4 hours	4 hours
Closed Loop Monitoring System	1 hour	24 hours	14 days
Post and Poles Plumb Vertically	N/A	N/A	21 days
Controller, Post & Pole Foundations	N/A	N/A	21 days
Complaints, Calls, Controller or System Alarms, Timing, Phasing, Programming	1 hour	4 hours	N/A

Patrol Truck Deficiencies	N/A	24 hours	24 hours
Signal Heads Visibility	1 day	2 days	14 days

Temporary replacement of a damaged or knocked down mast arm pole assembly shall require construction of a full or partial span wire signal installation or other method approved by the Engineer to assure signal heads are located overhead and over traveled pavement. Temporary replacement of mast arm mount signals with post mount signals will not be permitted.

Replacement of any equipment for any reason shall be reported to the Area Traffic Signal Maintenance and Operations Engineer in writing within 24 hours. Permanent and temporary replacement of the controller and/or cabinet shall require inspection and testing by the Vendor.

Automatic Traffic Enforcement equipment, such as red light enforcement cameras, detectors, and peripheral equipment, that is damaged or not operating properly from any cause, shall be the responsibility of the municipality or the automatic traffic enforcement company per Permit agreement."

Traffic Signal Inspection (TURN-ON).

Revise Article 801.15(b) of the Standard Specifications to read:

"Turn-on. It is the intent to have all electric work completed and equipment field tested by the Contractor and/or Vendor prior to the Department's "turn-on" field inspection. If in the event the Engineer determines work is not complete and the inspection will require more than two (2) hours to complete, the inspection shall be canceled, and the Contractor will be required to reschedule at another date. The maintenance of the traffic signals will not be accepted until all punch list work is corrected and re-inspected.

When the Contractor requests a turn-on and inspection of the completed traffic signal installation(s), the request must be made to the Area Traffic Signal Maintenance and Operations Engineer a minimum of seven (7) working days prior to the time of the requested inspection. The Department will attempt to fulfill the Contractor's turn-on and inspection date request(s); however, workload and other conditions may prevent the Department from accommodating specific dates or times. The Contractor shall not be entitled to any other compensation if the requested turn-on and inspection date(s) cannot be scheduled by the Department. The Department will not grant a field inspection until written or electronic notification is provided from the Contractor that the equipment has been field tested and the intersection is operating according to Contract requirements. The Contractor must invite local fire department personnel to the turn-on when emergency vehicle preemption (EVP) is included in the project. When the Contract includes the item RE-OPTIMIZE TRAFFIC SIGNAL SYSTEM, OPTIMIZE TRAFFIC SIGNAL SYSTEM, and/or TEMPORARY TRAFFIC SIGNAL TIMING, the Contractor must notify the SCAT Consultant of the turn-on/detour implementation schedule, as well as stage changes and phase changes during construction.

The Contractor must have all traffic signal work completed and the electrical service installation connected by the utility company prior to requesting an inspection and turn-on of the traffic signal installation. The Contractor shall be responsible to provide a police officer to assist with traffic control at the time of testing.

The Contractor shall provide a representative from the Vendor who is knowledgeable of the cabinet design and controller functions to attend the traffic signal inspection for both permanent and temporary traffic signal turn-ons.

Upon demonstration that the signals are operating and all work is completed in accordance with the Contract and to the satisfaction of the Engineer, the Engineer will then allow the signals to be placed in continuous operation. The signals shall continue to be maintained by the Contractor until final acceptance.

The Department requires the following Final Project Documentation from the Contractor at traffic signal turn-ons in electronic format in addition to hard copies where noted. An electronic media device shall be submitted with separate folders corresponding to each numbered title below. The electronic media device shall be labeled with date, project location, company, and Contract or Permit number. Electronic record drawings and material approvals shall be submitted prior to traffic signal turn-on for review by the Department as described in the Record Drawings section herein.

Final Project Documentation:

- (1) Record Drawings. Electronically produced signal plans of record with field revisions marked in red. Two (2) hard copies of 11 in. x 17 in. record drawings shall also be provided.
- (2) Field Testing. Written notification from the Contractor and the Vendor of satisfactory field testing with corresponding material performance measurements, such as for detector loops and fiber optic systems (see Article 801.13).
- (3) Material Approvals. Material approval documentation.
- (4) Manuals. Operation and service manuals of the signal controller and associated control equipment.
- (5) Cabinet Wiring Diagram and Cable Logs. Five (5) hard copies of 11 in. x 17 in. cabinet wiring diagrams shall be provided along with electronic PDF and DGN files of the cabinet wiring diagram. Five (5) hard copies of the cable logs and electronic Excel files shall be provided with cable #, number of conductors and spares, connected device/signal head and intersection location.
- (6) Warrantees and Guarantees. All manufacturer and Contractor warrantees and guarantees required by Article 801.14.
- (7) GPS Coordinates. GPS coordinates of traffic signal equipment as described in the Record Drawings section herein.

Acceptance of the traffic signal equipment by the Department shall be based upon inspection results at the traffic signal "turn-on", completeness of the required documentation, and successful operation during a minimum 72 hour "burn-in" period following activation of traffic signal equipment. If approved, traffic signal acceptance shall be verbal at the final inspection followed by written correspondence from the Engineer. The Contractor shall be responsible for all traffic signal equipment and associated maintenance thereof until Departmental acceptance is granted.

All equipment and/or parts to keep the traffic signal installation operating shall be furnished by the Contractor. No spare traffic signal equipment is available from the Department.

All punch list work shall be completed within two (2) weeks after the turn-on. The Contractor shall notify the Area Traffic Signal Maintenance and Operations Engineer to schedule an inspection of all punch list work. Failure to meet these time constraints shall result in liquidated damage charges of \$500 per month per incident.

All cost of work and materials required to comply with the requirements herein shall be included in the pay item bid prices, under which the subject materials and signal equipment are paid, and no additional compensation will be allowed. Materials and signal equipment not complying with the requirements herein shall be subject to removal and disposal at the Contractor's expense."

Record Drawings.

The requirements listed for Electrical Installation shall apply for Traffic Signal Installations in Article 801.16. Revise the second and third paragraphs of Article 801.16 of the Standard Specifications to read:

"When the work is complete, and seven (7) days before the request for a final inspection, electronic Contract drawings, stamped "RECORD DRAWINGS", shall be submitted to the Engineer for review and approval and shall be stamped with the date and the signature of the Contractor's supervising Engineer or electrician. The record drawings shall be submitted in PDF format. If the Contract consists of multiple intersections, each intersection shall be saved as an individual PDF file with TS# and location name in its file name.

In addition to the record drawings, copies of the final material approvals which have been Approved or Approved as Noted shall be submitted in PDF format. The PDF files shall clearly indicate the pay item either by filename or PDF Table of Contents referencing the respective pay item number for multi-item PDF files. Specific part or model numbers of items which have been selected shall be clearly visible.

The Contractor shall provide two (2) 11 in. x 17 in. hard copies of electronically produced final record drawings to be kept inside each traffic signal cabinet within project limits."

Add the following to Article 801.16 of the Standard Specifications:

"In addition to the specified record drawings, the Contractor shall record GPS coordinates of the following traffic signal components being installed, modified or being affected in other ways by the Contract:

- All Mast Arm Poles and Posts
- Traffic Signal Wood Poles
- Railroad Bungalow
- UPS
- Handholes
- Controller Cabinets
- Communication Cabinets
- Electric Service Disconnect locations
- CCTV/PTZ Camera installations

Datum to be used shall be North American 1983.

Data shall be provided in electronic format and shall be in .csv format. Latitude and Longitude shall be in decimal degrees with a minimum of 6 decimal places. Each coordinate shall have the following information:

- File shall be named: TSXXX_YY-MM-DD.csv (i.e. TS22157_24-01-01.csv)
- Each intersection shall have its own file
- Row 1 should have the location name (i.e. IL 31 @ Klausen)
- Row 2 is blank
- Row 3 is the headers for the columns
- Row 4 starts the data
- Column A (Date) – should be in the following format: MM/DD/YYYY
- Column B (Item) – as shown in the table below
- Column C (Description) – as shown in the table below
- Column D and E (GPS Data) – should be in decimal form

Examples:

Date	Item	Description	Latitude	Longitude
01/01/2024	MP (Mast Arm Pole)	NEQ, NB, Dual, Combination Pole	41.580493	-87.793378
01/01/2024	HH (Handhole)	Heavy Duty, Fiber, Intersection, Double	41.558532	-87.792571
01/01/2024	ES (Electrical Service)	Ground mount, Pole mount	41.765532	-87.543571
01/01/2024	CC (Controller Cabinet)		41.602248	-87.794053
01/01/2024	PTZ (PTZ)	NEQ extension pole	41.593434	-87.769876
01/01/2024	POST (Post)		41.651848	-87.762053
01/01/2024	MCC (Master Controller Cabinet)		41.584593	-87.793378
01/01/2024	COMC (Communication Cabinet)		41.584600	-87.793432
01/01/2024	BBS (Battery Backup System)		41.558532	-87.792571

Data collection can be made as construction progresses or can be collected after all items are installed. If the data is unacceptable, the Contractor shall make corrections to the data collection equipment and/or process and resubmit the data for review and approval as specified.

Data shall have a minimum 1 ft accuracy after post processing.”

Restoration of Work Area.

Add the following article to Section 801 of the Standard Specifications:

“801.17 Restoration of Work Area. Restoration of the traffic signal work area shall be included in the related pay items such as foundation, conduit, handhole, underground raceways, detector loop installation or replacement, etc. All roadway surfaces such as shoulders, medians, sidewalks, pavement, etc. shall be replaced in kind. All damage to mowed lawns shall be replaced with an approved sod, and all damage to unmowed fields shall be seeded. All brick pavers disturbed in the work area shall be restored to their original

configuration as directed by the Engineer. All damaged brick pavers shall be replaced with a comparable material approved by the Engineer.

Exposed holes created from removal or relocation of traffic signal equipment shall be sealed using a zinc-plated fender washer with toggle bolt.

Restoration of the work area shall be included in the Contract without any extra compensation allowed to the Contractor.

Removal, Disposal, and Salvage of Existing Traffic Signal Equipment.

The removal, disposal, and/or salvage of existing traffic signal equipment shall become the property of the Contractor and disposed of by the Contractor outside the State's right-of-way, unless otherwise noted. No additional compensation shall be provided to the Contractor for removal, disposal or salvage expense for the work in the Contract."

Bagging Signal Heads.

Light tan colored traffic and pedestrian signal reusable covers shall be used to cover dark/un-energized signal sections, visors, and retroreflective backplates. Covers shall be made of outdoor fabric with urethane coating for repelling water, have elastic fully sewn around the cover ends for a tight fit over the visor, and have a minimum of two (2) straps with buckles to secure the cover to the backplate. A center mesh strip allows viewing without removal for signal status testing purposes. Covers shall include a message indicating the signal is not in service. Pedestrian pushbuttons that are not in service shall be covered with a durable material such as described above or burlap that is secured in a weather-resistant manner. The entire housing, including the pedestrian sign, shall also be covered on the front side.

Turn-on of New Traffic Signal Installations.

The following only applies to new traffic signals at previously unsignalized locations.

The signal responsibility shall begin at the start of signal construction and shall end upon issuance of final acceptance by the Engineer. New traffic signal heads and indications may not be installed more than two (2) weeks (14 calendar days) prior to the scheduled turn-on of the traffic signal to avoid motorist confusion caused by the presence of new signal heads, even if properly covered. Unenergized signal indications shall be bagged until one (1) hour prior to the scheduled turn-on per the Bagging Signal Heads section above.

New stop bars and crosswalks on approaches that did not previously have stop control shall NOT be installed until the day of the traffic signal turn-on.

A Portable Changeable Message Sign (PCMS) must be placed two (2) weeks prior to the scheduled new traffic signal turn-on for all approaches to the intersection with the following messages:

NEW
TRAFFIC
SIGNAL

STARTING
MMM ##

where "MMM" and "##" are the 3-character month abbreviation and day of the scheduled turn-on, respectively.

On the day of the turn-on, change messages to read:

NEW
SIGNAL
AHEAD

BE
PREPARED
TO STOP

The PCMS must remain in place for two (2) weeks following the day of the turn-on.

Conflicting Stop signs shall be removed immediately at the time of the traffic signal turn-on.

Locating Underground Facilities.

Revise Section 803 to the Standard Specifications to read:

"IDOT traffic signal facilities are not part of any of the one-call locating service such as J.U.L.I.E or Digger. If the Contract requires the maintenance services of an Electrical Contractor, the Contractor shall be responsible at their own expense for locating all existing IDOT electrical facilities, including but not limited to interconnect conduit and handholes, prior to performing any work. A maintenance transfer is required prior to any locating work. If this Contract does not require the maintenance services of an Electrical Contractor, the Contractor may request one free locate for existing IDOT electrical facilities from the District One Electrical Maintenance Contractor prior to the start of any work. Additional requests will be at the expense of the Contractor. The location of underground traffic facilities does not relieve the Contractor of their responsibility to repair any facilities damaged during construction at their expense.

The exact location of all utilities shall be field verified by the Contractor before the installation of any components of the traffic signal system. For locations of utilities, locally owned equipment, and leased enforcement camera system facilities, the local Counties or Municipalities may need to be contacted: in the City of Chicago contact Digger at (312) 744-7000, and for all other locations contact J.U.L.I.E. at 1-800-892-0123 or 811.

The Contractor shall take whatever precautions to protect the electric cable or electric conductors in conduit from damage during location and construction operations. If the wiring is damaged, the Contractor shall replace the entire length of cable or conductors in conduit, in a manner satisfactory to the Engineer. Splicing below grade will not be permitted.

In the event the repairs are not made by the Contractor, the Contractor shall reimburse the Department for such repairs within sixty (60) days of receiving written notification of said damage. Otherwise, the cost of such repairs will be deducted from monies due or which will become due the Contractor under the terms of the Contract."

Grounding of Traffic Signal Systems

Revise Section 806 of the Standard Specifications to read:

"All traffic signal systems, equipment and appurtenances shall be properly grounded in strict conformance with the NEC. This work shall be in accordance with IDOT's District One Traffic Signal Design Details.

The grounding electrode system shall include a ground rod installed with each traffic signal controller concrete foundation and all mast arm and post concrete foundations. An additional ground rod will be required at locations where measured resistance exceeds 25 ohms. Ground rods are included in the applicable concrete foundation or service installation pay item and will not be paid for separately.

Testing shall be according to Article 801.13 (a) (4) and (5).

- (a) The grounded conductor (neutral conductor) shall be white color coded. This conductor shall be bonded to the equipment grounding conductor only at the Electric Service Installation. All power cables shall include one neutral conductor of the same size.
- (b) The equipment grounding conductor shall be green color coded. The following is in addition to Article 801.04 of the Standard Specifications:
 - (1) Equipment grounding conductors shall be bonded to the grounded conductor (neutral conductor) only at the Electric Service Installation. The equipment grounding conductor is paid for separately and shall be continuous. The Earth shall not be used as the equipment grounding conductor.
 - (2) Equipment grounding conductors shall be bonded, using a UL Listed grounding connector, to all traffic signal mast arm poles, traffic signal posts, pedestrian posts, pull boxes, handhole frames and covers, conduits, and other metallic enclosures throughout the traffic signal wiring system, except where noted herein. Bonding shall be made with a splice and pigtail connection, using a sized compression type copper sleeve, sealant tape, and heat-shrinkable cap. A UL listed electrical joint compound shall be applied to all conductors' terminations, connector threads and contact points. Conduit grounding bushings shall be installed at all conduit terminations, including spare or empty conduits and conduit protruding from handhole walls.
 - (3) All metallic and non-metallic raceways, including spare or empty raceways, shall have a continuous equipment grounding conductor, except raceways containing only detector loop lead-in circuits, circuits under 50 V and/or fiber optic cable will not be required to include an equipment grounding conductor.
 - (4) Individual conductor splices in handholes shall be soldered and sealed with heat shrink. When necessary to maintain effective equipment grounding, a full cable heat shrink shall be provided over individual conductor heat shrinks.
- (c) The grounding electrode conductor shall be similar to the equipment grounding conductor in color coding (green) and size. The grounding electrode conductor is used to connect the ground rod to the equipment grounding conductor and is bonded to ground rods via exothermic welding, UL listed pressure connectors, and UL listed clamps."

RE-OPTIMIZE TRAFFIC SIGNAL SYSTEM

Effective: May 22, 2002

Revised: November 1, 2023

800.03TS

Description.

This work shall consist of re-optimizing a traffic signal system according to the following Levels of work.

LEVEL I applies when improvements are made to an existing signalized intersection within an existing traffic signal system. The purpose of this work is to integrate the improvements to the subject intersection into the signal system while minimizing the impacts to the existing system operation. This

type of work would be commonly associated with the addition of signal phases, pedestrian phases, or improvements that do not affect the capacity at an intersection.

LEVEL II applies when improvements are made to an existing signalized intersection within an existing traffic signal system and detailed analysis of the intersection operation is desired by the engineer, or when a new signalized or existing signalized intersection is being added to an existing system, but optimization of the entire system is not required. The purpose of this work is to optimize the subject intersection, while integrating it into the existing signal system with limited impact to the system operations. This item also includes an evaluation of the overall system operation, including the Traffic Responsive Program (TRP).

For the purposes of re-optimization work, an intersection shall include all traffic movements operated by the subject controller and cabinet.

After the signal improvements are completed, the signal shall be re-optimized as specified by an approved Consultant who has previous experience in optimizing traffic signal systems for District One of the Illinois Department of Transportation. The Contractor shall contact the Traffic Signal Engineer at (847) 705-4734 for a listing of approved Consultants. Traffic signal system optimization work, including fine-tuning adjustments of the optimized system, shall follow the requirements stated in the most recent IDOT District 1 SCAT Guidelines, except as note herein.

A listing of existing signal equipment, interconnect information, phasing data, timing patterns, and SCAT Report may be obtained from the Department, if available and as appropriate. The Consultant shall confer with the Area Traffic Signal Maintenance and Operations Engineer prior to optimizing the system to determine if any extraordinary conditions exist that would affect traffic flows in the vicinity of the system, in which case, the Consultant may be instructed to wait until the conditions return to normal or to follow specific instructions regarding the optimization.

(a) LEVEL I Re-Optimization

1. The following tasks are associated with LEVEL I Re-Optimization.
 - a. Appropriate signal timings shall be developed for the subject intersection and existing timings shall be utilized for the rest of the intersections in the system.
 - b. Proposed signal timing plan for the modified intersection(s) shall be forwarded to IDOT for review prior to implementation.
 - c. Consultant shall conduct on-site implementation of the timings at the turn-on and make fine-tuning adjustments to the timings of the subject intersection in the field to alleviate observed adverse operating conditions and to enhance operations. The consultant shall respond to IDOT comments and public complaints for a minimum period of six (6) months from date of timing plan implementation.
2. The following deliverable shall be provided for LEVEL I Re-Optimization.
 - a. Consultant shall furnish to IDOT a cover letter describing the extent of the re-optimization work performed.

(b) LEVEL II Re-Optimization

1. In addition to the requirements described in the LEVEL I Re-Optimization above, the following tasks are associated with LEVEL II Re-Optimization.
 - a. Traffic counts shall be taken at the subject intersection(s) after the traffic signals are approved for operation by the Area Traffic Signal Maintenance and Operations Engineer. Manual turning movement counts shall be conducted from 6:30 a.m. to 9:30 a.m., 11:00 a.m. to 1:00 p.m., and 3:30 p.m. to 6:30 p.m. on a typical weekday from midday Monday to midday Friday and on a Saturday and/or Sunday, as directed by the Engineer, to account for special traffic generators such as shopping centers, educational institutes and special event facilities. The turning movement counts shall identify cars, and single-unit, multi-unit heavy vehicles, and transit buses.
 - b. The intersections shall be re-addressed and all system detectors reassigned as necessary according to the current standard practice of District One. System detector quantities and locations shall be assessed for optimal performance. The Department shall be notified of any proposed changes.
 - c. TRP operation shall be evaluated to verify proper pattern selection and lack of oscillation and a report of the operation shall be provided to IDOT.
2. The following deliverables shall be provided for LEVEL II Re-Optimization.
 - a. Consultant shall provide to IDOT one (1) USB flash drive for the optimized system containing the following:
 - (1) Electronic copy of the technical memorandum in PDF format
 - (2) Revised Synchro (or other appropriate, approved optimization software) files including the new signal and the rest of the signals in the system
 - (3) Traffic counts conducted at the subject intersection(s)The flash drive shall be labeled with the IDOT system number and master location (if applicable), as well as the submittal date and the consultant logo.
 - b. The technical memorandum shall include the following elements:
 - (1) Brief description of the project
 - (2) Analysis output from Synchro (or other appropriate, approved optimization software file)
 - (3) Traffic counts conducted at the subject intersection(s)

Basis of Payment.

This work shall be paid for at the contract unit price each for RE-OPTIMIZE TRAFFIC SIGNAL SYSTEM – LEVEL I or RE-OPTIMIZE TRAFFIC SIGNAL SYSTEM – LEVEL II, which price shall be payment in full for performing all work described herein per intersection. Following completion of the timings and submittal of the specified deliverables, 100 percent of the bid price will be paid. Each intersection will be paid for separately.

SERVICE INSTALLATION (TRAFFIC SIGNALS)

Effective: May 22, 2002

Revised: March 1, 2024

805.01TS

Revise Section 805 of the Standard Specifications to read:

Description.

This work shall consist of all materials and labor required to install, modify, or extend the electric service installation. All installations shall meet the requirements of the "District One Standard Traffic Signal Design Details".

General.

The electric service installation shall be the electric service disconnecting means and it shall be identified as suitable for use as service equipment.

The electric utility contact information is noted on the plans and represents the current information at the time of Contract preparation. The Contractor must request in writing for service and/or service modification within ten (10) days of Contract award and must follow-up with the electric utility to assure all necessary documents and payment are received by the utility. The Contractor shall forward copies of all correspondence between the Contractor and utility company to the Engineer and Area Traffic Signal Maintenance and Operations Engineer. The service agreement and sketch shall be submitted for signature to the IDOT's Traffic Operations Programs Engineer.

Materials.

- a. General. The completed control panel shall be constructed in accordance with UL Std. 508A, Industrial Control Panel, and carry the UL label. Wire terminations shall be UL listed.
- b. Enclosures.
 - (1) Pole Mounted Cabinet. The cabinet shall be UL 50, NEMA Type 4X, unfinished single door design, fabricated from minimum 0.080 in. (2.03 mm) thick Type 5052 H-32 aluminum. Seams shall be continuous welded and ground smooth. Stainless steel screws and clamps shall secure the cover and assure a watertight seal. The cover shall be removable by pulling the continuous stainless steel hinge pin. The cabinet shall have an oil-resistant gasket and a lock kit shall be provided with an internal O-ring in the locking mechanism assuring a watertight and dust-tight seal. The cabinet shall be sized to adequately house all required components with extra space for arrangement and termination of wiring. A minimum size of 14 in. (350 mm) high, 9 in. (225 mm) wide and 8 in. (200 mm) in depth is required. The cabinet shall be channel mounted to a wooden utility pole using assemblies recommended by the Vendor.
 - (2) Ground Mounted Cabinet. The cabinet shall be UL 50, NEMA Type 3R unfinished single door design with back panel. The cabinet shall be fabricated from Type 5052 H-32 aluminum with the frame and door 0.125 in. (3.175 mm) thick, the top 0.250 in. (6.350 mm) thick and the bottom 0.500-inch (12.70 mm) thick. Seams shall be continuous welded and ground smooth. The door and door opening shall be double flanged. The door shall be approximately 80% of the front surface, with a full length

tamperproof stainless steel .075 in. (1.91 mm) thick hinge bolted to the cabinet with stainless steel carriage bolts and nylock nuts. The locking mechanism shall be slam-latch type with a keyhole cover. The cabinet shall be sized to adequately house all required components with extra space for arrangement and termination of wiring. A minimum size of 40 in. (1000 mm) high, 16 in. (400 mm) wide and 15 in. (375 mm) in depth is required. The cabinet shall be mounted upon a Type A concrete foundation as indicated on the plans. The foundation is paid for separately.

- (3) All enclosures shall include a green external power indicator LED light with circuitry as shown in the Electrical Service-Panel Diagram detail sheet. For pole mounted service enclosures, the power indicator light shall be mounted as shown in the detail. For ground mounted enclosures, the power indicator light shall be mounted on the side of the enclosure most visible from the major roadway.
- (c) Electric Utility Meter Housing and Riser. The electric meter housing and meter socket shall be supplied and installed by the Contractor. The Contractor is to coordinate the work to be performed and the materials required with the utility company to make the final connection at the power source. Electric utility required risers, weather/service head, and any other materials necessary for connection shall also be included in the pay item. Materials shall be in accordance with the electric utility's requirements. For ground-mounted service, the electric utility meter housing shall be mounted to the enclosure. The meter shall be supplied by the utility company.
- (d) Surge Protector. Overvoltage protection, with LED indicator, shall be provided for the 120 V load circuit by the means MOV and thermal fusing technology. The response time shall be < 5 ns and operate within a range of -40°C to +85°C. The surge protector shall be UL 1449 Listed.
- (e) Circuit Breakers. Circuit breakers shall be standard UL listed molded case, thermal-magnetic bolt-on type circuit breakers with trip free indicating handles. 120 V circuit breakers shall have an interrupting rating of not less than 65,000 rms symmetrical amperes. Unless otherwise indicated, the main disconnect circuit breaker for the traffic signal controller shall be rated 60 A, 120 V and the auxiliary circuit breakers shall be rated 10 A, 120 V.
- (f) Fuses and Fuseholders. Fuses shall be small-dimensional cylindrical fuses of the dual element time-delay type. The fuses shall be rated for 600 VAC and shall have a UL listed interrupting rating of not less than 10,000 rms symmetrical amperes at rated voltage.
- (g) Ground and Neutral Bus Bars. A single copper ground and neutral bus bar, mounted on the equipment panel shall be provided. Ground and neutral conductors shall be separated on the bus bar. Compression lugs, plus 2 spare lugs, shall be sized to accommodate the cables with the heads of the connector screws painted green for ground connections and white for neutral connections.
- (h) Utility Services Connection. The Contractor shall notify the utility company marketing representative a minimum of thirty (30) working days prior to the anticipated date of hook-up. This 30-day advance notification will begin only after the utility company marketing representative has received service charge payments from the Contractor. Prior to contacting the utility company marketing representative for service connection, the service installation controller cabinet and cable must be installed for inspection by the utility company.

- (i) Ground Rod. Ground rods shall be copper-clad steel, a minimum of 10 ft (3.0m) in length, and 3/4 in. (20mm) in diameter. Ground rod resistance measurements to ground shall be 25 ohms or less. If necessary additional rods shall be installed to meet resistance requirements at no additional cost to the Contract.

Installation.

- a. General. The Contractor shall confirm the orientation of the traffic service installation and its door side with the Engineer prior to installation. All conduit entrances into the service installation shall be sealed with a pliable waterproof material.
- b. Pole Mounted. Brackets designed for pole mounting shall be used. All mounting hardware shall be stainless steel. Mounting height shall be as noted on the plans or as directed by the Engineer.
- c. Ground Mounted. The service installation shall be mounted plumb and level on the foundation and fastened to the anchor bolts with hot-dipped galvanized or stainless steel nuts and washers. The space between the bottom of the enclosure and the top of the foundation shall be caulked at the base with silicone.

Basis of Payment.

The service installation shall be paid for at the Contract unit price each for SERVICE INSTALLATION of the type specified which shall be payment in full for furnishing and installing the service installation complete. The CONCRETE FOUNDATION, TYPE A, which includes the ground rod, shall be paid for separately. SERVICE INSTALLATION, POLE MOUNTED shall include the 3/4 in. (20mm) grounding conduit, ground rod, and pole mount assembly. Any charges by the utility companies shall be approved by the Engineer and paid for as an addition to the Contract according to Article 109.05 of the Standard Specifications.

COILABLE NON-METALLIC CONDUIT

Effective: May 22, 2002

Revised: July 1, 2015

810.01TS

Description.

This work shall consist of furnishing and installing empty coilable non-metallic conduit (CNC).

General.

The CNC installation shall be in accordance with Sections 810 and 811 of the Standard Specifications except for the following:

Add the following to Article 810.03 of the Standard Specifications:

CNC meeting the requirements of NEC Article 353 shall be used for detector loop raceways to the handholes.

Add the following to Article 811.03 of the Standard Specifications:

On temporary traffic signal installations with detector loops, CNC meeting the requirements of NEC Article 353 shall be used for detector loop raceways from the saw-cut to 10 feet (3m) up the wood pole, unless otherwise shown on the plans

Basis of Payment.

All installations of CNC for loop detection shall be included in the contract and not paid for separately.

UNDERGROUND RACEWAYS

Effective: May 22, 2002

Revised: March 1, 2024

810.02TS

Revise Article 810.04 of the Standard Specifications to read:

“Installation. All underground conduits shall have a minimum depth of 30 in. (700 mm) below the finished grade and shall be installed to avoid existing and proposed utilities within the project limits.”

Add the following to Article 810.04 of the Standard Specifications:

“All metal conduit installed underground shall be Rigid Steel Conduit unless otherwise indicated on the plans.”

All raceways which extend outside of a structure or duct bank but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum of 1 ft (300 mm) or the length shown on the plans beyond the structure or duct bank. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped.

The ends of rigid metal conduit to be capped shall be threaded, the threads protected with full galvanizing, and capped with a threaded galvanized steel cap.

The ends of rigid nonmetallic conduit and coitable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 1/8 in. (3 mm) thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring.”

ROD AND CLEAN EXISTING CONDUIT

Effective: January 1, 2015

Revised: July 1, 2015

810.03TS

Description.

This work shall consist of inserting a duct rod or electrical fish rod or tape of sufficient length and rigidity into an electrical conduit opening in one electrical handhole, and pushing the said rod through the conduit to emerge at the next or subsequent handhole in the conduit system at the location(s) shown on the plans. The duct rod may be inserted and removed by any standard construction method which causes no damage to the conduit. The size of the conduit may vary, but there shall be no differentiation in cost for the size of the conduit.

The conduit which is to be rodded and cleaned may exist with various amounts of standing water in the handholes to drain the conduit and to afford compatible working conditions for the installation of the duct rods and/or cables. Pumping of handholes shall be included with the work of rodding and cleaning of the conduit.

Any handhole which, in the opinion of the Engineer contains excessive debris, dirt or other materials to the extent that conduit rodding and cleaning is not feasible, shall be cleaned at the Engineer's order and payment approval as a separate pay item.

Prior to removal of the duct rod, a duct cleaning attachment such as a properly sized wire brush or cleaning mandrel shall be attached to the duct rod, which by removal of the duct rod shall be pulled through the conduit to remove sand, grit, or other light obstructions from the duct to provide a clean, clear passage for the installation of cable. Whenever the installation of cables is not performed as an adjunct to or immediately following the cleaning of the duct, a light weight pulling line such as a 1/8" polyethylene line or conduit measuring tape shall be placed and shall remain in the conduit to facilitate future work. When great difficulty of either inserting the duct rod or removal of the cleaning mandrel is encountered, the duct may require further cleaning by use of a compressed air gun, or a low pressure water hose. In the case of a broken conduit, the conduit must be excavated and repaired. The existence and location of breaks in the conduit may be determined by rodding, but the excavation and repair work required will be paid for separately.

This work shall be measured per lineal foot for each conduit cleaned. Measurements shall be made from point to point horizontally. No vertical rises shall count in the measurement.

Basis of Payment.

This work shall be paid for at the contract unit price per lineal foot for ROD AND CLEAN EXISTING CONDUIT for the installation of new electric cables in existing conduits. Such price shall include the furnishing of all necessary tools, equipment, and materials required to prepare a conduit for the installation of cable.

HANDHOLES

Effective: January 01, 2002

Revised: November 1, 2023

814.01TS

Description.

Add the following to Section 814 of the Standard Specifications:

All conduits shall enter the handhole at a depth of 30 in. (762 mm) except for the conduits for detector loops when the handhole is less than 5 ft (1.52 m) from the detector loop. All conduit ends should be sealed with a waterproof sealant to prevent the entrance of contaminants into the handhole.

Steel cable hooks shall be epoxy coated and must meet the specifications set forth in 1006.10. Hooks shall be a minimum of 5/8 in. (16 mm) diameter with 90-degree bend and extend into the handhole at least 6 in. (152 mm). Hooks shall be placed a minimum of 12 in. (305 mm) below the lid or lower if additional space is required.

Precast round handholes shall not be used unless called out on the plans.

The cover of the handhole frame shall be labeled "Traffic Signals" with legible raised letters. Only handholes serving IDOT traffic signal equipment shall have this label. Handhole covers for Red Light

Running Cameras shall be labeled "RLRC".

Revise the third paragraph of Article 814.03 of the Standard Specifications to read:

"Handholes shall be constructed as shown on the plans and shall be cast-in-place or precast concrete units. Heavy duty handholes shall be either cast-in-place or precast concrete units."

Revise Article 814.03(c) of the Standard Specifications to read:

"Precast Concrete. Precast concrete handholes shall be fabricated according to Article 1042.17. Where a handhole is contiguous to a sidewalk, preformed joint filler of 1/2 in. (13 mm) thickness shall be placed between the handhole and the sidewalk."

Add the following to Section 814 of the Standard Specifications:

Cast-In-Place Handholes.

All cast-in-place handholes shall be concrete with minimum inside dimensions of 21-1/2 in. (546 mm). Frames and lid openings shall match this dimension.

For grounding purposes, the handhole frame shall have provisions for a 7/16 in. (11 mm) diameter stainless steel bolt cast into the frame. The covers shall have a stainless steel threaded stint extended from the eye hook assembly for the purpose of attaching the grounding conductor to the handhole cover.

The minimum wall thickness for heavy duty hand holes shall be 1 ft (305mm).

Precast Round Handholes.

All precast handholes shall be concrete with an inside diameter of 30 in. (762mm). Frames and covers shall have a minimum opening of 26 in. (660mm) and no larger than the inside diameter of the handhole.

For grounding purposes, the handhole frame shall have provisions for a 7/16 in. (11 mm) diameter stainless steel bolt cast into the frame. For the purpose of attaching the grounding conductor to the handhole cover, the covers shall either have a 7/16 in. (11 mm) diameter stainless steel bolt cast into the cover or a stainless steel threaded stint extended from an eye hook assembly. A hole may be drilled for the bolt if one cannot be cast into the frame or cover. The head of the bolt shall be flush or lower than the top surface of the cover.

The minimum wall thickness for precast heavy duty hand holes shall be 6 in. (152 mm).

Precast round handholes shall be only produced by an approved precast vendor.

FIBER OPTIC TRACER CABLE

Effective: May 22, 2002

Revised: November 1, 2023

817.02TS

The cable shall meet the requirements of Section 817 of the Standard Specifications, except for the following:

Add the following to Article 817.03 of the Standard Specifications:

"In order to trace the fiber optic cable after installation, the tracer cable shall be installed in the same conduit as the fiber optic cable in locations shown on the plans. The tracer cable shall be continuous, extended into the controller cabinet and terminated on a barrier type terminal strip mounted on the side wall of the controller cabinet. The barrier type terminal strip and tracer cable shall be clearly marked and identified. All tracer cable splices shall be kept to a minimum and shall incorporate maximum lengths of cable supplied by the manufacturer. The tracer cable will be allowed to be spliced at handholes only. The tracer cable splice shall use a Western Union Splice soldered with resin core flux and shall be soldered using a soldering iron. Blow torches or other devices which oxidize copper cable shall not be allowed for soldering operations. All exposed surfaces of the solder shall be smooth. The splice shall be covered with a black shrink tube meeting UL 224 guidelines, Type V and rated 600V, minimum length 4 in. (100 mm) and with a minimum 1 in. (25 mm) coverage over the XLP insulation, underwater grade."

Revise Article 817.05 of the Standard Specifications to read:

"Basis of Payment. The tracer cable shall be paid for separately as ELECTRIC CABLE IN CONDUIT, TRACER, NO. 14 1C per foot (meter), which price shall include all associated labor and material for installation."

FULL-ACTUATED CONTROLLER AND CABINET

Effective: January 1, 2002

Revised: March 1, 2024

857.02TS

Description.

This work shall consist of furnishing and installing a traffic actuated solid state digital controller in the controller cabinet of the type specified, meeting the requirements of Section 857 of the Standard Specifications, as modified herein, including malfunction management unit, load switches and flasher relays, and all necessary connections for proper operation.

If the intersection is part of an existing system and/or when specified in the plans, this work shall consist of furnishing and installing a(n) "Eagle" brand traffic actuated solid state controller.

Materials.

Add the following to Article 857.02 of the Standard Specifications:

"Controllers shall be Econolite Cobalt or Eagle/Yunex M60 unless specified otherwise on the plans or elsewhere on these specifications. Only controllers supplied by one of the District One approved Vendors will be allowed. The controller shall be of the most recent approved model and software version supplied by the Vendor at the time of the traffic signal TURN-ON unless specified otherwise on the plans or these specifications. A removable controller data key shall also be provided. Individual load switches shall be provided for each vehicle, pedestrian, and overlap phase. The controller shall prevent phases from being omitted during program changes and after all preemption events and shall inhibit simultaneous display of circular yellow and yellow arrow indications.

For integration into an Advanced Traffic Management System (ATMS) such as Centrac, Tactics, or TransSuite, the controller shall have the latest version of approved NTCIP software installed. For operation prior to integration into an ATMS, the controller shall maintain existing

communications.”

Revise Article 1074.03 (a) (5) paragraph “b.” to read:

“Thermostatically Controlled Exhaust Fans. The cabinet shall be equipped with two (2) thermostatically controlled exhaust fans. Each fan shall have a minimum air delivery capacity of 100 cfm (2.8 cu m/min) and shall be mounted on self-lubricating ball bearings. The thermostat control shall be adjustable between 91 and 113 °F (33 and 45 °C) and shall be set to turn the fan on at 95 °F (35 °C).”

Add the following to Article 1074.03 of the Standard Specifications:

(a) (6) Cabinets shall be designed for NEMA TS2 Type 1 operation. All cabinets shall be pre-wired for a minimum of eight (8) phases of vehicular, four (4) phases of pedestrian and four (4) phases of overlap operation.

Revise the second sentence in Article 1074.03 (b) (1) paragraph “a” to read:

“The malfunction management unit shall have a minimum of 16 fully programmable channels.”

Add the following to Article 1074.03 of the Standard Specifications:

- (b) (5) Cabinets – Provide 1/8 in. (3.2 mm) thick unpainted aluminum alloy 5052-H32. The surface shall be smooth, free of marks and scratches. All external hardware shall be stainless steel.
- (b) (6) Controller Harness – Provide a TS2 Type 2 “A” wired harness in addition to the TS2 Type 1 harness.
- (b) (7) Surge Protection – Shall be a 120 VAC Single phase Modular filter Plug-in type, supplied from an approved Vendor.
- (b) (8) BIU – shall be secured by mechanical means.
- (b) (9) Transfer Relays – Solid state or mechanical flash relays are acceptable.
- (b) (10) Switch Guards – All switches shall be guarded.
- (b) (11) Heating – One (1) 200 W, thermostatically-controlled, electric heater.
- (b) (12) Lighting – One (1) LED Panel shall be placed inside the cabinet top panel and one (1) LED Panel shall be placed on each side of the pull-out drawer/shelf assembly located beneath the controller support shelf. The LED Panels shall be controlled by a door switch. The LED Panels shall be provided from an approved Vendor.
- (b) (13) The cabinet shall be equipped with a pull-out drawer/shelf assembly. A 1-1/2 in. (38mm) deep drawer shall be provided in the cabinet, mounted directly beneath the controller support shelf. The drawer shall have a hinged top cover and shall be capable of accommodating one (1) complete set of cabinet prints and manuals. This drawer shall support 50 lb (23 kg) in weight when fully extended. The drawer shall open and close smoothly. Drawer dimensions shall make maximum use of available depth offered by the controller shelf and be a minimum of 18 in. (610mm) wide.
- (b) (14) Plan & Wiring Diagrams – 12 in. x 15 in. (305mm x 406mm) moisture sealed container attached to door.
- (b) (15) Detector Racks – Fully wired and labeled for four (4) channels of emergency vehicle preemption and sixteen channels (16) of vehicular operation.
- (b) (16) Field Wiring Labels – All field wiring shall be labeled.
- (b) (17) Field Wiring Termination – Approved channel lugs required.
- (b) (18) Power Panel – Provide a nonconductive shield.

- (b) (19) Circuit Breaker – The circuit breaker shall be sized for the proposed load but shall not be rated less than 30 A.
- (b) (20) Police Door – Provide wiring and termination for plug in manual phase advance switch.

Basis of Payment.

This work will be paid for at the contract unit price each for FULL-ACTUATED CONTROLLER AND TYPE IV CABINET; FULL-ACTUATED CONTROLLER AND TYPE IV STRETCHED CABINET; FULL-ACTUATED CONTROLLER AND TYPE V CABINET; FULL-ACTUATED CONTROLLER AND TYPE SUPER P CABINET; FULL-ACTUATED CONTROLLER AND TYPE SUPER P STRETCHED CABINET; FULL-ACTUATED CONTROLLER AND TYPE SUPER R CABINET; FULL-ACTUATED CONTROLLER AND TYPE IV CABINET, SPECIAL; FULL-ACTUATED CONTROLLER AND TYPE IV STRETCHED CABINET, SPECIAL; FULL-ACTUATED CONTROLLER AND TYPE V CABINET, SPECIAL; FULL-ACTUATED CONTROLLER AND TYPE SUPER P CABINET (SPECIAL); FULL-ACTUATED CONTROLLER AND TYPE SUPER P STRETCHED CABINET (SPECIAL); FULL-ACTUATED CONTROLLER AND TYPE SUPER R CABINET (SPECIAL).

UNINTERRUPTABLE POWER SUPPLY, SPECIAL

Effective: January 1, 2013

Revised: March 1, 2024

862.01TS

This work shall be in accordance with section 862 of the Standard Specification except as modified herein.

Add the following to Article 862.01 of the Standard Specifications:

“The UPS shall have the power capacity to provide normal operation of a signalized intersection that utilizes all LED type signal head optics for a minimum of six (6) hours.”

Add the following to Article 862.02 of the Standard Specifications:

“Materials shall be according to Article 1074.04 as modified in UNINTERRUPTABLE POWER SUPPLY, SPECIAL.”

Add the following to Article 862.03 of the Standard Specifications:

“The UPS shall additionally include, but not be limited to, a battery cabinet, where applicable. For Super P and Super R cabinets, the battery cabinet is integrated to the traffic signal cabinet and shall be included in the cost for the traffic signal cabinet of the size and type indicated on the plans.”

Revise Article 862.04 of the Standard Specifications to read:

Installation.

When a UPS is installed at an existing traffic signal cabinet, the UPS cabinet shall partially rest on the lip of the existing controller cabinet foundation and be secured to the existing controller cabinet by means of at least four (4) stainless steel bolts. The UPS cabinet shall be completely enclosed with the bottom and back constructed of the same material as the cabinet.

When a UPS is installed at a new signal cabinet and foundation, it shall be mounted as shown on the plans.

At locations where UPS is installed and an emergency vehicle priority system is in use, any existing incandescent confirmation beacons shall be replaced with LED lamps in accordance with the District One Emergency Vehicle Priority System specification at no additional cost to the Contract. A concrete apron shall be provided and be in accordance with Articles 424 and 202 of the Standard Specifications. The concrete apron shall also follow the District 1 Standard Traffic Signal Design Detail, Type D for Ground Mounted Controller Cabinet and UPS Battery Cabinet.

For a ground mounted UPS, the UPS shall be mounted on its own Type A concrete foundation which will be paid for separately. A concrete apron shall be provided with a dimension of 36 in. in front of the UPS cabinet, 5 in. deep, and a width sized appropriately to the width of the concrete foundation. The concrete apron shall follow Articles 424 and 202 of the Standard Specifications.

This item shall include any required modifications to an existing traffic signal controller as a result of the addition of the UPS including the addition of alarms.

Materials.

Revise Article 1074.04(a)(1) of the Standard Specifications to read:

“The UPS shall be line interactive or double conversion and provide voltage regulation and power conditioning when utilizing utility power. The UPS shall be sized appropriately for the intersection(s) normal traffic signal operating load. The UPS must be able to maintain the intersection’s normal operating load plus 20 percent of the intersection’s normal operating load. When installed at a railroad-interconnected intersection, the UPS must maintain the railroad preemption load, plus 20 percent of the railroad preemption-operating load. The total connected traffic signal load shall not exceed the published ratings for the UPS. The UPS shall provide a minimum of six (6) hours of normal operation run-time for signalized intersections with LED type signal head optics at 77 °F (25 °C) (minimum 1000 W active output capacity, with 86 percent minimum inverter efficiency).”

Revise the first paragraph of Article 1074.04(a)(3) of the Standard Specifications to read:

“The UPS shall have a minimum of four (4) sets of normally open (NO) and normally closed (NC) single-pole double-throw (SPDT) relay contact closures, available on a panel mounted terminal block or locking circular connectors, rated at a minimum 120 V/1 A, and labeled so as to identify each contact according to the plans.”

Revise Article 1074.04(a)(17) of the Standard Specifications to read:

“When the intersection is in battery backup mode, the UPS shall bypass all internal cabinet lights, ventilation fans, cabinet heaters, service receptacles, luminaires, any lighted street name signs, any automated enforcement equipment and any other devices directed by the Engineer.”

Revise Article 1074.04(b)(2) paragraph “b.” of the Standard Specifications to read:

“Batteries, inverter/charger and power transfer relay shall be housed in a separate NEMA Type 3R cabinet. The cabinet shall be Aluminum alloy, 5052-H32, 0.125 in. thick and have a natural mill finish.”

Revise Article 1074.04(b)(2) paragraph “c.” of the Standard Specifications to read:

“No more than three (3) batteries shall be mounted on individual shelves for a cabinet housing six batteries and no more than four (4) batteries per shelf for a cabinet housing eight batteries.”

Revise Article 1074.04(b)(2) paragraph “e.” of the Standard Specifications to read:

“The battery cabinet housing shall have the following nominal outside dimensions: a width of 25 in. (785 mm), a depth of 16 in. (440 mm), and a height of 41 to 48 in. (1.1 to 1.3 m). Clearance between shelves shall be a minimum of 10 in. (250 mm).”

Revise Article 1074.04(b)(2) paragraph “g.” of the Standard Specifications to read:

“The door shall open to the entire cabinet, have a neoprene gasket, an Aluminum continuous piano hinge with stainless steel pin, and a three point locking system. The door shall be equipped with a two position doorstop, one a 90° and one at 120°. The cabinet shall be provided with a main door lock which shall operate with a traffic industry conventional No. 2 key. Provisions for padlocking the door shall be provided.”

Add the following to Article 1074.04(b)(2) of the Standard Specifications:

- j. The battery cabinet shall have provisions for an external generator connection.

Add the following to Article 1074.04(c) of the Standard Specifications:

- (8) The UPS shall include a tip or kill switch installed in the battery cabinet, which shall completely disconnect power from the UPS when the switch is manually activated.
- (9) The UPS shall include standard RS-232 and internal Ethernet interface.
- (10) The UPS shall incorporate a flanged electric generator inlet for charging the batteries and operating the UPS. The generator connector shall be male type, twist-lock, rated as 15A, 125VAC with a NEMA L5-15P configuration and weatherproof lift cover plate. Access to the generator inlet shall be from a secured weatherproof lift cover plate or behind a locked battery cabinet police panel.
- (11) The bypass switch shall include an internal power transfer relay that allows removal of the battery back-up unit, while the traffic signal is connected to utility power, without impacting normal traffic signal operation.

Revise Article 1074.04(d)(3) of the Standard Specifications to read:

“All batteries supplied in the UPS shall be either gel cell or AGM type, deep cycle, completely sealed, prismatic lead calcium based, silver alloy, valve regulated lead acid (VRLA) requiring

no maintenance. All batteries in a UPS installation shall be the same type; mixing of gel cell and AGM types within a UPS installation is not permitted.”

Revise Article 1074.04(d)(4) of the Standard Specifications to read:

“Batteries shall be certified by the manufacturer to operate over a temperature range of -13°F to 160 °F (-25°C to 71 °C) for gel cell batteries and -40°F to 140°F (-40°C to 60 °C) for AGM type batteries.”

Add the following to Article 1074.04(d) of the Standard Specifications:

(9) The UPS shall consist of an even number of batteries that are capable of maintaining normal operation of the signalized intersection for a minimum of six (6) hours. Calculations shall be provided showing the number of batteries of the type supplied that are needed to satisfy this requirement. A minimum of four (4) batteries shall be provided.

(10) Battery heater mats shall be provided when gel cell type batteries are supplied.

Add the following to Article 1074.04 of the Standard Specifications:

(e) Warranty. The warranty for an uninterruptable power supply (UPS) and batteries (full replacement) shall cover a minimum of five (5) years from date the equipment is placed in operation.

(f) Installation. Bypass switch shall completely disconnect the traffic signal cabinet from the utility provider.

(g) The UPS shall be set-up to run the traffic signal continuously without going to a red flashing condition when switched to battery power unless otherwise directed by the Engineer. The Contractor shall confirm set-up with the Engineer. The continuous operation mode when switched to battery may require modification to unit connections and these modifications are included in the unit price for this item.

Revise Article 862.04 of the Standard Specifications to read:

Basis of Payment.

This work will be paid for at the Contract unit price per each for UNINTERRUPTABLE POWER SUPPLY, SPECIAL, UNINTERRUPTABLE POWER SUPPLY, GROUND MOUNTED, or UNINTERRUPTABLE POWER SUPPLY AND CABINET, SPECIAL. Replacement of emergency vehicle priority system confirmation beacons and any required modifications to the traffic signal controller shall be included in the cost of the UNINTERRUPTABLE POWER SUPPLY, SPECIAL, UNINTERRUPTABLE POWER SUPPLY, GROUND MOUNTED, or UNINTERRUPTABLE POWER SUPPLY AND CABINET, SPECIAL item. The concrete apron and earth excavation required shall be included in the cost of the UNINTERRUPTABLE POWER SUPPLY, GROUND MOUNTED or UNINTERRUPTABLE POWER SUPPLY AND CABINET, SPECIAL item.

FIBER OPTIC CABLE

Effective: May 22, 2002

Revised: July 1, 2015

871.01TS

Add the following to Article 871.01 of the Standard Specifications:

The Fiber Optic cable shall be installed in conduit or as specified on the plans.

Add the following to Article 871.02 of the Standard Specifications:

The control cabinet distribution enclosure shall be 24 Port Fiber Wall Enclosure, unless otherwise indicated on plans. The fiber optic cable shall provide twelve fibers per tube for the amount of fibers called for in the Fiber Optic Cable pay item in the Contract. Fiber Optic cable may be gel filled or have an approved water blocking tape.

Add the following to Article 871.04 of the Standard Specifications:

A minimum of six multimode fibers from each cable shall be terminated with approved mechanical connectors at the distribution enclosure. Fibers not being used shall be labeled "spare." Fibers not attached to the distribution enclosure shall be capped.. A minimum of 13.0 feet (4m) of extra cable length shall be provided for controller cabinets. The controller cabinet extra cable length shall be stored as directed by the Engineer.

Add the following to Article 871.06 of the Standard Specifications:

The distribution enclosure and all connectors will be included in the cost of the fiber optic cable.

Testing shall be in accordance with Article 801.13(d). Electronic files of OTDR signature traces shall be provided in the Final project documentation with certification from the Contractor that attenuation of each fiber does not exceed 3.5 dB/km nominal at 850nm for multimode fiber and 0.4 bd/km nominal at 1300nm for single mode fiber.

TERMINATE FIBER IN CABINET

Effective: November 1, 2023

871.03TS

Description.

This work shall consist of terminating existing or new fibers in a field cabinet, inside a building, as shown on the plans and/or as directed by the Traffic Engineer.

General.

This pay item shall include splices between existing fiber optic cables and any splices shown on the plans as a bid item. All multimode connectors shall be LC compatible, with ceramic ferrules. Singlemode fiber terminations shall utilize pre-fabricated, factory-terminated (LC compatible with ceramic ferrules) pigtails fusion spliced to bare fibers. The splicing of pigtails for singlemode fibers is included in the cost of TERMINATE FIBER IN CABINET. The prefabricated pigtails shall have all of their fibers color coded to match the singlemode fibers in the fiber optic cable. All fusion splices shall be secured on aluminum splice trays capable of accommodating the required number of fusion splices, including necessary splice holders and a compatible splice tray cover. The tray dimensions

shall not exceed 7.5" x 4.1" x 0.45" and shall be mounted within the enclosure using suitable hardware that allows removal for maintenance purposes without the use of tools. All individual splice trays shall be labelled. Splice trays and connector bulkheads shall be included in the cost of TERMINATE FIBER IN CABINET. Connector bulkheads shall be the proper type for the fiber enclosure at the location, and shall be properly secured to the enclosure.

The quality of all fiber splices and terminations shall be verified by OTDR and power meter testing and documented according to Article 801.13(d) of the "Standard Specifications," to the satisfaction of the Traffic Engineer.

All bulkhead connectors / adapters shall be labeled with the fiber numbers and direction (i.e. 13-14N, 1-2W, etc.) with a laminated machine printed label.

Basis of Payment.

This work will be paid for at the contract unit price per each for TERMINATE FIBER IN CABINET, The unit price shall include all equipment; materials; connectors; pigtails; splice trays; bulkheads; testing and documentation; and labor required to terminating each required multimode or singlemode fiber. Terminations involving new fiber optic cable installed under this contract, including any terminations shown on the plans as an included item, shall be included in the unit cost of the applicable FIBER OPTIC CABLE of the type, size, and number of fibers specified.

ELECTRIC CABLE

Effective: May 22, 2002

Revised: July 1, 2015

873.01TS

Delete "or stranded, and No. 12 or" from the last sentence of Article 1076.04 (a) of the Standard Specifications.

Add the following to the Article 1076.04(d) of the Standard Specifications:

Service cable may be single or multiple conductor cable.

SPLICE FIBER IN CABINET

Effective: November 1, 2023

871.02TS

Description.

This work shall consist of fusion splicing singlemode or multimode fibers in a field cabinet, inside a building, as shown on the plans and/or as directed by the Traffic Engineer.

General.

This pay item shall include splices between existing fiber optic cables and any splices shown on the plans as a bid item. Splices shall be secured in fiber optic splice trays within fiber optic distribution enclosures. All fusion splices shall be secured on aluminum splice trays capable of accommodating the required number of fusion splices, including necessary splice holders and a compatible splice tray cover. The tray dimensions shall not exceed 7.5" x 4.1" x 0.45" and shall be mounted within the enclosure using suitable hardware that allows removal for maintenance purposes without the use of tools. All individual splice trays shall be labelled. Splice trays shall be included in the unit cost of SPLICE FIBER IN CABINET.

The quality of all fiber splices shall be verified by testing and documentation according to Article 801.13(d) of the "Standard Specifications," to the satisfaction of the Traffic Engineer.

All optical fibers shall be spliced to provide continuous runs. Splices shall only be allowed in equipment cabinets, in buildings, as shown on the plans and/or as directed by the Traffic Engineer.

All splices shall be made using a fusion splicer that automatically positions the fibers using a system of light injection and detection. The Contractor shall provide all equipment and consumable supplies.

An OTDR trace and power meter readings must be provided from end point termination to end point termination for any fiber that is spliced.

Basis of Payment.

This work shall be paid for at the contract unit price per each for SPLICE FIBER IN CABINET. The unit price shall include all equipment; materials; fiber optic splice trays; testing and documentation; and labor required to fusion splice singlemode fiber optic cable. Splices involving new fiber optic cable installed under this contract, and any splices shown on the plans as an included item, shall be included in the unit cost of the applicable FIBER OPTIC CABLE of the type, size, and number of fibers specified.

EMERGENCY VEHICLE PRIORITY SYSTEM LINE SENSOR CABLE, NO. 20 3/C

Effective: January 1, 2013

Revised: July 1, 2015

873.03TS

This work shall consist of furnishing and installing lead-in cable for light detectors installed at existing and/or proposed traffic signal installations as part of an emergency vehicle priority system. The work includes installation of the lead-in cables in existing and/or new conduit. The electric cable shall be shielded and have (3) stranded conductors, colored blue, orange, and yellow with a stranded tinned copper drain wire. The cable shall meet the requirements of the vendor of the Emergency Vehicle Priority System Equipment.

Basis of Payment.

This work will be paid for at the contract unit price per foot for EMERGENCY VEHICLE PRIORITY SYSTEM LINE SENSOR CABLE, NO. 20 3/C, which price shall be payment in full for furnishing, installing and making all electrical connections necessary for proper operations.

TRAFFIC SIGNAL POST

Effective: May 22, 2002

Revised: July 14, 2021

875.01TS

Revise Article 1077.01 (c) of the Standard Specifications to read:

(c) Anchor Rods. The anchor rods shall be a minimum of 5/8 in. in diameter and 16 in. long and shall be according to Article 1006.09. The anchor rods shall be threaded approximately 6 in. at one end and have a bend at the other end. The first 12 in. at the threaded end shall be galvanized. One each galvanized nut and trapezoidal washer shall be furnished with each anchor rod. The washer shall be properly sized to fully engage and sit flush on all sides of the slot of the base plate.

Revise the first sentence of Article 1077.01 (d) of the Standard Specifications to read:

All posts shall be steel and bases shall be cast iron. All posts and bases shall be hot dipped galvanized according to AASHTO M 111. If the Department approves painting, powder coating by the manufacturer will be required over the galvanization in accordance with 851.01TS TRAFFIC SIGNAL PAINTING Special Provisions.

PEDESTRIAN SIGNAL POST

Effective: January 1, 2020

875.02TS

Description.

This work shall consist of furnishing and installing a metal pedestrian signal post. All installations shall meet the requirements of the "District One Standard Traffic Signal Design Details".

Materials.

- a. General. The pedestrian signal post shall be designed to support the traffic signal loading shown on the plans. The design and fabrication shall be according to the Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, as published by AASHTO.
- b. Post. The post shall be made of steel or aluminum and have an outside diameter of 4 1/2 in. The post shall be threaded for assembly to the base. Aluminum posts shall be according to the specifications for Schedule 80 aluminum pipe. Steel posts shall be according to the specifications for Schedule 40 steel pipe.
- c. Base. The base of a steel post shall be cast iron. The base of an aluminum post shall be aluminum. The base shall be threaded for the attachment to the threaded post. The base shall be approximately 10 in. high and 6 3/4 in. square at the bottom. The bottom of the base shall be designed to accept four 5/8 in. diameter anchor rods evenly spaced in a 6 in. diameter circle. The base shall be true to pattern, with sharp clean cutting ornamentation, and equipped with access doors for cable handling. The door shall be fastened to the base with stainless steel screws. A grounding lug shall be provided inside the base.
- d. Anchor Rods. The anchor rods shall be 5/8 in. in diameter and 16 in. long and shall be according to Article 1006.09. The anchor rods shall be threaded approximately 6 in. at one end and have a bend at the other end. The first 12 in. at the threaded end shall be galvanized. One each galvanized nut and trapezoidal washer shall be furnished with each anchor rod. The washer shall be properly sized to fully engage and sit flush on all sides of the slot of the base plate.

The aluminum post and base shall be drilled at the third points around the diameter and 1/4 in. by 2 in. stainless steel bolts shall be inserted to prevent the post from turning and wobbling.

- e. Finish. The steel post, steel post cap and the cast iron base shall be hot-dipped galvanized according to AASHTO M 111. If the Department approves painting, powder coating by the manufacturer will be required over the galvanization in accordance with 851.01TS TRAFFIC SIGNAL PAINTING Special Provisions. If the post and the base are threaded after the galvanization, the bare exposed metal shall be immediately cleaned to

remove all cutting solvents and oils, and then spray painted with two coats of an approved galvanized paint.

The aluminum post shall have a natural finish, 100 grit or finer.

Installation.

The pedestrian signal post shall be erected plumb, securely bolted to a concrete foundation, and grounded to a ground rod according to the details shown on the plans. No more than 3/4 in. of the post threads shall protrude above the base.

A post cap shall be furnished and installed on the top of the post. The post cap shall match the material of the post. The Contractor shall apply an anti-seize paste compound on all nuts and bolts prior to assembly.

Prior to the assembly, the Contractor shall apply two additional coats of galvanized paint on the threads of the post and the base. The Contractor shall use a fabric post tightener to screw the post to the base.

Basis of Payment.

This work will be paid for at the contract unit price per each for PEDESTRIAN SIGNAL POST, of the length specified.

MAST ARM ASSEMBLY AND POLE

Effective: May 22, 2002

Revised: July 01, 2015

877.01TS

Revise the second sentence of Article 1077.03 (a)(3) of the Standard Specifications to read:

Traffic signal mast arms shall be one piece construction, unless otherwise approved by the Engineer.

Add the following to Article 1077.03 (a)(3) of the Standard Specifications:

If the Department approves painting, powder coating by the manufacturer will be required over the galvanization in accordance with 851.01TS TRAFFIC SIGNAL PAINTING Special Provisions.

CONCRETE FOUNDATIONS

Effective: May 22, 2002

Revised: March 1, 2024

878.01TS

Add the following to Article 878.03 of the Standard Specifications:

"All anchor bolts shall be according to Article 1006.09, with all anchor bolts hot dipped galvanized a minimum of 12 in. at the threaded end.

Depending on the foundation type, the top of foundation shall be between 1 in. and 6 in. above finished grade or as directed by the Engineer.

No foundation is to be poured until the Resident Engineer gives their approval as to the depth of the foundation.”

Add the following to the first paragraph of Article 878.05 of the Standard Specifications:

“The concrete apron in front of the cabinet and UPS shall be included in this pay item.”

Revise the first paragraph of Article 878.05 of the Standard Specifications to read:

“Basis of Payment. This work will be paid for at the Contract unit price per foot (meter) of depth of CONCRETE FOUNDATION of the type specified, or CONCRETE FOUNDATION, TYPE A 12-INCH DIAMETER for pedestrian post concrete foundations.”

LIGHT EMITTING DIODE (LED) SIGNAL HEAD AND OPTICALLY PROGRAMMED LED SIGNAL HEAD

Effective: May 22, 2002

Revised: March 1, 2024

880.01TS

Materials.

Add the following to Section 1078 of the Standard Specifications:

“LED modules proposed for use and not previously approved by IDOT District One will require independent testing for compliance to current VTCSH-ITE standards for the product and be Intertek ETL Verified. This would include modules from new Vendors and new models from IDOT District One approved Vendors.

The proposed independent testing facility shall be approved by IDOT District One. Independent testing must include a minimum of two (2) randomly selected modules of each type of module (i.e. ball, arrow, pedestrian, etc.) used in the District and include as a minimum Luminous Intensity and Chromaticity tests. However, complete module performance verification testing may be required by the Engineer to assure the accuracy of the Vendor’s published data and previous test results. An IDOT representative will select sample modules from the local warehouse and mark the modules for testing. Independent test results shall meet current ITE standards and vendor’s published data. Any module failures shall require retesting of the module type. All costs associated with the selection of sample modules, testing, reporting, and retesting, if applicable, shall be the responsibility of the LED module Vendor and not be a cost to this Contract.

All signal heads shall provide 12 in. (300 mm) displays with glossy yellow or black polycarbonate housings. All head housings shall be the same color (yellow or black) at the intersection. For new signalized intersections and existing signalized intersections where all signals heads are being replaced, the proposed head housings shall be black. Where only selected heads are being replaced, the proposed head housing color (yellow or black) shall match existing head housings. Connecting hardware and mounting brackets shall be polycarbonate (black). A corrosion resistant anti-seize lubricant shall be applied to all metallic mounting bracket joints and shall be visible to the inspector at the signal turn-on. Post top mounting collars are required on all posts and shall be constructed of the same material as the brackets.

The LED signal modules shall be replaced or repaired if an LED signal module fails to function as intended due to workmanship or material defects. LED signal modules which exhibit luminous intensities less than the minimum values specified in Table 1 of the ITE Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement (June 27, 2005) [VTCSH], or applicable successor ITE specifications, or show signs of entrance of moisture or contaminants, shall be replaced or repaired. The Vendor's written warranty for the LED signal modules shall be dated, signed by a Vendor's representative, and included in the product submittal to the State. See Article 801.14 of the Standard Specifications for warranty information.

(a) Physical and Mechanical Requirements

- (1) Modules can be manufactured under this specification for the following faces:
 - a. 12 in. (300 mm) circular, multi-section
 - b. 12 in. (300 mm) arrow, multi-section
- (2) The maximum weight of a module shall be 4 lb (1.8 kg).
- (3) Each module shall be a sealed unit to include all parts necessary for operation (a printed circuit board, power supply, a lens and gasket, etc.) and shall be weatherproof after installation and connection.
- (4) The lens of the module shall be tinted with a wavelength-matched color to reduce sun phantom effect and enhance on/off contrast. The tinting shall be uniform across the lens face. Polymeric lens shall provide a surface coating or chemical surface treatment applied to provide abrasion resistance. The lens of the module shall be integral to the unit, convex with a smooth outer surface and made of plastic. The lens shall have a textured surface to reduce glare.
- (5) The use of tinting or other materials to enhance ON/OFF contrasts shall not affect chromaticity and shall be uniform across the face of the lens.
- (6) Each module shall have a symbol of the type of module (i.e. circle, arrow, etc.) in the color of the module. The symbol shall be 1 in. (25.4 mm) in diameter. Additionally, the color shall be written out in 1/2 in. (12.7mm) letters next to the symbol.

(b) Photometric Requirements

- (1) The LEDs utilized in the modules shall be AlInGaP technology for red and InGaN for green and amber indications and shall be the ultra bright type rated for 100,000 hours of continuous operation from -40 °C to 74 °C.

(c) Electrical

- (1) Maximum power consumption for LED modules as per the tables in Article 1078.01.
- (2) Operating voltage of the modules shall be 120 VAC. All parameters shall be measured at this voltage.

- (3) The modules shall be operationally compatible with currently used controller assemblies (solid state load switches, flashers, and conflict monitors).
- (4) When a current of 20 mA AC or less is applied to the unit, the voltage read across the two leads shall be 15 VAC or less.
- (5) The LED modules shall provide constant light output under power. Modules with dimming capabilities shall have the option disabled or set on a non-dimming operation.
- (6) LED arrows shall be wired such that a loss or the failure of one or more LEDs

(d) Retrofit Traffic Signal Module

The following specification requirements apply to the Retrofit module only. All general specifications apply unless specifically superseded in this section.

- (1) Retrofit modules can be manufactured under this specification for the following faces:
 - a. 12 in. (300 mm) circular, multi-section
 - b. 12 in. (300 mm) arrow, multi-section
 - (2) Each Retrofit module shall be designed to be installed in the doorframe of a standard traffic signal housing. The Retrofit module shall be sealed in the doorframe with a one-piece EPDM (ethylene propylene rubber) gasket.
 - (3) The maximum weight of a Retrofit module shall be 4 lb (1.8 kg).
 - (4) Each Retrofit module shall be a sealed unit to include all parts necessary for operation (a printed circuit board, power supply, a lens and gasket, etc.) and shall be weatherproof after installation and connection.
 - (5) Electrical conductors for modules, including Retrofit modules, shall be 39-2/5 in. (1 m) in length, with quick disconnect terminals attached.
 - (6) The lens of the Retrofit module shall be integral to the unit, shall be convex with a smooth outer surface and made of plastic or of glass.
- (e) The following specification requirements apply to the 12 in. (300 mm) arrow module only. All general specifications apply unless specifically superseded in this section.
- (1) The arrow module shall meet specifications stated in Section 9.01 of the Equipment and Material Standards of the Institute of Transportation Engineers (November 1998) [ITE Standards], Chapter 2 (Vehicle Traffic Control Signal Heads) or applicable successor ITE specifications for arrow indications.
 - (2) The LEDs arrow indication shall be a solid display with a minimum of three (3) outlining rows of LEDs and at least one (1) fill row of LEDs.
- (f) The following specification requirement applies to the 12 in. (300 mm) programmed visibility (PV) module only. All general specifications apply unless specifically superseded in this section.

- (1) The LED module shall be a module designed and constructed to be installed in a programmed visibility (PV) signal housing without modification to the housing.

Delete the fourth paragraph of Article 880.03 of the Standard Specifications. Refer to the "Bagging Signal Heads" section of the District 1 Traffic Signal Special Provision 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS."

Basis of Payment.

Add the following to the first paragraph of Article 880.04 of the Standard Specifications:

"The price shall include furnishing the equipment described above, all mounting hardware and installing them in satisfactory operating condition."

Revise the second paragraph of Article 880.04 of the Standard Specifications to read:

If the work consists of retrofitting an existing polycarbonate traffic signal head with light emitting diodes (LEDs), it will be paid for as a SIGNAL HEAD, LED, RETROFIT, of the type specified, and of the particular kind of material, when specified. Price shall be payment in full for removal of the existing module, furnishing the equipment described above including LED modules, all mounting hardware, and installing them in satisfactory operating condition. The type specified will indicate the number of signal faces, the number of signal sections in each signal face and the method of mounting.

LED SIGNAL FACE, LENS COVER

Effective: July 1, 2021

Revised: April 1, 2024

880.03TS

Description.

This work shall consist of furnishing and installing a signal lens cover with the purpose or preventing snow buildup on and around a signal lens allowing for clear indication during inclement weather.

This item shall fit over a 12 in. signal head lens and shall include the clear lens cover, attachment collar, and any clips or fasteners necessary to fit it flush. The cover shall be installed in accordance with the Manufacturer's instructions and in a manner that prevents dust, debris, or moisture buildup on the inside of the lens cover that could affect the signal indication visibility. Lens covers shall be installed on all red signal head indications.

The snow resistant signal head lens cover shall be warrantied for a period of three (3) years from final inspection and shall be free from material and workmanship defects.

Basis of Payment.

This work shall be paid for at the Contract unit price each for LED SIGNAL FACE, LENS COVER, the price of which shall include the cost for all work and material described herein and includes furnishing, installing, and all mounting hardware necessary for a fully operational snow resistant signal head lens cover.

LIGHT EMITTING DIODE (LED) PEDESTRIAN SIGNAL HEAD

Effective: May 22, 2002

Revised: March 1, 2024

881.01TS

Add the following to the third paragraph of Article 881.03 of the Standard Specifications:

“No mixing of different types of pedestrian traffic signals or displays shall be permitted.”

Delete the fourth paragraph of Article 881.03 of the Standard Specifications. Refer to the “Bagging Signal Heads” section of the District 1 Traffic Signal Special Provision 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS.

Add the following to Article 881.03 of the Standard Specifications:

“Pedestrian Countdown Signal Heads shall be 16 in. (406mm) x 18 in. (457mm) single units with glossy yellow or black polycarbonate housings. All pedestrian head housings shall be the same color (yellow or black) at the intersection. For new signalized intersections and existing signalized intersections where all pedestrian heads are being replaced, the proposed head housings shall be black. Where only selected heads are being replaced, the proposed head housing color (yellow or black) shall match existing head housings. Connecting hardware and mounting brackets shall be polycarbonate (black). A corrosion resistant anti-seize lubricant shall be applied to all metallic mounting bracket joints, and shall be visible to the inspector at the signal turn-on.

Each pedestrian signal LED module shall be fully MUTCD compliant and shall consist of double overlay message combining full LED symbols of an Upraised Hand and a Walking Person. “Egg Crate” type sun shields are not permitted. Numerals shall measure 9 in. (229mm) in height and easily identified from a distance of 120 ft (36.6m).”

Materials.

Add the following to Article 1078.02 of the Standard Specifications:

“The module shall operate in one mode: Clearance Cycle Countdown Mode Only. The countdown module shall display actual controller programmed clearance cycle and shall start counting when the flashing clearance signal turns on and shall countdown to “0” and turn off when the steady Upraised Hand (symbolizing Don’t Walk) signal turns on. The module shall not have user accessible switches or controls for modification of cycle.

At power on, the module shall enter a single automatic learning cycle. During the automatic learning cycle, the countdown display shall remain dark.

The module shall re-program itself if it detects any increase or decrease of Pedestrian Timing. The counting unit will go blank once a change is detected and then take one complete pedestrian cycle (with no counter during this cycle) to adjust its buffer timer.

If the controller preempts during the Walking Person (symbolizing Walk), the countdown will follow the controller’s directions and will adjust from Walking Person to flashing Upraised Hand. It will start to count down during the flashing Upraised Hand.

If the controller preempts during the flashing Upraised Hand, the countdown will continue to count down without interruption.

The next cycle following the preemption event shall use the correct, initially programmed values.

If the controller output displays Upraised Hand steady condition and the unit has not arrived to zero or if both the Upraised Hand and Walking Person are dark for some reason, the unit suspends any timing and the digits will go dark.

The digits will go dark for one pedestrian cycle after loss of power of more than 1.5 seconds.

The countdown numerals shall be two (2) "7 segment" digits forming the time display utilizing two rows of LEDs.

The LED module shall meet the requirements of the Institute of Transportation Engineers (ITE) LED purchase specification, "Pedestrian Traffic Control Signal Indications - Part 2: LED Pedestrian Traffic Signal Modules," or applicable successor ITE specifications, except as modified herein.

The LED modules shall provide constant light output under power. Modules with dimming capabilities shall have the option disabled or set on a non-dimming operation.

In the event of a power outage, light output from the LED modules shall cease instantaneously.

The LEDs utilized in the modules shall be AlInGaP technology for Portland Orange (Countdown Numerals and Upraised Hand) and GaN technology for Lunar White (Walking Person) indications.

The individual LEDs shall be wired such that a loss or the failure of one or more LED will not result in the loss of the entire module.

See Article 801.14 of the Standard Specifications for warranty information."

Basis of Payment.

Add the following to the first paragraph of Article 881.04 of the Standard Specifications:

"The price shall include furnishing the equipment described above, all mounting hardware, and installing them in satisfactory operating condition."

Add the following to Article 881.04 of the Standard Specifications:

"If the work consists of retrofitting an existing polycarbonate pedestrian signal head and pedestrian countdown signal head with light emitting diodes (LEDs), it will be paid for as a PEDESTRIAN SIGNAL HEAD, LED, RETROFIT, of the type specified, and of the particular kind of material, when specified. Price shall be payment in full for furnishing the equipment described above including LED modules, all mounting hardware, and installing them in satisfactory operating condition."

TRAFFIC SIGNAL BACKPLATE

Effective: May 22, 2002
Revised: March 1, 2024
882.01TS

Revise the first sentence of Article 1078.03 of the Standard Specifications to read:

“All backplates shall be louvered and made of formed ABS plastic or composite aluminum.”

Revise the first sentence of the second paragraph of Article 1078.03 of the Standard Specifications to read:

“The backplate shall be composed of one or two pieces.”

Delete the second sentence of the fourth paragraph of Article 1078.03 of the Standard Specifications.

Add the following to the fourth paragraph of Article 1078.03 of the Standard Specifications:

“When retro reflective sheeting is specified, it shall be Type ZZ sheeting according to Article 1091.03 and applied in preferred orientation for the maximum angularity according to the vendor’s recommendations. The retroreflective sheeting shall be installed under a controlled environment by the Manufacturer/Vendor before shipment to the Contractor. The formed plastic backplate shall be prepared and cleaned, following recommendations of the retroreflective sheeting Manufacturer.”

DETECTOR LOOP

Effective: May 22, 2002
Revised: March 1, 2024
886.01TS

Procedure.

A minimum of seven (7) working days prior to the Contractor cutting loops, the Contractor shall mark the proposed loop locations and contact the Area Traffic Signal Maintenance and Operations Engineer to inspect and approve the layout. When preformed detector loops are installed, the Contractor shall have them inspected and approved prior to the pouring of the Portland cement concrete surface using the same notification process as above.

Installation.

Revise Article 886.04 of the Standard Specifications to read:

“Loop detectors shall be installed according to the requirements of the “District One Standard Traffic Signal Design Details.” Saw-cuts (homeruns on preformed detector loops) from the loop to the edge of pavement shall be made perpendicular to the edge of pavement when possible in order to minimize the length of the saw-cut (homerun on preformed detector loops) unless directed otherwise by the Engineer or as shown on the plans.

The detector loop cable insulation shall be labeled with the cable specifications.

Each loop detector lead-in wire shall be labeled in the handhole using a waterproof tag secured to each wire with nylon ties.

Resistance to ground shall be a minimum of 500 mega-ohms under any conditions of weather or moisture. Inductance shall be more than 50 and less than 700 microhenries.

- (a) Type I. All loops installed in new asphalt pavement shall be installed in the binder course and not in the surface course. The edge of pavement, curb, and handhole shall be cut with a 1/4 in. (6.3 mm) deep x 4 in. (100 mm) saw cut to mark the location of each loop cable.
- (b) Loop sealant shall be two-component thixotropic chemically cured polyurethane from an approved Vendor. The sealant shall be installed 1/8 in. (3 mm) below the pavement surface. If installed above the surface, the excess shall be removed immediately.
- (c) Preformed. This work shall consist of furnishing and installing a rubberized or cross-linked polyethylene heat resistant preformed traffic signal loop in accordance with the Standard Specifications, except for the following:
 - 1. Preformed detector loops shall be installed in the sub-base under the Portland cement concrete pavement. Loop lead-ins shall be extended to a temporary protective enclosure near the proposed handhole location. The protective enclosure shall provide sufficient protection from other construction activities and may be buried for additional protection.
 - 2. Handholes shall be placed next to the shoulder or back of curb when preformed detector loops enter the handhole. CNC, included in this pay item, shall be used to protect the preformed lead-ins from back of curb to the handhole.
 - 3. Preformed detector loops shall be factory assembled with ends capped and sealed against moisture and other contaminants. The loop configurations and homerun lengths shall be assembled for the specific application. The loop and homerun shall be constructed using a minimum 5/8 in. (16 mm) outside diameter, minimum 3/8 in. (9.5 mm) inside diameter Class A oil resistant synthetic cord reinforced hydraulic hose with 250 psi (1,720 kPa) internal pressure rating or a similarly sized XLPE cable jacket. The hose for the loop and homerun assembly shall be one continuous piece. No joints or splices shall be allowed in the hose except where necessary to connect homeruns to the loops. This will provide maximum wire protection and loop system strength. Hose tee connections shall be heavy duty high temperature synthetic rubber. The tee shall be of proper size to attach directly to the hose, minimizing glue joints. The tee shall have the same flexible properties as the hose to ensure that the whole assembly can conform to pavement movement and shifting without cracking or breaking. For XLPE jacketed preformed loops, all splice connections shall be soldered, sealed, and tested before being sealed in a high impact glass impregnated plastic splice enclosure. The wire used shall be #16 THWN stranded copper. The number of turns in the loop shall be application specific. Homerun wire pairs shall be twisted a minimum of eight turns per foot. No wire splices will be allowed in the preformed loop assembly. The loop and homeruns shall be filled and sealed with a flexible sealant to ensure complete moisture blockage and further protect the wire. The preformed loops shall be constructed to allow a minimum of 6-1/2 ft of extra cable in the handhole."

Method of Measurement.

Add the following to Article 886.05 of the Standard Specifications:

"Preformed detector loops will be measured along the detector loop embedded in the pavement rather than the actual length of the wire. Detector loop measurements shall include

the saw cut and the length of the detector loop wire to the edge of pavement. The detector loop wire, including all necessary connections for proper operations, from the edge of pavement to the handhole, shall be included in the price of the detector loop. CNC, trench and backfill, and drilling of pavement or handholes shall be included in detector loop quantities."

Basis of Payment.

This work shall be paid for at the contract unit price per foot (meter) for DETECTOR LOOP, TYPE I or PREFORMED DETECTOR LOOP as specified in the plans, which price shall be payment in full for furnishing and installing the detector loop and all related connections for proper operation.

VIDEO VEHICLE DETECTION SYSTEM

Effective: January 1, 2020

Revised: March 1, 2024

886.04TS

Description.

This work shall consist of furnishing and installing a video vehicle detection system as specified and/or as shown on the plans. This pay item shall include all necessary work and equipment required to have a fully operational system including but not limited to the detector unit(s), the interface unit and all the necessary hardware, cables, and accessories required to complete the installation in accordance with the manufacturer's specifications.

The video vehicle detection system shall work under all weather conditions, including rain, freezing rain, snow, wind, dust, fog, and changes in temperature and light. It shall work in an ambient temperature range of -30°F to 165°F.

The video vehicle detection system shall be compatible with the District's approved traffic controller assemblies utilizing NEMA TS 1 or NEMA TS 2 controllers and cabinet components for full time operation. The video vehicle detection system shall provide a minimum of one interface unit that has Ethernet connectivity, surge protection and shall be capable of supporting a minimum of 2 detector units. The video vehicle detection system shall include a display and stand inside the cabinet that has a minimum 10 in. screen with a minimum 1280 x 800 resolution. The display shall be temperature rated for the cabinet environment.

The video vehicle detection system shall be one of the following systems or an approved equivalent:

- Autoscope Vision
- Iteris Vantage Next

A representative from the supplier of the video vehicle detection system shall supervise the installation and testing of the video vehicle detection system and shall be present at the traffic signal turn-on inspection. Once the video vehicle detection system is configured, it shall not need reconfiguration to maintain performance, unless the roadway configuration or the application requirements change.

The mounting location(s) of the detector unit(s) shall be per the manufacturer's recommendations. If an extension mounting assembly is needed, it shall be included in this item. All holes drilled into signal poles, mast arms, or posts shall require rubber grommets to prevent chafing of wires.

The video detection system shall be warrantied for a period of two (2) years from final inspection and shall be free from material and workmanship defects.

Basis of Payment.

This work shall be paid for at the Contract unit price each for VIDEO VEHICLE DETECTION SYSTEM, SINGLE APPROACH, the price of which shall include the cost for all of the work and material described herein and includes furnishing, installing, delivery, handling, testing, set-up and all appurtenances and mounting hardware necessary for a fully operational video vehicle detection system.

EMERGENCY VEHICLE PRIORITY SYSTEM

Effective: May 22, 2002

Revised: July 1, 2015

887.01TS

Revise Section 887 of the Standard Specifications to read:

It shall be the Contractor's responsibility to contact the municipality or fire district to verify the brand of emergency vehicle pre-emption equipment to be installed prior to the contract bidding. The equipment must be completely compatible with all components of the equipment currently in use by the Agency.

All new installations shall be equipped with Confirmation Beacons as shown on the "District One Standard Traffic Signal Design Details." The Confirmation Beacon shall consist of a 6 watt Par 38 LED flood lamp with a 30 degree light spread, or a 7 watt Par 30 LED flood lamp with a 15 degree or greater spread, maximum 7 watt energy consumption at 120V, and a 2,000 hour warranty for each direction of pre-emption. The lamp shall have an adjustable mount with a weatherproof enclosure for cable splicing. All hardware shall be cast aluminum or stainless steel. Holes drilled into signal poles, mast arms, or posts shall require rubber grommets. In order to maintain uniformity between communities, the confirmation beacons shall indicate when the control equipment receives the pre-emption signal. The pre-emption movement shall be signaled by a flashing indication at the rate specified by Section 4L.01 of the "Manual on Uniform Traffic Control Devices," and other applicable sections of future editions. The stopped pre-empted movements shall be signaled by a continuous indication.

All light operated systems shall include security and transit preemption software and operate at a uniform rate of 14.035 Hz \pm 0.002, or as otherwise required by the Engineer, and provide compatible operation with other light systems currently being operated in the District.

This item shall include any required modifications to an existing traffic signal controller as a result of the addition of the EMERGENCY VEHICLE PRIORITY SYSTEM.

Basis of Payment.

The work shall be paid for at the contract unit price each for furnishing and installing LIGHT DETECTOR and LIGHT DETECTOR AMPLIFIER. Furnishing and installing the confirmation beacon shall be included in the cost of the Light Detector. Any required modifications to the traffic signal controller shall be included in the cost of the LIGHT DETECTOR AMPLIFIER. The preemption detector amplifier shall be paid for on a basis of (1) one each per intersection controller and shall provide operation for all movements required in the pre-emption phase sequence.

RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, DETECTOR UNIT

Effective: January 1, 2002

Revised: July 1, 2015

887.02TS

This item shall consist of relocating the existing emergency vehicle priority system, detector unit (single channel or dual channel) from its existing location to a new traffic signal post or mast arm assembly and pole, and connecting it to an emergency vehicle priority system, phasing unit. If the existing Emergency Vehicle Priority System, Detector Unit Assembly includes a Confirmation Beacon, the Confirmation Beacon shall also be relocated and connected to the Emergency Vehicle Priority System, Detector Unit and shall be included at no cost in this item.

The emergency vehicle system is not to be inoperative for more than 8 hours and the Contractor must notify the Municipality or Fire Protection District 72 hours prior to the disconnection of the equipment.

Basis of Payment.

This item will be paid for at the contract unit price each for RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, DETECTOR UNIT.

ACCESSIBLE PEDESTRIAN SIGNALS

Effective: April 1, 2003

Revised: November 1, 2023

888.02TS

Description. This work shall consist of furnishing and installing accessible pedestrian signals (APS). Each APS shall consist of an interactive vibrotactile pedestrian pushbutton with speaker, an informational sign, a light emitting diode (LED) indicator light, a solid-state electronic control board, a power supply, wiring, and mounting hardware. The APS shall meet the requirements of the MUTCD and Sections 801 and 888 of the Standard Specifications, except as modified herein.

Add the following to Article 888.03 of the Standard Specifications:

A mounting bracket and/or extension shall be used to assure proper orientation and accessibility where needed. The price of the bracket and/or extension shall be included in the cost of the pedestrian push button. The contractor is not allowed to install a push-button assembly with the sign below the push-button to meet mounting requirements.

Add the following to Article 1074.02(e) of the Standard Specifications:

Stations shall be designed to be mounted to a post, mast arm pole or wood pole. The station shall be aluminum and shall accept a 3 inch round push-button assembly and a regulatory pedestrian instruction sign according to MUTCD, sign series R10-3e 9" x 15" sign with arrow(s) for a count-down pedestrian signal. Stations shall be powder coated yellow with a black pushbutton and stainless steel arrow on pushbutton.

Electrical Requirements. The APS shall operate with systems providing 95 to 130 VAC, 60 Hz and throughout an ambient air temperature range of -29 to +160 °F (-34 to +70 °C).

The APS shall contain a power protection circuit consisting of both fuse and transient protection.

Audible Indications. A pushbutton locator tone shall sound at each pushbutton and shall be deactivated during the associated walk indication and when associated traffic signals are in flashing

mode. Pushbutton locator tones shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals. Each actuation of the pushbutton shall be accompanied by the speech message "Wait". Locator tones shall be audible 6 to 12 ft from pushbutton.

If two accessible pedestrian pushbuttons are placed less than 10 ft apart or placed on the same pole, the audible walk and don't walk indication shall be a speech message. This speech message shall sound throughout the WALK interval only. Common street name shall be used and not the route number of the street unless there is no common street name. The street name used in programming shall reflect the street name mast arm mounted sign panel. Locations without street name (ex. private benefit driveways, shopping plaza entrance, etc.) shall use a general term "Commercial Driveway" as a street name for that leg. The speech message shall be modeled after: "Street Name. Walk Sign is on to cross "Street Name." For signalized intersections utilizing exclusive pedestrian phasing, the verbal message shall be "Walk sign is on for all crossings". In addition, a speech pushbutton information message shall be provided by actuating the APS pushbutton during DON'T WALK interval. This verbal message shall be modeled after: "Wait". The extended press option verbal message shall be: "Wait to cross 'Street Name' at 'Street Name'".

Railroad Preemption.

At locations with railroad interconnection APS pushbutton shall be capable of receiving a railroad preemption similar to a traffic signal controller and shall be hard wired to the railroad preemption relay inside the traffic signal cabinet. A shelf mount control unit shall be provided and installed inside the cabinet capable of receiving and transmitting the railroad preemption to all the push buttons.

At railroad intersections all APS pushbuttons shall use the speech message and shall follow the below speech models.

During Don't Walk: "Wait to cross 'Street Name' at 'Street Name', Caution, Walk time shortened when train approaches" – this does not repeat, plays only once with every push button press.

During Walk: "Walk sign is on to cross 'Street Name', – this repeats as many times as possible during Walk interval only.

During Railroad preemption: All push buttons at same time "Train Approaching" – this message shall be repeated two times.

At locations with emergency vehicle preemption, NO additional speech message shall be provided.

At locations with Equestrian Pushbuttons style installation the APS push buttons shall use speech message only and shall emit the audible message from the bottom mounted push button only.

Locations with Corner Islands or Center Medians

At locations with corner islands pushbuttons shall follow the requirement of the 10 ft as specified herein regarding the percussive tone vs a speech message. When push buttons are closer than 10 ft apart the speech message shall follow the format specified herein for the main street crossing. The speech message shall follow the below speech models for the unusual configurations.

Crossing of the right turn lane from or to Corner Island: "Wait to cross right turn lane for 'Street Name' at 'Street Name' crosswalks" and "Walk sign is on to cross right turn lane for 'Street Name' at 'Street Name' crosswalks"

Crossing from Corner Island to Corner Island where second pushbutton actuation is required: "Wait to cross 'Street Name' at 'Street Name' to median with second pushbutton" and "Walk sign is on to cross 'Street Name' to median with second pushbutton"

Center Medians on a divided highways with push buttons will require pushbutton to have a dual arrow on the pushbutton.

Where two accessible pedestrian pushbuttons are separated by 10 ft or more, the walk indication shall be an audible percussive tone. It shall repeat at 8 to 10 ticks per second with a dominant frequency of 880 Hz. Percussive tone shall be uniform at all stations at the intersection and shall not change for different directions.

Automatic volume adjustments in response to ambient traffic sound level shall be provided up to a maximum volume of 100 dBA. Locator tone and verbal messages shall be no more than 5 dB louder than ambient sound. Locator tone and speech message shall be programmed at same volume one shall not be significantly louder than the other and shall be adjusted as directed by the Engineer.

Pedestrian Pushbutton. Pedestrian pushbuttons shall be at least 2 in. (50 mm) in diameter or width. The force required to activate the pushbutton shall be no greater than 3.5 lb (15.5 N).

A red LED shall be located on or near the pushbutton which, when activated, acknowledges the pedestrians request to cross the street.

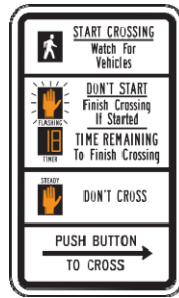
APS pushbutton systems that utilize any wireless technology including Bluetooth technology to place calls or communicate with controller will not be allow. A central master control unit shall be provided and installed in the traffic signal cabinet. Push button shall be connected directly to the master control unit in the traffic signal cabinet using only 2 wires. All pushbuttons shall be capable of placing a pedestrian call request into the controller and shall be hard wired. APS pushbuttons shall be a direct replacement of existing standard push buttons and shall be weather resistant with a minimum warranty of 5 years.

APS push buttons shall be compatible with one another and easily replaceable on future replacements or maintenance repairs no multiple model variations will be allowed.

All APS pushbuttons shall come with the messages pre-programmed for each particular intersection regardless of the location or the 10 ft separation. Final field adjustments including percussive tone vs speech message use shall be completed once push buttons are installed in the final location. All push buttons shall be programmed with the appropriate parameters and settings as directed by the Engineer. These settings shall be standard for all pushbuttons and will vary based on the manufacturer. Access to pushbutton settings shall be provided through an app either through wired, wireless, or Bluetooth connection. Pushbutton information, settings, and access instructions shall all be provided in a weatherproof pouch and safely stored inside each traffic signal cabinet.

Contractor shall remove any existing pedestrian isolation boards, field wire terminals, and any wires to the board when easily accessible. If the pedestrian isolation board has been installed from the factory on the back panel of the cabinet, contractor is to disconnect the power to the isolation board and any wires while leaving the board mounted. This work shall be included in the cost of Accessible Pedestrian Signals and will not be paid for separately.

Signage. A sign shall be located immediately above the pedestrian pushbutton and parallel to the crosswalk controlled by the pushbutton. The sign shall conform to the following standard MUTCD design: R10-3e.



R10-3E

Tactile Arrow. A tactile arrow, pointing in the direction of travel controlled by a pushbutton, shall be provided on the pushbutton.

Vibrotactile Feature. The pushbutton shall pulse when depressed and shall vibrate continuously throughout the WALK interval.

Basis of Payment. This work will be paid for at the contract unit price per each for ACCESSIBLE PEDESTRIAN SIGNALS and shall include furnishing, installation, mounting hardware including extension brackets if required, and programming of the push button.

TEMPORARY TRAFFIC SIGNAL INSTALLATION

Effective: May 22, 2002

Revised: March 1, 2024

890.01TS

Revise Section 890 of the Standard Specifications to read:

Description.

This work shall consist of furnishing, installing, maintaining, and removing a temporary traffic signal installation as shown on the plans, including but not limited to temporary signal heads, emergency vehicle priority systems, interconnect, vehicle detectors, uninterruptable power supply, and signing. When temporary traffic signals will be operating within a traffic signal system, the equipment shall be compatible with the current operating requirements of the system. For integration into an Advanced Traffic Management System (ATMS) such as Centrac, Tactics, or TransSuite, the controller shall have the latest version of approved NTCIP software installed.

General.

Only an approved controller Vendor will be allowed to assemble a temporary traffic signal and railroad traffic signal cabinet. Traffic signal inspection and TURN-ON shall be according to 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS special provision.

Construction Requirements.

- (a) Controllers. Only controllers supplied by one of the District approved Vendors will be approved for use at temporary signal locations. All controllers used for temporary traffic signals shall be fully actuated NEMA microprocessor based with RS232 data entry ports compatible with existing monitoring software approved by IDOT District 1, installed in NEMA TS2 cabinets with 8 phase back panels, capable of supplying 255 seconds of cycle length and individual phase length settings up to 99 seconds. On projects with one lane open and two-way traffic flow, such as bridge deck repairs, the temporary signal controller shall be capable of providing an adjustable all red clearance setting of up to 250 seconds

in length. All controllers used for temporary traffic signals shall meet or exceed the requirements of Section 857 of the Standard Specifications with regards to internal time base coordination and preemption. All railroad interconnected temporary controllers and cabinets shall be new and shall satisfy the requirements of Article 857.02 of the Standard Specifications and as modified herein. On projects with multiple temporary traffic signal installations, all controllers shall be the same Manufacturer brand and model number with the latest version software installed at the time of the signal TURN-ON, or as specified in the Contract.

- (b) Cabinets. Only control equipment, including controller cabinet and peripheral equipment, supplied by one of the District approved Vendors will be approved for use at temporary traffic signal locations. All control equipment for the temporary traffic signal(s) shall be furnished by the Contractor unless otherwise stated in the Contract. All temporary traffic signal cabinets shall have a closed bottom. The bottom shall be sealed along the entire perimeter of the cabinet base to ensure a water, dust, animal, and insect-proof seal. The bottom shall provide a minimum of two (2) 4 in. (100 mm) diameter holes to run the electric cables through. The 4 in. (100 mm) diameter holes shall have a bushing installed to protect the electric cables and shall be sealed after the electric cables are installed.
- (c) Grounding. Grounding shall be provided for the temporary traffic signal cabinet meeting or exceeding the applicable portions of the National Electrical Code, Section 806 of the Standard Specifications and shall meet the requirements of the "Grounding of Traffic Signal Systems" section of 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS special provision.
- (d) Traffic Signal Heads. All traffic signal sections shall be 12 in. (300 mm). Pedestrian signal sections shall be 16 in. (406mm) x 18 in. (457mm). All signal heads shall be furnished with tunnel visors unless otherwise specified in the contract. Traffic signal sections shall be Light Emitting Diode (LED) with expandable view, unless otherwise approved by the Engineer. Pedestrian signal heads shall be LED Pedestrian Countdown Signal Heads. The temporary traffic signal heads shall be placed as indicated on the temporary traffic signal plan or as directed by the Engineer. If no traffic staging is in place or will not be staged on the day of the turn on, the temporary traffic signal shall have the signal head displays, signal head placements and controller phasing match the existing traffic signal or shall be as directed by the Engineer. The Contractor shall furnish enough extra cable length to relocate heads to any position on the span wire or at locations illustrated on the plans for construction staging. The temporary traffic signal shall remain in operation during all signal head relocations. Each temporary traffic signal head shall have its own cable from the controller cabinet to the signal head.
- (e) Interconnect.
 - (1) Temporary traffic signal interconnect shall be provided using fiber optic cable or wireless interconnect technology as specified in the Contract. If the Contract specifies fiber optic cable to be used for temporary interconnect, the Contractor may request, in writing, to substitute the fiber optic temporary interconnect with a wireless interconnect. The Contractor must provide assurances that the radio device will operate properly at all times and during all construction staging. If approved for use by the Engineer, the Contractor shall submit marked-up traffic signal plans indicating locations of radios and antennas and installation details. If wireless interconnect is used, and in the opinion of the Engineer it is not viable, or if it fails during testing or operations, the Contractor

shall be responsible for installing all necessary poles, fiber optic cable, and other infrastructure for providing temporary fiber optic interconnect at no cost to the Contract.

- (2) The existing system interconnect and phone lines are to be maintained as part of the Temporary Traffic Signal Installation specified for on the plan. If the existing traffic signal has a cellular modem, the modem shall be temporarily relocated to the temporary signal. The temporary signal cabinet shall have an antenna supplied by the Contractor. Any existing network switches shall be temporarily relocated to the temporary signal. Any existing pan-tilt-zoom (PTZ) cameras shall be temporarily relocated to the temporary signal. The interconnect, including any required fiber splices and terminations, shall be installed into the temporary controller cabinet as per the notes or details on the plans. All labor and equipment required to install and maintain the existing interconnect as part of the Temporary Traffic Signal Installation shall be included in the cost of TEMPORARY TRAFFIC SIGNAL INSTALLATION. The temporary traffic signal interconnect shall maintain interconnect communications throughout the entire signal system for the duration of the project.
- (3) Temporary wireless interconnect for closed-loop systems. The radio interconnect system shall be compatible with Eagle/Yunex or Econolite controller closed loop systems. This work shall include all temporary wireless interconnect components at the adjacent existing traffic signal(s) to provide a completely operational closed loop system. This work shall include all materials, labor and testing to provide the completely operational closed loop system as shown on the plans. The radio interconnect system shall include the following components:
 - a. Rack or Shelf Mounted RS-232 Frequency Hopping Spread Spectrum (FHSS) Radio
 - b. Software for Radio Configuration (Configure Frequency and Hopping Patterns)
 - c. Antennas (Omni Directional or Yagi Directional)
 - d. Antenna Cables, LMR400, Low Loss. Maximum 100 ft from controller cabinet to antenna
 - e. Brackets, Mounting Hardware, and Accessories Required for Installation
 - f. RS232 Data Cable for Connection from the radio to the local or master controller
 - g. All other components required for a fully functional radio interconnect system

All controller cabinet modifications and other modifications to existing equipment that are required for the installation of the radio interconnect system components shall be included in the cost of TEMPORARY TRAFFIC SIGNAL INSTALLATION.

The radio interconnect system may operate at 900Mhz (902-928) or 2.4 Ghz depending on the results of a site survey. The telemetry shall have an acceptable rate of transmission errors, time outs, etc. comparable to that of a hardwire system.

The proposed or existing master controller and telemetry module shall be configured for use with the radio interconnect at a minimum rate of 9600 baud.

The radio interconnect system shall include all other components required for a complete and fully functional telemetry system and shall be installed in accordance with the Vendor's recommendations.

Temporary wireless interconnect for Advanced Traffic Management Systems. The radio interconnect system shall be compatible with an ATMS.

- (f) Emergency Vehicle Preemption. All emergency vehicle preemption equipment (light detectors, light detector amplifiers, confirmation beacons, etc.) as shown on the temporary traffic signal plans shall be provided by the Contractor. It shall be the Contractor's responsibility to contact the municipality or fire district to verify the brand of emergency vehicle preemption equipment to be installed prior to the Contract bidding. The equipment must be completely compatible with all components of the equipment currently in use by the Agency. All light operated systems shall operate at a uniform rate of 14.035 hz \pm 0.002, or as otherwise required by the Engineer, and provide compatible operation with other light systems currently being operated in the District. All labor and material required to install and maintain the Emergency Vehicle Preemption installation shall be included in the item TEMPORARY TRAFFIC SIGNAL INSTALLATION.
- (g) Vehicle Detection. All temporary traffic signal installations shall have vehicular detection installed at all approaches of the intersection and as directed by the Engineer. Video vehicle detection systems shall be approved by IDOT prior to the Contractor furnishing and installing. The Contractor shall install, wire, and adjust the alignment of the video vehicle detection system in accordance to the Manufacturer's recommendations and requirements. The Contractor shall be responsible for adjusting the alignment of the video vehicle detection system for all construction staging changes and for maintaining proper alignment throughout the project. The Vendor shall be present and assist the contractor in setting up the video vehicle detection system. An in-cabinet video monitor shall be provided with all video vehicle detection systems and shall be included in the item TEMPORARY TRAFFIC SIGNAL INSTALLATION.
- (h) Pedestrian push-buttons. Pedestrian push-buttons shall be provided for all pedestrian signal heads/phases or as directed by the Engineer. Accessible Pedestrian Signal (APS) buttons shall be installed at any location where they currently exist. All push-buttons shall be latching and have MUTCD R10-3e signs with proper arrows.
- (i) Uninterruptable Power Supply. All temporary traffic signal installations shall have an Uninterruptable Power Supply (UPS). The UPS cabinet shall be mounted to the temporary traffic signal cabinet and shall be according to the applicable portions of Section 862 of the Standard Specifications and as modified in the current District One Traffic Signal Special Provision 862.01TS UNINTERRUPTABLE POWER SUPPLY, SPECIAL.
- (j) Signs. All existing signs shall be removed from existing poles and relocated to the temporary signal. If new mast arm assembly and pole(s) and posts are specified for the permanent signals, the signs shall be relocated to the new equipment at no extra cost. Any signs that are required for the temporary traffic signal shall be provided as shown on the plans or as directed by the Engineer. Relocation, removing, bagging and installing signs for the various construction stages shall be provided as shown on the plans or as directed by the Engineer. If Illuminated Street Name Signs exist, they shall be taken down and stored by the Contractor, and the Contractor shall furnish reflectorized street name signs on the temporary traffic signal installation.

- (k) Energy Charges. The electrical utility energy charges for the operation of the temporary traffic signal installation shall be paid for by others if the installation replaces an existing signal. Otherwise, charges shall be paid for under 109.05 of the Standard Specifications.
- (l) Maintenance.
 - (1) Maintenance shall meet the requirements of the Standard Specifications and the "Maintenance and Responsibility of Traffic Signal and Flashing Beacon Installations" section of the current District One Traffic Signal Special Provision 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS.
 - (2) Maintenance of temporary signals and of the existing signals shall be included in the cost of the TEMPORARY TRAFFIC SIGNAL INSTALLATION pay item. When temporary traffic signals are to be installed at locations where existing signals are presently operating, the Contractor shall be fully responsible for the maintenance of the existing signal installation as soon as they begin any physical work on the Contract or any portion thereof.
 - (3) The temporary signal responsibility shall begin at the start of temporary signal construction and shall end with the removal of the signal as directed by the Engineer.
- (m) Temporary Traffic Signals for Bridge Projects. Temporary Traffic Signals for bridge projects shall follow the State Standards, Standard Specifications, Special Provisions and any plans for Bridge Temporary Traffic Signals included in the Contract. The installation shall meet the Standard Specifications and all other requirements in this TEMPORARY TRAFFIC SIGNAL INSTALLATION specification. In addition, all electric cable shall be aerially suspended at a minimum height of 18 ft (5.5m) on temporary wood poles (Class 5 or better) of 45 ft (13.7 m) minimum height. The signal heads shall be span wire mounted or bracket mounted to the wood pole or as directed by the Engineer. The Controller cabinet shall be mounted to the wood pole as shown in the plans, or as directed by the Engineer. A video vehicle detection system may be used in place of detector loops as approved by the Engineer or as shown in the Contract.
- (n) Temporary Portable Traffic Signal for Bridge Projects.
 - (1) The controller and cabinet shall be NEMA type designed for NEMA TS2 Type 1 operation. Controller and LED signal displays shall meet the applicable Standard Specifications and all other requirements in this TEMPORARY TRAFFIC SIGNAL INSTALLATION special provision.
 - (2) Work shall be according to Article 701.18(b) of the Standard Specifications except as noted herein.
 - (3) General.
 - a. The temporary portable bridge traffic signals shall be trailer-mounted units. The trailer-mounted units shall be set up securely and level. Each unit shall be self-contained and consist of two signal heads. The left signal head shall be mounted on a mast arm capable of extending over the travel lane. Each unit shall contain a solar cell system to facilitate battery charging. There shall be a minimum of twelve (12) days backup reserve battery supply and the units shall be capable of operating with a 120 V power supply from a generator or electrical service.

- b. All signal heads located over the travel lane shall be mounted at a minimum height of 17 ft (5 m) from the bottom of the signal back plate to the top of the road surface. All far right signal heads located outside the travel lane shall be mounted at a minimum height of 8 ft (2.5 m) from the bottom of the signal back plate to the top of the adjacent travel lane surface.
- c. The long all red intervals for the traffic signal controller shall be adjustable up to 250 seconds in one-second increments.
- d. As an alternative to detector loops, temporary portable bridge traffic signals may be equipped with other approved methods of vehicle detection and traffic actuation.
- e. All portable traffic signal units shall be interconnected using hardwire communication cable. Radio communication equipment may be used only with the approval of the Engineer. If radio communication is used, a site analysis shall be completed to ensure that there is no interference present that would affect the traffic signal operation. The radio equipment shall meet all applicable FCC requirements.
- f. The temporary portable bridge traffic signal system shall meet the physical display and operational requirements of conventional traffic signals as specified in Part IV and other applicable portions of the currently adopted version of the Manual on Uniform Traffic Control Devices (MUTCD) and the Illinois MUTCD. The signal system shall be designed to continuously operate over an ambient temperature range between -30°F (-34°C) and 120°F (48°C). When not being utilized to inform and direct traffic, portable signals shall be treated as non-operating equipment according to Article 701.11.

Basis of Payment.

This work shall be paid for at the Contract unit price each for TEMPORARY TRAFFIC SIGNAL INSTALLATION, TEMPORARY BRIDGE TRAFFIC SIGNAL INSTALLATION, or TEMPORARY PORTABLE BRIDGE TRAFFIC SIGNAL INSTALLATION, the price of which shall include all costs for the modifications required for traffic staging, changes in signal phasing as required in the Contract plans, video vehicle detection systems, any maintenance or adjustment to the video vehicle detection system, the temporary wireless interconnect system, temporary fiber optic interconnect system, all material required, the installation and complete removal of the temporary traffic signal, and any changes required by the Engineer. Each location will be paid for separately.

TEMPORARY TRAFFIC SIGNAL TIMING

Effective: May 22, 2002

Revised: March 1, 2024

890.02TS

Description.

This work shall consist of developing and maintaining appropriate traffic signal timings for the specified intersection for the duration of the temporary signalized condition, as well as impact to existing traffic signal timings caused by detours or other temporary conditions.

All timings and adjustments necessary for this work shall be performed by an approved Consultant who has previous experience in optimizing Traffic Signal Systems for District One of the Illinois Department of Transportation. The Contractor shall contact the Traffic Signal Engineer for a listing of approved Consultants.

The following tasks are associated with TEMPORARY TRAFFIC SIGNAL TIMING:

- (a) Consultant shall attend temporary traffic signal inspection (turn-on) and/or detour meeting and conduct on-site implementation of the traffic signal timings.
- (b) Consultant shall be responsible for making fine-tuning adjustments to the timings in the field to alleviate observed adverse operating conditions and to enhance operations.
- (c) Consultant shall provide monthly observation of traffic signal operations in the field.
- (d) Consultant shall provide on-site consultation and adjust timings as necessary for construction stage changes, temporary traffic signal phase changes, and any other conditions affecting timing and phasing, including lane closures, detours, and other construction activities.
- (e) Consultant shall make timing adjustments and prepare comment responses as directed by the Area Traffic Signal Maintenance and Operations Engineer.
- (f) Return original timing plan once construction is complete.

Basis of Payment.

The work shall be paid for at the Contract unit price each for TEMPORARY TRAFFIC SIGNAL TIMING, which price shall be payment in full for performing all work described herein per intersection. When the temporary traffic signal installation is turned on and/or detour implemented, 50 percent of the bid price will be paid. The remaining 50 percent of the bid price will be paid following the removal of the temporary traffic signal installation and/or detour.

REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT

Effective: May 22, 2002

Revised: March 1, 2024

895.02TS

Add the following to Article 895.05 of the Standard Specifications:

"The traffic signal equipment which is to be removed and is to become the property of the Contractor shall be disposed of outside the right-of-way at the Contractor's expense.

All equipment to be returned to the State shall be delivered by the Contractor to the State's Traffic Signal Maintenance Contractor's main facility. The Contractor shall contact the State's Electrical Maintenance Contractor to schedule an appointment to deliver the equipment. No equipment will be accepted without a prior appointment. All equipment shall be delivered within thirty (30) days of removing it from the traffic signal installation. The Contractor shall provide one hard copy and one electronic file of a list of equipment that is to remain the property of the State, including model and serial numbers, where applicable. The Contractor shall also provide a copy of the Contract plan or special provision showing the quantities and type of equipment. Controllers and peripheral equipment from the same location shall be boxed together (equipment from different locations may not be mixed) and all boxes and

controller cabinets shall be clearly marked or labeled with the location from which they were removed. If equipment is not returned according to these requirements, it will be rejected by the State's Electrical Maintenance Contractor. The Contractor shall be responsible for the condition of the traffic signal equipment from the time Contractor takes maintenance of the signal installation until **approval by the Department. A delivery receipt will be signed** by the State's Electrical Maintenance Contractor indicating the items have been returned.

The Contractor shall safely store and arrange for pick up or delivery of all equipment to be returned to agencies other than the State. The Contractor shall package the equipment and provide all necessary documentation as stated above.

Traffic signal equipment which is lost, **damaged**, or not returned to the Department for any reason shall be replaced with new equipment meeting the requirements of these Specifications at no cost to the contract."

REBUILD EXISTING HANDHOLE

Effective: January 1, 2002

Revised: November 1, 2023

895.04TS

This item shall consist of rebuilding and bringing to grade a handhole or double handhole at a location shown on the plans or as directed by the Engineer. The work shall consist of removing the handhole frame and cover and the walls of the handhole to a depth of eight (8) inches below the finished grade.

Handhole

Four (4) holes, four (4) inches in depth and one half (1/2) inch in diameter, shall be drilled into the remaining concrete; one hole centered on each of the four handhole walls. Four (4) #3 epoxy coated steel rebar, eight (8) inches in length, shall be furnished and shall be installed in the drilled holes with a masonry epoxy.

Double Handhole

Six (6) holes, four (4) inches in depth and one half (1/2) inch in diameter, shall be drilled into the remaining concrete; one hole centered on both short walls and two spaced equally on both long walls. Six (6) #3 epoxy coated steel rebar, eight (8) inches in length, shall be furnished and shall be installed in the drilled holes with a masonry epoxy.

All concrete debris shall be disposed of outside the right-of-way. All rebar must meet the specifications set forth in 1006.10.

The area adjacent to each side of the handhole shall be excavated to allow forming. All steel hooks, handhole frame, cover, and concrete shall be provided to construct a rebuilt handhole according to applicable portions of Section 814 of the Standard Specification and as modified in 814.01TS HANDHOLES Special Provision. The existing frame and cover shall be replaced if it was damaged during removal or as determined by the Engineer.

Basis of Payment.

This work shall be paid for at the contract unit price each for REBUILD EXISTING HANDHOLE, which price shall be payment in full for all labor, materials, and equipment necessary to complete the work described above and as indicated on the drawings.

RELOCATE EXISTING REMOTE-CONTROLLED VIDEO SYSTEM (SPECIAL) (LCDOT)

Effective: October 1, 2016
Revised: January 26, 2018
LC801.05

Description: This work shall consist of the removal, storage, and relocation of an existing remote-controlled video system from one traffic signal installation or light pole to another location.

General: The remote-controlled video system shall be removed and relocated as shown on the plans and/or as directed by the Traffic Engineer. Any damage sustained by the remote-controlled video system during the removal, storage, transport, and/or reinstallation operations shall be repaired or replaced in kind to the satisfaction of the Traffic Engineer at the Contractor's expense.

All holes drilled into signal poles, mast arms, or posts shall require rubber grommets to prevent the chafing of wires.

Basis of Payment: This item will be paid for at the contract unit price per each for RELOCATE EXISTING REMOTE-CONTROLLED VIDEO SYSTEM (SPECIAL). *The unit price shall include all equipment, materials and labor required to disconnect the existing remote-controlled video system; package and store it; transport it; install the complete system in the new location; and in operation to the satisfaction of the Traffic Engineer.*

RELOCATE SWITCH (LCDOT)

Effective: October 1, 2016
Revised: March 1, 2019
LC801.06

Description: This work shall consist of the removal, storage, and relocation of an existing Layer II or Layer III switch and associated power supply, from one traffic signal, ITS, or communications cabinet to another cabinet.

General: The switch shall be removed and relocated as shown on the plans and/or as directed by the Traffic Engineer. Any damage sustained by the switch during the removal, storage, transport, and/or reinstallation operations shall be repaired or replaced in kind by the County's PASSAGE Consultant to the satisfaction of the Traffic Engineer at the Contractor's expense.

Basis of Payment: This item will be paid for at the Contract unit price each for RELOCATE SWITCH. *The unit price shall include all equipment, materials and labor required to disconnect the existing switch; package and store it; transport it; install the switch in the new location; and in operation to the satisfaction of the Traffic Engineer. The unit price shall also include the all equipment, materials and labor required to disconnect the existing switch power supply and all fiber optic jumper cables; package and store them; transport them; install the power supply and all fiber optic jumper cables necessary for proper operation in the new location; and in operation to the satisfaction of the Traffic Engineer.*

UNDERGROUND CONDUIT, MULTI-DUCT, 3 WAY - 22MM (2), 1.25" SDR 11 (1) MICRODUCTS.

Effective: September 1, 2023

Revised: June 1, 2024 (Project Specific)

Description

This work shall consist of furnishing, installing, splicing, connecting, and demonstrating continuity a of fiber optic conduit (duct) system of the size specified herein and as shown on the Plans.

Materials

The conduit and fittings shall meet the requirements of Article 1088.01(c) of the Standard Specifications, except as modified herein. The conduit system shall consist of two 22mm O.D. (15.4mm I.D.) micro-ducts and one 1.66" O.D. (1.318" I.D.) duct contained inside a HDPE protective outer sheath with a minimum thickness of 0.05" inch as specified. The conduit system shall be designed for direct burial.

The overall conduit shall have a nominal 2.68" outside diameter with a supported bend radius of 28" inches, an unsupported bend radius of 46" inches, and a safe working load of 4,800 lbs.

The anticipated product life shall be a minimum of fifteen years after installation, allowing for jetting (blowing) operations for cable installations and replacements.

Conduit shall be free from holes, blisters, inclusions, cracks, or other imperfections that would affect the performance or serviceability of the product.

Conduit shall be constructed of polymeric materials, which are lightweight, flexible, corrosion resistant and nonconductive. The base material shall be clean virgin grade high-density polyethylene (HDPE), which conforms to ASTM D3350-98a, Type III, Category 5, Class B or C and Grade P- 34 per ASTM D1248-84 or equivalent.

The base HDPE material shall conform to the following minimum mechanical properties:

Description Property ASTM Standard Density D1505 0.940-0.950 g/cm³ Melt Index (E) D1238 0.10 – 0.35 g/10 Minute Environmental Stress Crack Resistance (ESCR) D1693 192.0 hrs (per ASTM D3350) Tensile @ Yield (min) D638 2500 – 3200 psi (1,700 – 2,200 N/cm²) % Elongation D638 300% Flexural Modulus (min) D790 115,000 psi (790,000 kPa) Hardness D2240 60 Shore D VICAT Softening Point D1525 248°F (120°C) Brittleness Temperature D746 -94°F (-70°C)

Micro-ducts shall be smooth on the outside and have a co-extruded permanent layer of Silicore (or approved equivalent) to provide a permanent low friction boundary layer between the microduct and the fiber optic cable for the anticipated service life of the micro-duct.

Standard available micro-duct colors shall be blue, yellow, green, brown, grey, black, and red, or other colors as approved. Micro-Ducts shall be individually colored and be sequentially numbered every two feet. Colors shall be protected from ultra-violet (UV) degradation by the incorporation of Hindered Amine Light Stabilizers (HALS) to allow for two years of outside storage UV protection. The duct material shall be compounded with antioxidant additives to prevent thermal degradation.

All micro-ducts shall have a minimum sustained air pressure of 300 PSI, and a minimum burst pressure of 475 PSI.

The microduct system shall be equipped with an integrated 20 AWG copper wire, insulated and installed inside the duct that is designed to be used for underground utility locating purposes.

Continuity of the tracer wire must be maintained at all points. Connection devices used shall be as approved by the tracer wire manufacturer, except wire nuts of any type are not acceptable and shall not be used.

The Contractor shall perform a locate or conductivity test as a part of the final documentation.

Conduit shall be supplied on 3,500 ft. reels (or larger as equipment and installation techniques permit) in order to minimize the number of conduit splices. Fittings shall be mechanical or glued splices that preserve the smooth, seamless surface on the inside of the conduit. Fittings shall be capable of developing a minimum of 75% of the rated tensile (pull) strength of the conduit.

Installation

The microduct shall be installed according to Section 810 of the Standard Specifications, in accordance with manufacturer's specifications, and as specified herein.

Fiber optic cable shall be air blown (jetted) into the microducts.

Conduit shall be buried 30" inches ($\pm 3"$) below final grade throughout its entire length. Conduit shall be installed in straight runs as much as possible with a minimum number of bends according to Section 816 of the Standard Specifications. Any bend in the conduit shall be limited to the bend radius specified herein.

The microduct system shall be sealed at all times during construction to eliminate the ingress of dirt and moisture. The Contractor shall utilize caps that are approved for use by the duct manufacturer.

The Contractor shall perform post installation testing on all micro ducts prior to installing fiber optic cable. As a minimum, tests shall include: an air test, a foam sponge test, a plastic sphere test and a pressure test. The tracer wire shall be tested per specifications prior to any fiber optic cable being installed.

Each micro-duct shall be tested for continuity by blowing a sponge and then a plastic sphere (approximately 80% of the inside duct diameter) from one end to the other and each duct shall be pressure tested in accordance with the manufacturer's procedures to ensure that the duct will pressurize and hold air pressure for a specific amount of time.

The Contractor shall perform acceptance testing of the micro-ducts in accordance with the manufacturer's recommended practices. Testing, at a minimum shall demonstrate that the micro-ducts are installed and assembled correctly, are air-tight, and have had no reduction of the interior diameter. Each micro-duct shall be pressurized to check for leaks and other problems that would prevent the installation of fiber optic cable in the future. All testing shall be performed in the presence of the Resident Engineer.

The Contractor shall submit testing information to the Department for review and approval prior to ordering material.

A cable marking tape shall be installed above the conduit system according to Article 819.05 of the Standard Specifications. The color of the tape shall be red with large black lettering which reads "WARNING – FIBER OPTIC CABLE BELOW" or similar.

In addition to the GPS documentation requirements in the General Electrical Provisions, the Contractor shall locate the microduct every 100' feet using a GIS locating device that is accurate to the nearest foot.

The Contractor shall submit catalog cut sheets for the communications duct, microducts, splice kits, and all installation and testing documents to the Department for review prior to ordering.

Method of Measurement

This work will be measured for payment in feet in place. Measurements will be made in straight lines along the centerline of the conduit between ends and changes in direction.

Vertical measurement of the duct shall be as follows:

For runs terminating at junction boxes, the vertical measurement will be made from the bottom of the trench, or horizontal raceway, to a point 18 inches beyond the center of the junction box or control cabinet.

Basis of Payment

This work will be paid for at the contract unit price per foot for UNDERGROUND CONDUIT, MULTI-DUCT, 3 WAY - 22MM (2), 1.25" SDR 11 (1) MICRODUCTS.

COMBINATION LIGHTING CONTROLLER

Effective: February 1, 2015

Revised: May 5, 2022

Description

This item shall consist of furnishing and installing a combination lighting controller complete with the panel assembly indicated on the drawings and wiring for the control of highway lighting as specified herein, shown on the Contract Drawings and as directed by the Engineer.

Materials

Photo control. The photocell shall be in accordance with Article 1068.01(e)(2) except that the size of the photocell shall allow mounting under the cabinet roof overhang.

Overcurrent Protection. Circuit breakers shall be 30A unless otherwise indicated. Circuit breakers shall be standard listed molded case, thermal-magnetic bolt-on type circuit breakers with trip free indicating handles. 120 V circuit breakers shall have a listed interrupting rating of not less than 10,000 rms symmetrical amperes at rated circuit voltage for which the breaker is applied.

Contactor. The contactor shall be a 30A, 2-Pole, 120VAC@60Hz electrically held contactor.

Hand-Off-Auto switch. 30mm. 3 position selector switch.

Panel Assembly. Threaded brass inserts shall be provided for the non-conductive inner mounting panel.

CONSTRUCTION REQUIREMENTS

General

This item shall be constructed in full accord with Section 825 of the Standard Specifications and the details as indicated in the Contract Drawings.

Basis of Payment

This work shall be paid for at the contract unit price each for COMBINATION LIGHTING CONTROLLER which price shall be payment in full for furnishing, installing, shipping, handling, tools and appurtenances necessary for a complete and operational unit as indicated on the drawings and as approved by the Engineer

RECTANGULAR RAPID FLASHING BEACON ASSEMBLY (COMPLETE)

Description: This work shall consist of furnishing and installing the Rectangular Rapid Flashing Beacon (RRFB) Assembly complete with RRFB; power supply; traffic signal post and powder coating the post; foundation; pedestrian push button; warning signs and plaques; controller and cabinet; and wireless communication equipment as shown on the plans and/or as specified by the Engineer. All equipment and hardware required to mount the RRFB and associated equipment to the assembly shall be included in the unit cost of this item.

Materials: All components shall be manufactured and assembled as a complete system and consist of the following:

Rectangular Rapid Flashing Beacon: Each RRFB assembly shall satisfy the FHWA *Manual on Uniform Traffic Control Devices, 11th Edition*, dated December 2023, including the unit size, mounting location, flash rate, and operational parameters unless modified herein by this special provision. The RRFB assembly shall be programmable to allow the Village to set the duration of the flashing beacon display based on the crossing time requirements established in the MUTCD. The Contractor shall furnish and install two direction RRFB units with far side indicator light mounted to the sign structure as indicated on the plans. The minimum size of the LED beacon shall be 7 inches x 3 inches with a minimum spacing between the two indications of at least 7 inches. The RRFB shall be able to be seen at least 1,000 feet in advance of the crossing during the day. The RRFB shall have an operating temperature meeting NEMA specifications.

Power Supply: The installation shall be solar powered power supply.

Solar Power Supply: The solar power supply shall be easy to install, fully self-contained weather, corrosion, and vandal-resistant, with a UV-resistant solar panel. The solar power supply shall be power autonomous without need of an external power supply. The batteries shall be sealed, maintenance free, and field-replaceable independently of other components. The battery pack shall have a minimum rated lifespan of three years. The power supply system shall have the capacity to operate the RRFB for 30 days at a normal use of 400 activations of 30 seconds per day without solar charging. The RRFB shall have an automatic light control to provide useful light during extreme conditions that prevent charging over an extended period of time. The manufacturer shall provide documentation for each installation consisting of solar power calculations to verify load, duty cycle and battery capacity based on location.

The solar panel shall be installed at the highest point on the assembly structure, or as directed by the Engineer, and away from the travelled way. The solar panel shall be installed at an angle specified by the manufacturer facing the equator (due south) with a full unobstructed solar exposure for optimum performance of the system, or as recommended by the manufacturer and directed by the Engineer. If batteries are to be installed in a separate cabinet, the cabinet shall be a minimum of seven feet above the ground and located on the post as to be not over the sidewalk, bike path or trail.

Controller: The RRFB controller shall meet the requirements of Section 858 of the "Standard Specifications" except where modified herein:

- A. Power Options: The controller unit shall be solar-powered.
- B. Controller to Controller Communication: At each location all installed RRFB assemblies shall communicate wirelessly using an unlicensed radio band so as to simultaneously commence operation of their alternating rapid flashing indications and cease operation simultaneously. The communication equipment shall comply with FCC requirements and the vendor representative shall field test the equipment prior to placing the units in operation to demonstrate the RRFBs ability to achieve proper operation under the requirements of FHWA Memorandum IA-21 and all subsequent interpretation letters. Up to 10 optional RF channels shall be available to allow multiple RRFB Systems to operate within close proximity of each other.
- C. Timing: The controller shall provide the full programmed timing upon all push button activations.

Traffic Signal Post: The traffic signal post shall be stainless steel meeting the requirements of Section 875 of the "Standard Specifications". Post shall be powder coated with black finish.

Foundation: The traffic signal post foundation may be either concrete or metal.

- A. Concrete Foundation: If used the concrete foundation shall meet the requirements of Section 878 of the "Standard Specifications".
- B. Light Pole Foundation Metal: If used the metal foundation shall meet the requirements of Section 836 of the "Standard Specifications".

Pedestrian Push Button: The pedestrian push button shall meet the requirements of the "Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way" adopted September 7, 2023 and Sections 801 and 888 of the Standard Specifications except as modified herein. Each pedestrian pushbutton shall include a speaker, an informational sign, a light emitting diode (LED) indicator light, a solid state electronic control board, a power supply, wiring, and mounting hardware.

Electrical Requirements. The APS shall operate with systems providing 95 to 130 VAC, 60 Hz and throughout an ambient air temperature range of -29 to +160 °F (-34 to +70 °C).

The APS shall contain a power protection circuit consisting of both fuse and transient protection.

Audible Indications. A pushbutton locator tone shall sound at each pushbutton. Pushbutton

locator tones shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals.

Each actuation of the pushbutton shall be accompanied by the speech message "Warning lights are flashing". The message shall be spoken twice. There shall be no percussive indication.

Automatic volume adjustments in response to ambient traffic sound level shall be provided up to a maximum volume of 100 dBA. Locator tone and verbal messages shall be no more than 5 dB louder than ambient sound.

Pedestrian Pushbutton. Pedestrian pushbuttons shall be at least 2 in. (50 mm) in diameter or width. The force required to activate the pushbutton shall be no greater than 3.5 lb (15.5 N).

Signage. A sign shall be located immediately above the pedestrian pushbutton and parallel to the crosswalk controlled by the pushbutton. The sign shall be standard MUTCD design R10-25.

Tactile Arrow. A tactile arrow, pointing in the direction of travel controlled by a pushbutton, shall be provided either on the pushbutton or its sign. There shall be no vibrotactile indication.

Beacon Flashing Requirements: RRFBs shall provide 75 flashing sequences per minute. During each 800-millisecond flashing sequence, the left and right RRFB indications shall operate using the following sequence:

- A. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- B. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- C. The RRFB indication on the left-hand side shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- D. The RRFB indication on the right-hand side shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- E. Both RRFB indications shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 50 milliseconds.
- F. Both RRFB indications shall be illuminated for approximately 50 milliseconds. Both RRFB indications shall be dark for approximately 250 milliseconds.

The flash rate of each individual RRFB indication, as applied over the full flashing sequence, shall not be between 5 and 30 flashes per second to avoid frequencies that might cause seizures. The RRFB shall be rated for Class I light intensity output according to the Society of Automotive Engineers (SAE) Standard J595 with a 15 year life expectancy. During the night time hours, the RRFB shall be equipped with an automatic dimming feature.

Signs: Each RRFB assembly shall include two crossing signs (W11-2) 30 inch x 30 inch dimension, two diagonal downward pointing arrow (W16-7P) plaques 21 inch x 15 inch dimension, mounted back-to-back and a R10-25 9 inch x 12 inch dimension, mounted as part of or above the pedestrian push button. The W-series sign panels shall be manufactured with fluorescent yellow green type ZZ sheeting meeting the requirements of Section 1091 of the "Standard Specifications". The R-series signs shall be manufactured with type AP sheeting meeting the requirements of Section 1091 of the "Standard Specifications" and shall be vandal resistant. All signs shall meet the latest requirements of the MUTCD.

Warranty: All materials shall be warranted for three years from date of acceptance or turn on.

Installation: The RRFB Assembly (Complete) shall be installed strictly according to the manufacturer's recommendations, the applicable portions of the "Standard Specifications" as modified herein, as shown on the Plans, and/or as directed by the Engineer.

The final elevation and location of the beacons shall be approved by the Engineer prior to the Contractor beginning work.

Basis of Payment: This work will be paid at the contract unit price for each RECTANGULAR RAPID FLASHING BEACON ASSEMBLY (COMPLETE). The unit price shall include all labor, equipment, materials and documentation required to furnish and install the RRFB assembly complete with power supply; traffic signal post and powder coating the post; foundation; pedestrian push button; warning signs and plaques; controller and cabinet; wireless communication equipment; and mounting hardware.

RELOCATE EXISTING WIRELESS TRANSMISSION SYSTEM POINT TO POINT (LCDOT)

Description: This work shall consist of the removal, storage, and relocation of an existing wireless transmission system point to point unit from one traffic signal installation to another traffic signal installation. The work includes removing and reinstalling the directional antenna; associated cables and/or wiring; and all mounting hardware.

General: The wireless transmission system point to point unit shall be removed and relocated as shown on the plans. Any damage sustained to the wireless transmission system point to point unit during removal, storage, transport, and/or reinstallation operations shall be repaired or replaced in kind to the satisfaction of the Engineer at the Contractors expense.

All components of this item shall be installed as high as possible on the mast arm assembly pole, camera pole or wood pole as shown on the plans and/or as directed by the LCDOT Traffic Engineer. The system shall not be installed on the mast arm or luminaire arm unless directed to do so by the LCDOT Traffic Engineer. In the event existing equipment precludes the highest mounting location, the Contractor shall contact the LCDOT Traffic Engineer before moving any existing equipment to confirm the preferred mounting location.

The antenna shall be aimed at another antenna on the County's wireless system, (e.g. aimed at corresponding antenna at another intersection), as shown on the plans and/or as directed by the Traffic Engineer. A representative of the County's PASSAGE Consultant shall be present during the aiming of the antenna to assess the link performance and direct any necessary adjustments in mounting and/or aiming the antenna.

All holes drilled into signal poles, mast arms, or posts shall require rubber grommets to prevent the chafing of wires.

Basis of Payment: This item will be paid for at the contract unit price per each for RELOCATE WIRELESS TRANSMISSION SYSTEM POINT TO POINT. *The unit price shall include all equipment, materials, and labor required to remove, store and reinstall the antenna, placing the system in operation to the satisfaction of the LCDOT Traffic Engineer. The unit price shall also include all equipment, materials and labor required to remove and reinstall all associated connectors; cables; hardware; other peripheral equipment; and all programming and field support by the County's PASSAGE Consultant.*

WIRELESS TRANSMISSION SYSTEM SUBSCRIBER UNIT (LCDOT)

Description: This work shall consist of the installation of a new temporary node on the Lake County PASSAGE wireless network. The work includes furnishing and installing the directional antenna and power injector; associated cables and/or wiring; and all mounting hardware. Once the proposed interconnect system is operational, this equipment shall be removed by the Contractor and delivered to the County.

Materials: The Wireless Transmission System Subscriber Unit includes:

- One Proxim Tsunami MP 8250 Subscriber unit with Integrated 23dBi Antenna (Model MP-8250-SUR-US).
- Two Proxim Model 76394 surge suppressors.
- Power wiring from the radio power injector to the circuit breaker.
- All mounting hardware.

The Wireless Transmission System Subscriber Unit electronics shall be procured from the County's PASSAGE Consultant. The PASSAGE Consultant shall program this equipment for the appropriate location in the County's communication network.

General: The power injector and one surge suppressor shall be installed in the signal cabinet as directed by the Traffic Engineer. All remaining mounted components of this item shall be installed as high as possible on the mast arm assembly pole or camera pole as shown on the plans and/or as directed by the Traffic Engineer. The system shall not be installed on the mast arm or luminaire arm unless directed to do so by the Traffic Engineer. In the event existing equipment precludes the highest mounting location, the Contractor shall contact the Traffic Engineer before moving any existing equipment to confirm the preferred mounting location.

The antenna shall be aimed at another antenna on the County's wireless system, (e.g. aimed at corresponding antenna at another intersection), as shown on the plans and/or as directed by the Traffic Engineer. A representative of the County's PASSAGE Consultant shall be present during the aiming of the antenna to assess the link performance and direct any necessary adjustments in mounting and/or aiming the antenna. .

All holes drilled into signal poles, mast arms, or posts shall require rubber grommets to prevent the chafing of wires.

Basis of Payment: This item will be paid for at the contract unit price per each for WIRELESS TRANSMISSION SYSTEM SUBSCRIBER UNIT. *The unit price shall include all equipment, materials, and labor required to furnish and install the antenna and power injector, placing the system in operation to the satisfaction of the Traffic Engineer. The unit price shall also include all equipment, materials and labor required to furnish and install all associated connectors; cables; hardware; other peripheral equipment; and all programming and field support by the County's PASSAGE Consultant. The OUTDOOR RATED NETWORK CABLE from the antenna to the traffic signal cabinet or switch location shall also be included and shall not be paid for separately.*

FLASHING BEACON INSTALLATION, RELOCATION AND REMOVAL

Effective: January 1, 2007

Revised: March 1, 2024

880.02TS

This work shall consist of furnishing and installing a new flashing beacon installation, solar powered flashing beacon installation, relocation of existing flashing beacon, and/or the removal of the existing flashing beacon installation as shown on the plans and as described herein. The energy charges for the operation of the flashing beacon installation shall be paid for by the Department unless otherwise directed by the Engineer.

The installation, relocation and removal of flashing beacon installations shall be according to the applicable portions of Sections 800 and 1000 of the Standard Specifications for Road and Bridge Construction and District 1 Flashing Beacon Installation Details except as revised herein. LED signal heads shall be as modified in 880.01TS LED SIGNAL HEAD AND OPTICALLY PROGRAMMED LED SIGNAL HEAD Special Provision.

- (a) Flashing Beacon Installation. This item shall consist of installing a post mounted 12 in. (300 mm) LED single section red or yellow flashing beacon on a new or existing post as shown on the plans or as directed by the Engineer. This item shall include furnishing and installing a flasher controller in an aluminum cabinet, or integrated within the signal head, 12 in. (300 mm) LED red or yellow signal section with a dimmer if required by the Engineer, and all other hardware necessary to complete the installation.
- (b) Solar Powered Flashing Beacon Installation. This item shall consist of installation of a solar powered flashing beacon, post mounted as shown on the plans or as directed by the Engineer. This item shall consist of furnishing and installing a 12 in. (300 mm) single red or yellow flashing module on a new or existing post as shown on the plans or as directed by the Engineer. This item shall include furnishing and installing a flasher controller that is integrated within the signal head, with discrete solar panels, LED module, battery, electronics, compact housing and be capable of operating 24 hours, 7 days a week. The flasher unit shall be installed on a standard wood or metal post. The flash pattern shall be MUTCD compliant and have alternate flash patterns available. The battery shall have a life span of a minimum of five (5) years and be field replaceable. The battery and electronics may be located inside the solar panel housing or signal head. The sections of the flasher unit shall be secured with tamper resistant stainless steel hardware. Unless otherwise noted, the housing shall be black in color.
- (c) Relocate Existing Flashing Beacon. Relocation of an existing flashing beacon installation, as shown on the plans or as directed by the Engineer, shall meet the above requirements. This work shall include the complete relocation of the existing flashing beacon installation, the backfilling of the holes created by the removal of the poles, and restoration of the surface to match the adjoining area.
- (d) Remove Existing Flashing Beacon Installation Complete. Removal of an existing flashing beacon installation shall be as shown on the plans or as directed by the Engineer and shall be according to applicable portions of Section 895 of the Standard Specifications. This work shall include a complete removal of an existing flashing beacon installation, backfilling of the holes created by the removal of the poles and restoration of the surface to match the adjoining area. The flashing beacon installation will be removed only after the permanent signal installation is accepted for maintenance, or as directed by the Engineer.

Basis of Payment.

This work shall be paid for at the Contract unit price each for FLASHING BEACON INSTALLATION; SOLAR POWERED FLASHING BEACON INSTALLATION; RELOCATE EXISTING FLASHING

BEACON or REMOVE EXISTING FLASHING BEACON INSTALLATION COMPLETE. The price shall be payment in full for all labor and material necessary to complete the work described above.

TEMPORARY FLASHING BEACON INSTALLATION

This work shall consist of furnishing and installing, relocating and removing a temporary solar powered flashing beacon installation as shown on the plans and as described herein.

The installation, relocation and removal of flashing beacon installation shall be according to the applicable portions of Sections 800 and 1000 of the Standard Specifications for Road and Bridge Construction and District 1 Flashing Beacon Installation Details except as revised herein. LED signal heads shall be as modified in 880.01TS LED SIGNAL HEAD AND OPTICALLY PROGRAMMED LED SIGNAL HEAD Special Provision.

This item shall consist of the installation of a temporary solar powered flashing beacon, post mounted as shown on the plans or as directed by the Engineer. This item shall consist of furnishing and installing a 12 in. (300 mm) single yellow flashing module on a new post as shown on the plans or as directed by the Engineer. This item shall include furnishing and installing a flasher controller that is integrated within the signal head, with discrete solar panels, LED module, battery, electronics, compact housing and be capable of operating 24 hours, 7 days a week. The flasher unit shall be installed on a standard wood or metal post. The flash pattern shall be MUTCD compliant and have alternate flash patterns available. The battery shall have a life span of a minimum of five (5) years and be field replaceable. The battery and electronics may be located inside the solar panel housing or signal head. The sections of the flasher unit shall be secured with tamper resistant stainless steel hardware. Unless otherwise noted, the housing shall be black in color.

The temporary solar powered flashing beacon installation shall be relocated throughout construction as needed, or as directed by the Engineer. This work shall include the complete relocation of the existing flashing beacon installation, the backfilling of the holes created by the removal of the poles, and restoration of the surface to match the adjoining area. If the flashing beacon installation must be removed due to construction activities and will not be immediately relocated to a new area, then it shall be safely stored by the Contractor until it is reinstalled.

Upon completion the temporary solar powered flashing beacon shall be removed, including backfilling of the holes created by the removal of the poles and restoration of the surface to match the adjoining area. The temporary flashing beacon installation will be removed only after the relocated flashing beacon is accepted for maintenance, or as directed by the Engineer.

Basis of Payment.

This work shall be paid for at the Contract unit price each for TEMPORARY FLASHING BEACON INSTALLATION. The price shall be payment in full for all labor and material necessary to complete the work described above.

GENERAL ELECTRICAL REQUIREMENTS

This special provision replaces Articles 801.01 – 801.07, 801.09 – 801-16 of the Standard Specifications.

Definition. Codes, standards, and industry specifications cited for electrical work shall be by definition the latest adopted version thereof, unless indicated otherwise.

Materials by definition shall include electrical equipment, fittings, devices, motors, appliances, fixtures, apparatus, all hardware and appurtenances, and the like, used as part of, or in connection with, electrical installation.

Standards of Installation. Materials shall be installed according to the manufacturer's recommendations, the NEC, OSHA, the NESC, and AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

All like materials shall be from the same manufacturer. Listed and labeled materials shall be used whenever possible. The listing shall be according to UL or an approved equivalent.

Safety and Protection. Safety and protection requirements shall be as follows.

Safety. Electrical systems shall not be left in an exposed or otherwise hazardous condition. All electrical boxes, cabinets, pole handholes, etc. which contain wiring, either energized or non-energized, shall be closed or shall have covers in place and be locked when possible, during nonworking hours.

Protection. Electrical raceway or duct openings shall be capped or otherwise sealed from the entrance of water and dirt. Wiring shall be protected from mechanical injury.

Equipment Grounding Conductor. All electrical systems, materials, and appurtenances shall be grounded. Good ground continuity throughout the electrical system shall be assured, even though every detail of the requirements is not specified or shown. Electrical circuits shall have a continuous insulated equipment grounding conductor. When metallic conduit is used, it shall be bonded to the equipment grounding conductor, but shall not be used as the equipment grounding conductor.

Detector loop lead-in circuits, circuits under 50 volts, and runs of fiber optic cable will not require an equipment grounding conductor.

Where connections are made to painted surfaces, the paint shall be scraped to fully expose metal at the connection point. After the connection is completed, the paint system shall be repaired to the satisfaction of the Engineer.

Bonding of all boxes and other metallic enclosures throughout the wiring system to the equipment grounding conductor shall be made using a splice and pigtail connection. Mechanical connectors shall have a serrated washer at the contact surface.

All connections to structural steel or fencing shall be made with exothermic welds. Care shall be taken not to weaken load carrying members. Where connections are made to epoxy coated reinforcing steel, the epoxy coating shall be sufficiently removed to facilitate a mechanical connection. The epoxy coating shall be repaired to the satisfaction of the Engineer. Where connections are made to insulated conductors, the connection shall be wrapped with at least four layers of electrical tape extended 6 in. (150 mm) onto the conductor insulation.

Submittals. At the preconstruction meeting, the Contractor shall submit a written listing of manufacturers for all major electrical and mechanical items. The list of manufacturers shall be binding, except by written request from the Contractor and approval by the Engineer. The request shall include acceptable reasons and documentation for the change.

Major items shall include, but not limited to the following:

Type of Work (discipline)	Item
All Electrical Work	Electric Service Metering Emergency Standby System Transformers Cable Unit Duct Splices Conduit Surge Suppression System
Lighting	Tower Pole Luminaire Foundation Breakaway Device Controllers Control Cabinet and Peripherals
ITS	Controller Cabinet and Peripherals CCTV Cameras Camera Structures Ethernet Switches Detectors Detector Loop Fiber Optic Cable

Within 30 calendar days after contract execution, the Contractor shall submit, for approval, one copy each of the manufacturer's product data (for standard products and components) and detailed shop drawings (for fabricated items). Submittals for the materials for each individual pay item shall be complete in every respect. Submittals which include multiple pay items shall have all submittal material for each item or group of items covered by a particular specification, grouped together and the applicable pay item identified. Various submittals shall, when taken together, form a complete coordinated package. A partial submittal will be returned without review unless prior written permission is obtained from the Engineer.

The submittal shall be properly identified by route, section, county, and contract number.

The Contractor shall have reviewed the submittal material and affixed his/her stamp of approval, with date and signature, for each individual item. In case of subcontractor submittal, both the subcontractor and the Contractor shall review, sign, and stamp their approval on the submittal.

Illegible print, incompleteness, inaccuracy, or lack of coordination will be grounds for rejection.

Items from multiple disciplines shall not be combined on a single submittal and transmittal. Items for lighting, signals, surveillance and CCTV must be in separate submittals since they may be reviewed by various personnel in various locations.

The Engineer will review the submittals for conformance with the design concept of the project according to Article 105.04 and the following. The Engineer will stamp the drawings indicating their status as "Approved", "Approved as Noted", "Disapproved", or "Information Only". Since the Engineer's review is for conformance with the design concept only, it shall be the Contractor's

responsibility to coordinate the various items into a working system as specified. The Contractor shall not be relieved from responsibility for errors or omissions in the shop, working, or layout drawings by the Engineer's approval thereof. The Contractor shall still be in full compliance with contract and specification requirements.

All submitted items reviewed and marked "Disapproved" or "Approved as Noted" shall be resubmitted by the Contractor in their entirety, unless otherwise indicated within the submittal comments.

Work shall not begin until the Engineer has approved the submittal. Material installed prior to approval by the Engineer, will be subject to removal and replacement at no additional cost to the County.

Unless otherwise approved by the Engineer, all of the above items shall be submitted to the Engineer at the same time. Each item shall be properly identified by route, section, and contract number.

Certifications. When certifications are specified and are available prior to material manufacture, the certification shall be included in the submittal information. When specified and only available after manufacture, the submittal shall include a statement of intent to furnish certification. All certificates shall be complete with all appropriate test dates and data.

Authorized Project Delay. See Article 801.08

Maintenance and Responsibility During Construction.

Lighting Operation and Maintenance Responsibility. The scope of work shall include the assumption of responsibility for the continuing operation and maintenance of the existing, proposed, temporary, sign and navigation lighting, or other lighting systems and all appurtenances affected by the work as specified elsewhere herein. Maintenance of lighting systems is specified elsewhere and will be paid for separately

The proposed lighting system must be operational prior to opening the roadway to traffic unless temporary lighting exists which is designed and installed to properly illuminate the roadway.

Energy and Demand Charges. The payment of basic energy and demand charges by the electric utility for existing lighting which remains in service will continue as a responsibility of the Owner, unless otherwise indicated. Unless otherwise indicated or required by the Engineer duplicate lighting systems (such as temporary lighting and proposed new lighting) shall not be operated simultaneously at the Owner's expense and lighting systems shall not be kept in operation during long daytime periods at the Owner's expense. Upon written authorization from the Engineer to place a proposed new lighting system in service, whether the system has passed final acceptance or not, (such as to allow temporary lighting to be removed), the Owner will accept responsibility for energy and demand charges for such lighting, effective the date of authorization. All other energy and demand payments to the utility shall be the responsibility of the Contractor until final acceptance.

Marking Proposed Locations for Highway Lighting System. The Contractor shall mark or stake the proposed locations of all poles, cabinets, junction boxes, pull boxes, handholes, cable routes, pavement crossings, and other items pertinent to the work. A proposed location inspection by the Engineer shall be requested prior to any excavation, construction, or installation work after all proposed installation locations are marked. Any work installed without location approval is subject to corrective action at no additional cost to the County.

Inspection of electrical work. Inspection of electrical work shall be according to Article 105.12 and the following.

Before any splice, tap, or electrical connection is covered in handholes, junction boxes, light poles, or other enclosures, the Contractor shall notify and make available such wiring for the Engineer's inspection.

Testing. Before final inspection, the electrical work shall be tested. Tests may be made progressively as parts of the work are completed, or may be made when the work is complete. Tests shall be made in the presence of the Engineer. Items which fail to test satisfactorily shall be repaired or replaced. Tests shall include checks of control operation, system voltages, cable insulation, and ground resistance and continuity.

The forms for recording test readings will be available from the Engineer in electronic format. The Contractor shall provide the Engineer with a written report of all test data including the following:

- Voltage Tests
- Amperage Tests
- Insulation Resistance Tests
- Continuity tests
- Detector Loop Tests

Lighting systems. The following tests shall be made.

- (1) Voltage Measurements. Voltages in the cabinet from phase to phase and phase to neutral, at no load and at full load, shall be measured and recorded. Voltage readings at the last termination of each circuit shall be measured and recorded.
- (2) Insulation Resistance. Insulation resistance to ground of each circuit at the cabinet, with all loads connected, shall be measured and recorded.

On tests of new cable runs, the readings shall exceed 50 megohms for phase and neutral conductors with a connected load over 20 A, and shall exceed 100 megohms for conductors with a connected load of 20 A or less.

On tests of cable runs which include cables which were existing in service prior to this contract, the resistance readings shall be the same or better than the readings recorded at the maintenance transfer at the beginning of the contract. Measurements shall be taken with a megohm meter approved by the Engineer.

- (3) Loads. The current of each circuit, phase main, and neutral shall be measured and recorded. The Engineer may direct reasonable circuit rearrangement. The current readings shall be within ten percent of the connected load based on material ratings.
- (4) Ground Continuity. Resistance of the system ground as taken from the farthest extension of each circuit run from the controller (i.e. check of equipment ground continuity for each circuit) shall be measured and recorded. Readings shall not exceed 2.0 ohms, regardless of the length of the circuit.
- (5) Resistance of Grounding Electrodes. Resistance to ground of all grounding electrodes shall be measured and recorded. Measurements shall be made with a ground tester

during dry soil conditions as approved by the Engineer. Resistance to ground shall not exceed 10 ohms.

All test results shall be furnished to the Engineer seven working days before the date the inspection is scheduled.

Contract Guarantee. The Contractor shall provide a written guarantee for all electrical work provided under the contract for a period of six months after the date of acceptance with the following warranties and guarantees.

- (a) The manufacturer's standard written warranty for each piece of electrical material or apparatus furnished under the contract. The warranty for light emitting diode (LED) modules, including the maintained minimum luminance, shall cover a minimum of 60 months from the date of delivery.
- (b) The Contractor's written guarantee that, for a period of six months after the date of final acceptance of the work, all necessary repairs to or replacement of said warranted material or apparatus for reasons not proven to have been caused by negligence on the part of the user or acts of a third party shall be made by the Contractor at no additional cost to the County.
- (c) The Contractor's written guarantee for satisfactory operation of all electrical systems furnished and constructed under the contract for a period of six months after final acceptance of the work.

Record Drawings. Alterations and additions to the electrical installation made during the execution of the work shall be neatly and plainly marked in red by the Contractor on the full-size set of record drawings kept at the Engineer's field office for the project. These drawings shall be updated on a daily basis and shall be available for inspection by the Engineer during the course of the work. The record drawings shall include the following:

- Cover Sheet
- Summary of Quantities, electrical items only
- Legends, Schedules and Notes
- Plan Sheet
- Pertinent Details
- Single Line Diagram
- Other useful information useful to locate and maintain the systems.

Any modifications to the details shall be indicated. Final quantities used shall be indicated on the Summary of Quantities. Foundation depths used shall also be listed.

As part of the record drawings, the Contractor shall inventory all materials, new or existing, on the project and record information on inventory sheets provided by the Engineer.

The inventory shall include:

- Location of Equipment, including rack, chassis, slot as applicable.
- Designation of Equipment
- Equipment manufacturer
- Equipment model number
- Equipment Version Number

- Equipment Configuration
 - Addressing, IP or other
 - Settings, hardware or programmed
- Equipment Serial Number

When the work is complete, and seven days before the request for a final inspection, the set of contract drawings, stamped "**RECORD DRAWINGS**", shall be submitted to the Engineer for review and approval and shall be stamped with the date and the signature of the Contractor's supervising Engineer or electrician. The record drawings shall be submitted in PDF format on CDROM as well as hardcopy's for review and approval.

In addition to the record drawings, PDF copies of the final catalog cuts which have been Approved and Approved as Noted with applicable follow-up shall be submitted along with the record drawings. The PDF files shall clearly indicate either by filename or PDF table of contents the respective pay item number. Specific part or model numbers of items which have been selected shall be clearly visible. Hard copies of the catalog are not required with this submittal.

The Contractor shall provide two sets of electronically produced drawings in a moisture proof pouch to be kept on the inside door of the controller cabinet or other location approved by the Engineer. These drawings shall show the final as-built circuit orientation(s) of the project in the form of a single line diagram with all luminaires numbered and clearly identified for each circuit.

Final documentation shall be submitted as a complete submittal package, i.e. record drawings, test results, inventory, etc. shall be submitted at the same time. Partial piecemeal submittals will be rejected without review. A total of five hardcopies and CDROMs of the final documentation shall be submitted.

GPS Documentation. In addition to the specified record drawings, the Contactor shall record GPS coordinates of the following electrical components being installed, modified or being affected in other ways by this contract:

- All light poles and light towers.
- Handholes and vaults.
- Junction Boxes
- Conduit roadway crossings.
- Controllers.
- Structures with electrical connections, i.e. DMS, lighted signs.
- Electric Service locations.
- CCTV Camera installations.
- Roadway Surveillance installations.

Datum to be used shall be North American 1983.

Data shall be provided electronically and in print form. The electronic format shall be compatible with MS Excel. Latitude and Longitude shall be in decimal degrees with a minimum of 6 decimal places. Each coordinate shall have the following information:

1. District
2. Description of item
3. Designation
4. Use
5. Approximate station

6. Contract Number
7. Date
8. Owner
9. Latitude
10. Longitude
11. Comments

Prior to the collection of data, the contractor shall provide a sample data collection of at least six data points of known locations to be reviewed and verified by the Engineer to be accurate within 20 feet. Upon verification, data collection can begin. Data collection can be made as construction progresses, or can be collected after all items are installed. If the data is unacceptable the contractor shall make corrections to the data collection equipment and or process and submit the data for review and approval as specified. **Data collection prior to the submittal and review of the sample data of existing data points will be unacceptable and rejected.**

Accuracy. Data collected is to be mapping grade. A handheld mapping grade GPS device shall be used for the data collection. The receiver shall support differential correction and data shall have minimum 5 meter accuracy after post processing.

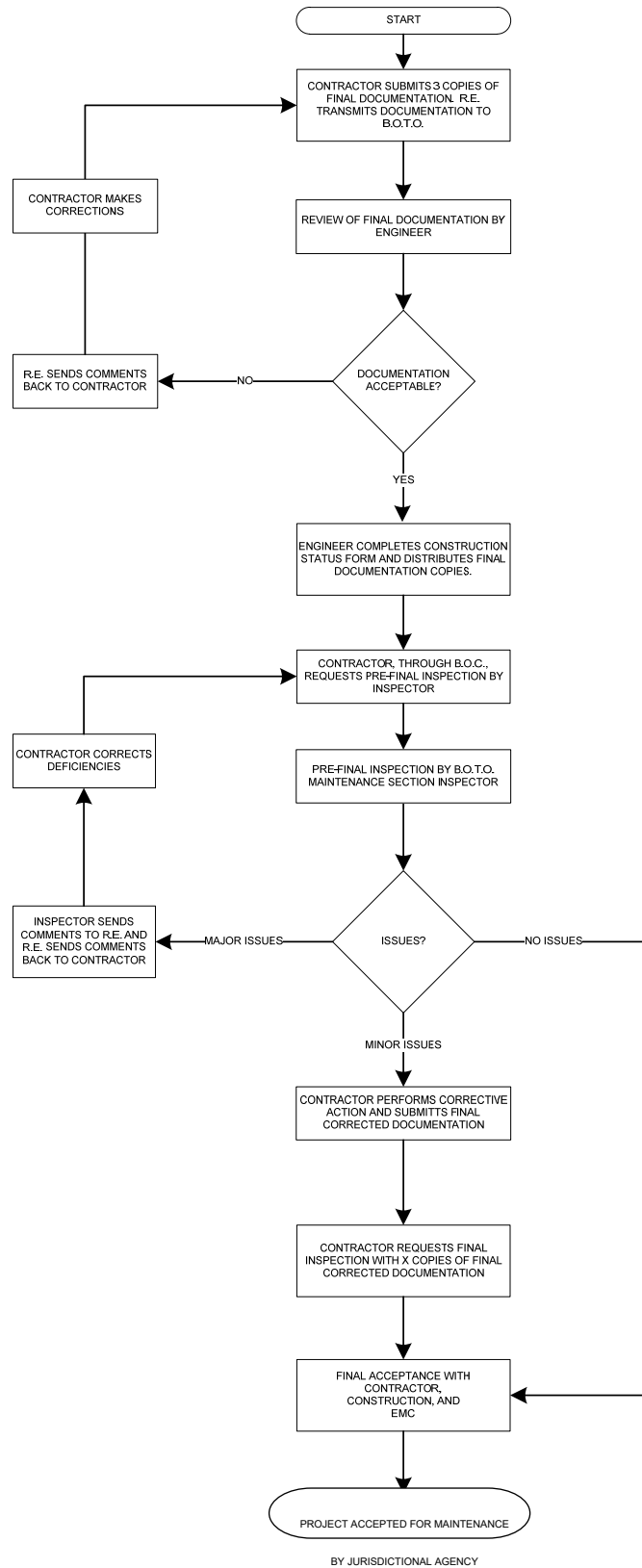
GPS receivers integrated into cellular communication devices, recreational and automotive GPS devices are not acceptable.

The GPS shall be the product of an established major GPS manufacturer having been in the business for a minimum of 6 years."

Acceptance. Acceptance of electrical work will be given at the time when the County assumes the responsibility to protect and maintain the work according to Article 107.30 or at the time of final inspection.

When the electrical work is complete, tested, and fully operational, the Contractor shall schedule an inspection for acceptance with the Engineer no less than seven working days prior to the desired inspection date. The Contractor shall furnish the necessary labor and equipment to make the inspection.

A written record of the test readings taken by the Contractor according to Article 801.13 shall be furnished to the Engineer seven working days before the date the inspection is scheduled. Inspection will not be made until after the delivery of acceptable record drawings, specified certifications, and the required guarantees.



Final Acceptance Documentation Checklist

LOCATION	
Route	Common Name
Limits	Section
Contract #	County
Controller Designation(s)	EMC Database Location Number(s)

ITEM	Contractor (Verify)	Resident Engineer (Verify)
Record Drawings		
-Four hardcopies (11" x 17")	<input type="checkbox"/>	<input type="checkbox"/>
-Scanned to two CD-ROMs	<input type="checkbox"/>	<input type="checkbox"/>
Field Inspection Tests		
-Voltage	<input type="checkbox"/>	<input type="checkbox"/>
-Amperage	<input type="checkbox"/>	<input type="checkbox"/>
-Cable Insulation Resistance	<input type="checkbox"/>	<input type="checkbox"/>
-Continuity	<input type="checkbox"/>	<input type="checkbox"/>
-Controller Ground Rod Resistance	<input type="checkbox"/>	<input type="checkbox"/>
(Four Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
GPS Coordinates		
-Excel file	<input type="checkbox"/>	<input type="checkbox"/>
(Check Special Provisions, Excel file scanned to two CD's)		
Job Warranty Letter		
(Four Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Catalog Cut Submittals		
-Approved & Approved as Noted	<input type="checkbox"/>	<input type="checkbox"/>
(Scanned to two CD's)		
Lighting Inventory Form		
(Four Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Lighting Controller Inventory Form		
(Four Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Light Tower Inspection Form		
(If applicable, Four Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>

Four Hardcopies & scanned to two CD's shall be submitted for all items above. The CD ROM shall be labeled as shown in the example contained herein.

General Notes:

Record Drawings – The record drawings should contain contract cover sheet, summary of quantities showing all lighting pay item sheets, proposed lighting plans and lighting detail sheets. Submit hardcopies 11 x 17 size. Include the original “red-ink” copy. The red-ink markup should be neatly drawn. Record drawings copies should be legible. Blurred copies will not be acceptable. Temporary lighting plans and removal lighting plans should not be part of the set.

Field Inspection Tests – Testing should be done for proposed cables. Testing shall be per standard specifications. Forms shall be neatly filled out.

GPS Coordinates – Check special provisions “General Electrical Requirements”. Submit electronic “EXCEL” file.

Job Warranty Letter – See standard specifications.

Cutsheet Submittal – See special provisions “General Electrical Requirements”. Scan Approved and Approved as Noted cutsheets.

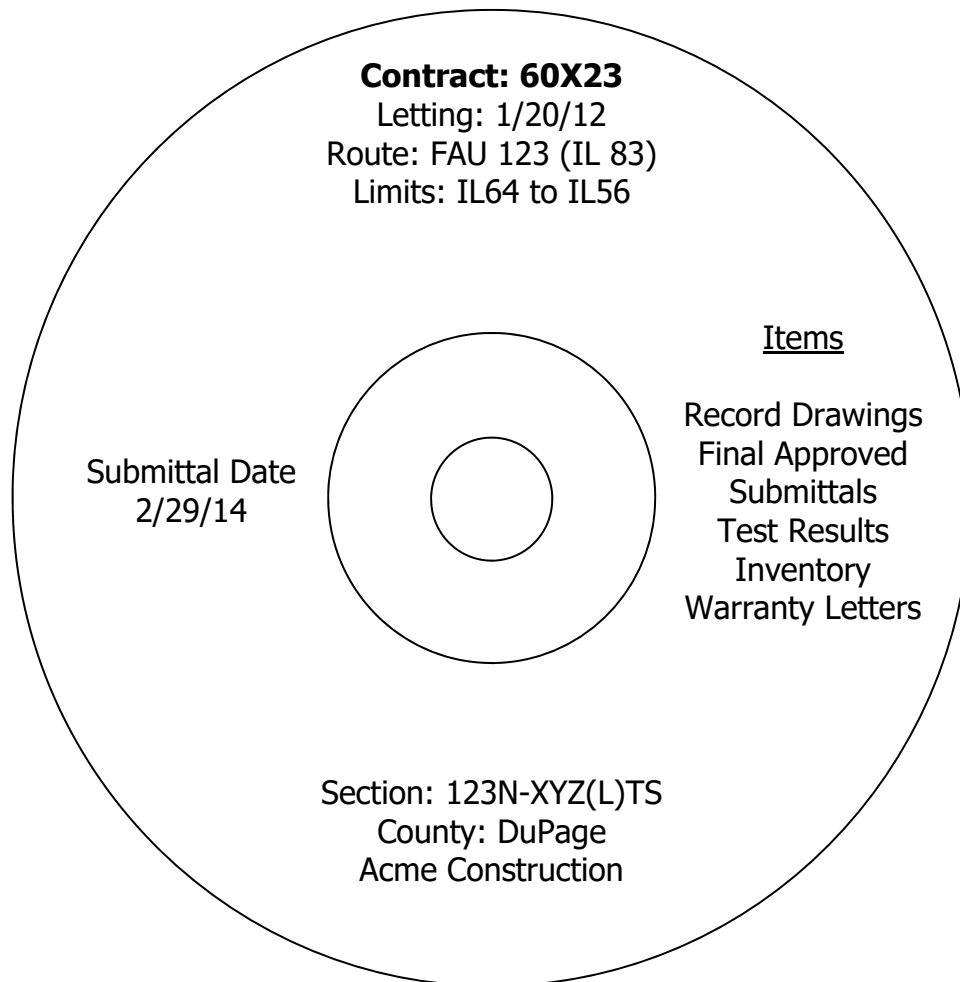
Lighting Inventory Form – Inventory form should include only proposed light poles, proposed light towers, proposed combination (traffic/light pole) lighting and proposed underpass luminaires.

Lighting Controller Inventory Form – Form should be filled out for only proposed lighting controllers.

Light Tower Safety Inspection Form – Form should be filled out for each proposed light tower.

CD LABEL FORMAT TEMPLATE.

Label must be printed; hand written labels are unacceptable and will be rejected.



ELECTRIC UTILITY SERVICE CONNECTION (COMED)

Effective: January 1, 2012

Description. This item shall consist of payment for work performed by ComEd in providing or modifying electric service as indicated. THIS MAY INVOLVE WORK AT MORE THAN ONE ELECTRIC SERVICE. For summary of the Electrical Service Drop Locations see the schedule contained elsewhere herein.

CONSTRUCTION REQUIREMENTS

General. It shall be the Contractor's responsibility to contact ComEd. The Contractor shall coordinate his work fully with the ComEd both as to the work required and the timing of the installation. No additional compensation will be granted under this or any other item for extra work caused by failure to meet this requirement. **Please contact ComEd, New Business Center Call Center, at 866 NEW ELECTRIC (1-866-639-3532) to begin the service connection process. The Call Center Representatives will create a work order for the service connection. The representative will ask the requestor for information specific to the request. The representative will assign the request based upon the location of project.**

The Contractor should make particular note of the need for the earliest attention to arrangements with ComEd for service. In the event of delay by ComEd, no extension of time will be considered applicable for the delay unless the Contractor can produce written evidence of a request for electric service within 30 days of execution.

Method Of Payment. The Contractor will be reimbursed to the exact amount of money as billed by ComEd for its services. Work provided by the Contractor for electric service will be paid separately as described under ELECTRIC SERVICE INSTALLATION. No extra compensation shall be paid to the Contractor for any incidental materials and labor required to fulfill the requirements as shown on the plans and specified herein.

For bidding purposes, this item shall be estimated as \$68,250.00

Basis Of Payment. This work will be paid for at the contract lump sum price for **ELECTRIC UTILITY SERVICE CONNECTION** which shall be reimbursement in full for electric utility service charges.

ELECTRIC SERVICE INSTALLATION

Effective: January 1, 2012

Description. This item shall consist of all material and labor required to extend, connect or modify the electric services, as indicated or specified, which is over and above the work performed by the utility. Unless otherwise indicated, the cost for the utility work, if any, will be reimbursed to the Contractor separately under ELECTRIC UTILITY SERVICE CONNECTION. This item may apply to the work at more than one service location and each will be paid separately.

Materials. Materials shall be in accordance with the Standard Specifications.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall ascertain the work being provided by the electric utility and shall provide all additional material and work not included by other contract pay items required to complete the electric service work in complete compliance with the requirements of the utility.

No additional compensation will be allowed for work required for the electric service, even though not explicitly shown on the Drawings or specified herein

Method Of Measurement. Electric Service Installation shall be counted, each.

Basis Of Payment. This work will be paid for at the contract unit price each for **ELECTRIC SERVICE INSTALLATION** which shall be payment in full for the work specified herein.

WIRE AND CABLE

Effective: January 1, 2012

Add the following to the first paragraph of Article 1066.02(a):

“The cable shall be rated at a minimum of 90°C dry and 75°C wet and shall be suitable for installation in wet and dry locations, and shall be resistant to oils and chemicals.”

Revise the Aerial Electric Cable Properties table of Article 1066.03(a)(3) to read:

Aerial Electric Cable Properties

Phase Conductor				Messenger wire	
Size AWG	Stranding	Average Insulation Thickness		Minimum Size AWG	Stranding
		mm	mils		
6	7	1.1	(45)	6	6/1
4	7	1.1	(45)	4	6/1
2	7	1.1	(45)	2	6/1
1/0	19	1.5	(60)	1/0	6/1
2/0	19	1.5	(60)	2/0	6/1
3/0	19	1.5	(60)	3/0	6/1
4/0	19	1.5	(60)	4/0	6/1

Add the following to Article 1066.03(b) of the Standard Specifications:

“Cable sized No. 2 AWG and smaller shall be U.L. listed Type RHH/RHW and may be Type RHH/RHW/USE. Cable sized larger than No. 2 AWG shall be U.L. listed Type RHH/RHW/USE.”

Revise Article 1066.04 to read:

“Aerial Cable Assembly. The aerial cable shall be an assembly of insulated aluminum conductors according to Section 1066.02 and 1066.03. Unless otherwise indicated, the cable assembly shall be composed of three insulated conductors and a steel

reinforced bare aluminum conductor (ACSR) to be used as the ground conductor. Unless otherwise indicated, the code word designation of this cable assembly is "Palomino". The steel reinforced aluminum conductor shall conform to ASTM B-232. The cable shall be assembled according to ANSI/ICEA S-76-474."

Revise the second paragraph of Article 1066.05 to read:

"The tape shall have reinforced metallic detection capabilities consisting of a woven reinforced polyethylene tape with a metallic core or backing."

UNDERGROUND RACEWAYS

Effective: March 1, 2015

Revise Article 810.04 of the Standard Specifications to read:

"Installation. All underground conduits shall have a minimum depth of 30-inches (700 mm) below the finished grade."

Add the following to Article 810.04 of the Standard Specifications:

"All metal conduit installed underground shall be Rigid Steel Conduit unless otherwise indicated on the plans."

Add the following to Article 810.04 of the Standard Specifications:

"All raceways which extend outside of a structure or duct bank but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum of 300 mm (12") or the length shown on the plans beyond the structure or duct bank. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped.

The ends of rigid metal conduit to be capped shall be threaded, the threads protected with full galvanizing, and capped with a threaded galvanized steel cap.

The ends of rigid nonmetallic conduit and coilable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 3 mm (0.125") thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring."

EXPOSED RACEWAYS

Effective: January 1, 2012

Revise the first paragraph of Article 811.03(a) of the Standard Specifications to read:

"General. Rigid metal conduit installation shall be according to Article 810.05(a). Conduits terminating in junction and pull boxes shall be terminated with insulated and

gasketed watertight threaded NEMA 4X conduit hubs. The hubs shall be Listed under UL 514B. The insulated throat shall be rated up to 105° C. When PVC coated conduit is utilized, the aforementioned hubs shall also be PVC coated.”

Add the following to Article 811.03(b) of the Standard Specifications:

“Where PVC coated conduit is utilized, all conduit fittings, couplings and clamps shall be PVC coated. All other mounting hardware and appurtenances shall be stainless steel.”

“The personnel installing the PVC coated conduit must be trained and certified by the PVC coated conduit Manufacturer or Manufacturer’s representative to install PVC coated conduit. Documentation demonstrating this requirement must be submitted for review and approval.”

Add the following to Article 1088.01(a) of the Standard Specifications:

All iron and steel products, which are to be incorporated into the work, including conduit and all conduit fittings, shall be domestically manufactured or produced and fabricated as specified in Article 106.”

Revise Article 1088.01(a)(3) of the Standard Specifications to read:

- a. PVC Coated Steel Conduit. The PVC coated rigid metal conduit shall be UL Listed (UL 6). The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations shall be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating shall be UL listed.
- b. The PVC coating shall have the following characteristics:

Hardness:	85+ Shore A Durometer
Dielectric Strength:	400V/mil @ 60 Hz
Aging:	1,000 Hours Atlas Weatherometer
Temperature	The PVC compound shall conform at 0° F. to Federal Specifications PL-406b, Method 2051, Amendment 1 of 25 September 1952 (ASTM D 746)
Elongation:	200%

- c. The exterior and interior galvanized conduit surface shall be chemically treated to enhance PVC coating adhesion and shall also be coated with a primer before the PVC coating to ensure a bond between the zinc substrate and the PVC coating. The bond strength created shall be greater than the tensile strength of the plastic coating.
- d. The nominal thickness of the PVC coating shall be 1 mm (40 mils). The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above -1°C (30°F).
- e. An interior urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil

thickness. The interior coating shall be applied in a manner so there are no runs, drips, or pinholes at any point. The coating shall not peel, flake, or chip off after a cut is made in the conduit or a scratch is made in the coating.

- f. Conduit bodies shall have a tongue-in-groove gasket for maximum sealing capability. The design shall incorporate a positive placement feature to assure proper installation. Certified test results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be submitted for review when requested by the Engineer.
- g. The PVC conduit shall pass the following tests:

Exterior PVC Bond test RN1:

Two parallel cuts 13 mm (1/2 inch) apart and 40 mm (1 1/2 inches) in length shall be made with a sharp knife along the longitudinal axis. A third cut shall be made perpendicular to and crossing the longitudinal cuts at one end. The knife shall then be worked under the PVC coating for 13 mm (1/2 inch) to free the coating from the metal.

Using pliers, the freed PVC tab shall be pulled with a force applied vertically and away from the conduit. The PVC tab shall tear rather than cause any additional PVC coating to separate from the substrate.

Boil Test:

Acceptable conduit coating bonds (exterior and interior) shall be confirmed if there is no disbondment after a minimum average of 200 hours in boiling water or exposure to steam vapor at one atmosphere. Certified test results from a national recognized independent testing laboratory shall be submitted for review and approval. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D870, a 6" length of conduit test specimen shall be placed in boiling water. The specimen shall be periodically removed, cooled to ambient temperature and immediately tested according to the bond test (RN1). When the PVC coating separates from the substrate, the boil time to failure in hours shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, a 6" conduit test specimen shall be cut in half longitudinally and placed in boiling water or directly above boiling water with the urethane surface facing down. The specimen shall be periodically removed, cooled to ambient temperature and tested in accordance with the Standard Method of Adhesion by Tape Test (ASTM D3359). When the coating disbonds, the time to failure in hours shall be recorded.

Heat/Humidity Test:

Acceptable conduit coating bonds shall be confirmed by a minimum

average of 30 days in the Heat and Humidity Test. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D1151, D1735, D2247 and D4585, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. The specimens shall be periodically removed and a bond test (RN1) performed. When the PVC coating separates from the substrate, the exposure time to failure in days shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. When the coating disbonds, the time to failure in hours shall be recorded.

Add the following to Article 1088.01(a)(4) of the Standard Specifications:

“All liquid tight flexible metal conduit fittings shall have an insulated throat to prevent abrasion of the conductors and shall have a captive sealing O-ring gasket. The fittings shall be Listed under UL 514B. The insulated throat shall be rated up to 105° C.”

Revise the second paragraph of Article 811.04 of the Standard Specifications to read:

“Expansion fittings and LFNC will not be measured for payment.”

Revise Article 811.05 of the Standard Specifications to read:

“811.05 Basis of Payment. This work will be paid for at the contract unit price per meter (foot) for **CONDUIT ATTACHED TO STRUCTURE**, of the diameter specified, **RIGID GALVANIZED STEEL** or **CONDUIT ATTACHED TO STRUCTURE**, of the diameter specified, **RIGID GALVANIZED STEEL, PVC COATED.**”

MAINTENANCE OF LIGHTING SYSTEMS

Replace Article 801.11 and 801.12 of the Standard Specifications with the following:

Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor shall be responsible for the proper operation and maintenance of all existing and proposed lighting systems which are part of, or which may be affected by the work until final acceptance or as otherwise determined by the Engineer.

Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall initiate a request for a maintenance transfer and preconstruction inspection, as specified elsewhere herein, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting systems which may be affected by the work.

During the maintenance preconstruction inspection, the party responsible for existing maintenance shall perform testing of the existing system in accordance with Article 801.13a. The Contractor shall request a date for the preconstruction inspection no less than fourteen (14) days prior to the desired date of the inspection.

The Engineer will document all test results and note deficiencies. All substandard equipment will be repaired or replaced by the existing maintenance contractor, or the Engineer can direct the Contractor to make the necessary repairs under Section 109.04.

Existing lighting systems, when depicted on the plans, are intended only to indicate the general equipment installation of the systems involved and shall not be construed as an exact representation of the field conditions. It remains the Contractor's responsibility to visit the site to confirm and ascertain the exact condition of the electrical equipment and systems to be maintained. Contract documents shall indicate the circuit limits.

Maintenance of Existing Lighting Systems

Existing lighting systems. Existing lighting systems shall be defined as any lighting system or part of a lighting system in service at the time of contract Letting. The contract drawings indicate the general extent of any existing lighting, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these specifications and failure to do so will not be justification for extra payment or reduced responsibilities.

Extent of Maintenance.

Partial Maintenance. Unless otherwise indicated, if the number of circuits affected by the contract is equal to or less than 40% of the total number of circuits in a given controller and the controller is not part of the contract work, the Contractor needs only to maintain the affected circuits within the project limits. The project limits are defined as those limits indicated in the contract plans. Equipment outside of the project limits, on the affected circuits shall be maintained and paid for under Article 109.04. The affected circuits shall be isolated by means of in-line waterproof fuse holders as specified elsewhere and as approved by the Engineer. The unaffected circuits and the controller will remain under the maintenance of the Village.

Full Maintenance. If the number of circuits affected by the contract is greater than 40% of the total number of circuits in a given controller, or if the controller is modified in any way under the contract work, the Contractor shall maintain the entire controller and all associated circuits within the project limits. Equipment outside of the project limits shall be maintained and paid for under Article 109.04.

If the existing equipment is damaged by normal vehicular traffic, not contractor operations, is beyond repair and cannot be re-set, the contractor shall replace the equipment in kind with payment made for such equipment under Article 109.04. If the equipment damaged by any construction operations, not normal vehicular traffic, is beyond repair and cannot be re-set, the contractor shall replace the equipment in kind and the cost of the equipment shall be included in the cost of this pay item and shall not be paid for separately.

Maintenance of Proposed Lighting Systems

Proposed Lighting Systems. Proposed lighting systems shall be defined as any lighting system or part of a lighting system, temporary or permanent, which is to be constructed under this contract regardless of the project limits indicated in the plans.

The Contractor shall be fully responsible for maintenance of all items installed under this contract. Maintenance shall include, but not be limited to, any equipment failures or malfunctions as well as equipment damage either by the motoring public, Contractor operations, vandalism, or other means. The potential cost of replacing or repairing any malfunctioning, damaged, or vandalized equipment shall be included in the bid price of this item and will not be paid for separately.

Lighting System Maintenance Operations

The Contractor's responsibility shall include all applicable responsibilities of the Electrical Maintenance Contract. These responsibilities shall include the maintenance of lighting units (including sign lighting), cable runs and lighting controls. In the case of a pole knockdown or sign light damage, the Contractor shall promptly clear the lighting unit and circuit discontinuity and restore the system to service. The equipment shall then be re-set by the contractor within the time limits specified herein.

If the existing equipment is damaged by normal vehicular traffic, not contractor operations, is beyond repair and cannot be re-set, the contractor shall replace the equipment in kind with payment made for such equipment under Article 109.04. If the equipment damaged by any construction operations, not normal vehicular traffic, is beyond repair and cannot be re-set, the contractor shall replace the equipment in kind and the cost of the equipment shall be included in the cost of this pay item and shall not be paid for separately.

Responsibilities shall also include weekly night-time patrol of the lighting system, with patrol reports filed immediately with the Engineer and with deficiencies corrected within 24 hours of the patrol. Patrol reports shall be presented on standard forms as designated by the Engineer. Uncorrected deficiencies may be designated by the Engineer as necessitating emergency repairs as described elsewhere herein.

The following chart lists the maximum response, service restoration, and permanent repair time the Contractor will be allowed to perform corrective action on specific lighting system equipment.

INCIDENT OR PROBLEM	SERVICE RESPONSE TIME	SERVICE RESTORATION TIME	PERMANENT REPAIR TIME
Control cabinet out	1 hour	4 hours	7 Calendar days
Hanging mast arm	1 hour to clear	na	7 Calendar days
Radio problem	1 hour	4 hours	7 Calendar days
Motorist caused damage or leaning light pole 10 degrees or more	1 hour to clear	4 hours	7 Calendar days
Circuit out – Needs to reset breaker	1 hour	4 hours	na
Circuit out – Cable trouble	1 hour	24 hours	21 Calendar days

Outage of 3 or more successive lights	1 hour	4 hours	na
Outage of 75% of lights on one tower	1 hour	4 hours	na
Outage of light nearest RR crossing approach, Islands and gores	1 hour	4 hours	na
Outage (single or multiple) found on night outage survey or reported to EMC	na	na	7 Calendar days
Navigation light outage	na	na	24 hours

- **Service Response Time** -- amount of time from the initial notification to the Contractor until a patrolman physically arrives at the location.
- **Service Restoration Time** – amount of time from the initial notification to the Contractor until the time the system is fully operational again (In cases of motorist caused damage the undamaged portions of the system are operational.)
- **Permanent Repair Time** – amount of time from initial notification to the Contractor until the time permanent repairs are made if the Contractor was required to make temporary repairs to meet the service restoration requirement.

Failure to provide this service will result in liquidated damages of \$500 per day per occurrence. In addition, the Village reserves the right to assign any work not completed within this timeframe to the Electrical Maintenance Contractor. All costs associated to repair this uncompleted work shall be the responsibility of the Contractor. Failure to pay these costs to the Electrical Maintenance Contractor within one month after the incident will result in additional liquidated damages of \$500 per month per occurrence. Unpaid bills will be deducted from any monies owed to the Contractor. Repeated failures and/or a gross failure of maintenance shall result in the Village's Electrical Maintenance Contractor being directed to correct all deficiencies and the resulting costs deducted from any monies owed the contractor.

Damage caused by the Contractor's operations shall be repaired at no additional cost to the Contract.

Operation of Lighting

The lighting shall be operational every night, dusk to dawn. Duplicate lighting systems (such as temporary lighting and proposed new lighting) shall not be operated simultaneously. Lighting systems shall not be kept in operation during long daytime periods.

Method of Measurement

The contractor shall demonstrate to the satisfaction of the Engineer that the lighting system is fully operational prior to submitting a pay request. Failure to do so will be grounds for denying the pay request. Months in which the lighting systems are not maintained and not operational will not be paid. Payment shall not be made retroactively for months in which lighting systems were not operational.

Basis of Payment. Maintenance of lighting systems shall be paid for at the contract unit price per calendar month for **MAINTENANCE OF LIGHTING SYSTEM.**

LUMINAIRE

Description. This work shall consist of furnishing and installing LED lighting unit as specified herein and installation according to Section 821 of the Standard Specification.

Materials. The luminaire shall be eLuminaire Altair Series ALQ-S.

LUMINAIRE, TYPE A (SPECIAL) = model number ALQS–Small– 3M-18-4K7-MV-BL

Material for the LED luminaire shall be according to the following:

Optics

- IP66 rated
- Type 3 medium light distribution per IESNA classification.

Performance

- Rated for -40°C to 60°C for operating temperature range
- Color temperature of 4000K
- Fixture wattage
 - Luminaire, Type A (Special) is 137 watts with 18,454 lumens.
- BUG rating is B3-U0-G3

Electronic Drivers

- Universal voltage 120-277 V
- Greater than 0.9 power factor
- Less than 20% harmonic distortion
- 20kA level of surge protection.

Housing

- Altair Series ALQ-S is 15.7" length x 10.6" wide x 2.4" high with an approximate weight of 11.0 lbs. and EPA is 0.31
- 3G vibration rated
- Polymethyl methacrylate high durability, non-discoloring lens
- Color: Black (color must be approved with local agencies before purchasing).

Finish

- Multi stage pre-treatment and high durability TGIC powder coat finish.

Submittal Requirements. The Contractor shall submit, for approval, an electronic version of all associated luminaire IES files, AGI32 files and the TM-21 or TM-28 calculator spreadsheet with inputs and reports associated with the project luminaires. The Contractor shall also provide (as a minimum) an electronic (PDF) version of each of the following manufacturer's product data for each type of luminaire:

1. Descriptive literature and catalogue cuts for luminaire, LED driver, and surge protection device.
2. LED drive current, total luminaire input wattage and total luminaire current at the system operating voltage or voltage range and ambient temperature of 25 C.
3. LED efficacy per luminaire expressed in lumens per watt (lpw).
4. Initial delivered lumens at the specified color temperature, drive current, and ambient temperature.

5. Computer photometric calculation reports as specified and in the luminaire performance table.
6. TM-15 BUG rating report.
7. Isofootcandle chart with max candela point and half candela trace indicated.
8. Documentation of manufacturers experience and verification that luminaires were assembled in the U.S.A. as specified.
9. Supporting documentation of compliance with ANSI standards as well as UL listing as specified.
10. Supporting documentation of laboratory accreditations and certifications for specified testing as indicated.
11. Thermal testing documents as specified.
12. IESNA LM-79, LM-80 (or LM-84) and TM-21 (or TM-28) reports as specified.
13. Salt fog test reports and certification as specified.
14. Vibration Characteristics Test Reports and certification as specified.
15. Ingress Protection Test Reports as specified.
16. Written warranty.

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE

Roadway Lighting GIVEN CONDITIONS

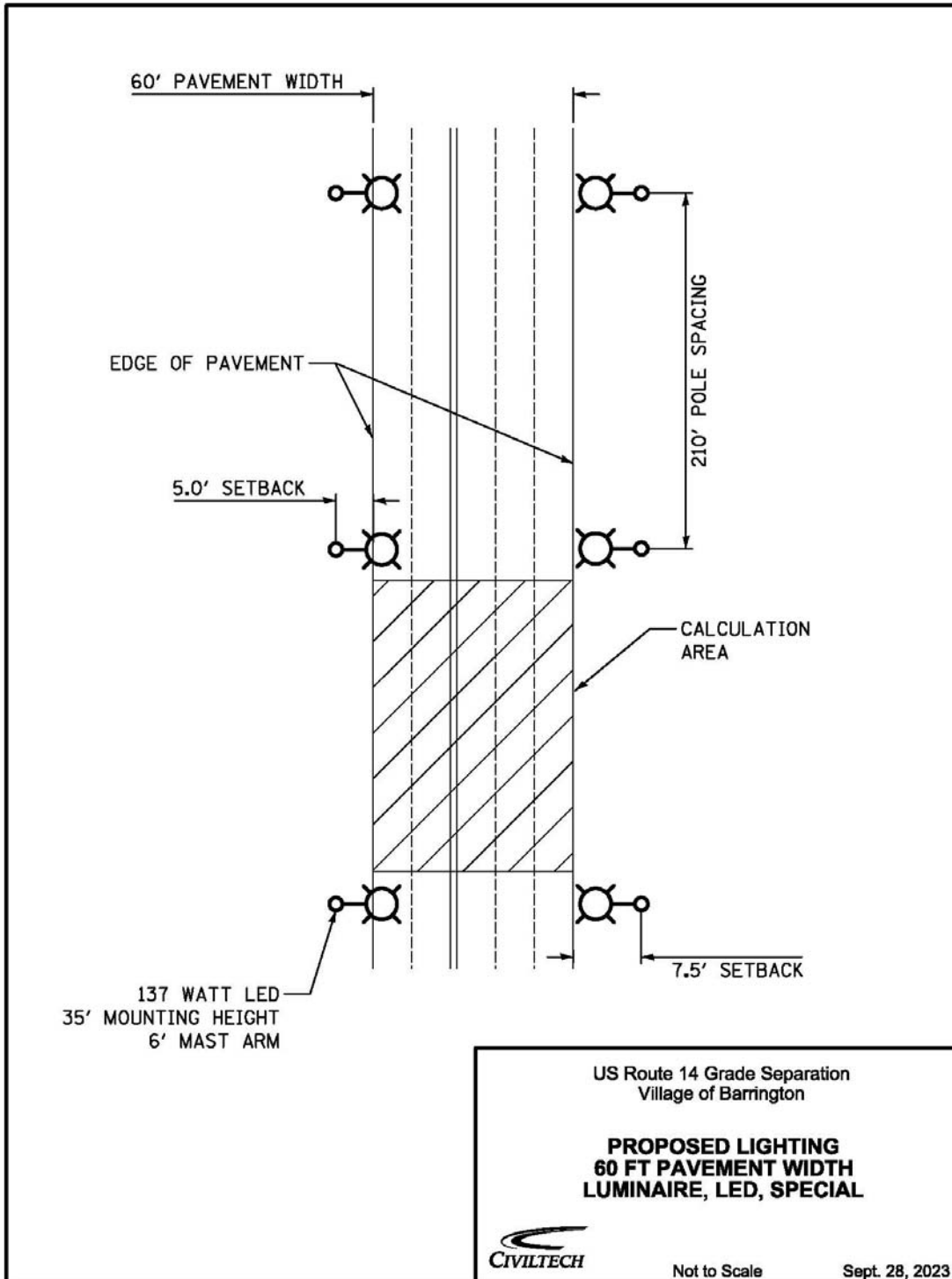
Roadway Data	Roadway Width	60	Ft
	Number of Lanes Left of Median	2	
	Number of Lanes Right of Median	3	
	Lane Width	12	Ft
	Median Width	0	Ft
	IES Surface Classification	R3	
	Q-Zero Value	0.07	
Mounting Data	Mounting Height	35	Ft
	Mast Arm Length	6	Ft
	Pole Set-Back from Edge of Pavement	5 and 7.5	Ft
Luminaire Data	Source	LED	
	Color Temperature	4000	°K
	Lumens	18,454	Min
	Pay Item Lumen Designation		
	BUG Rating	B3-U0-G3 (Max)	
	IES Vertical Distribution	Medium	
	IES Control of Distribution		
	IES Lateral Distribution	Type III	
Pole Layout Data	Total Light Loss Factor	0.70	
	Spacing	210	Ft
	Configuration	Opposite	
	Luminaire Overhang over E.O.P.	0.5 and -1.5	Ft

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested, and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS

NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

Roadway Luminance	Average Luminance, L_{AVE} (Max)		Cd/m ²
	Average Luminance, L_{AVE} (Min)	0.9	Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0	Max
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0	Max
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3	Max



Installation.

Each luminaire shall be installed according to the luminaire manufacturer's recommendations.

Luminaires which are pole mounted shall be mounted on site such that poles and arms are not left unloaded. Pole mounted luminaires shall be leveled/adjusted after poles are set and vertically aligned before being energized. When mounted on a tenon, care shall be exercised to assure maximum insertion of the mounting tenon. Each luminaire shall be checked to assure compatibility with the project power system. When the night-time check of the lighting system by the Engineer indicates that any luminaires are mis-aligned, the mis-aligned luminaires shall be corrected at no additional cost.

No luminaire shall be installed prior to approval. Where independent testing is required, full approval will not be given until complete test results, demonstrating compliance with the specifications, have been reviewed and accepted by the Engineer.

Pole wiring shall be provided with the luminaire. Pole wire shall run from handhole to luminaire. Pole wire shall be sized No. 10, rated 600 V, RHW/USE-2, and have copper conductors, stranded in conformance with ASTM B 8. Pole wire shall be insulated with cross-linked polyethylene (XLP) insulation. Pole wire shall include a phase, neutral, and green ground wire. Wire shall be trained within the pole or sign structure so as to avoid abrasion or damage to the insulation.

Pole wire shall be extended through the pole, pole grommet, luminaire ring, and any associated arm and tenon. The pole wire shall be terminated in a manner that avoids sharp kinks, pinching, pressure on the insulation, or any other arrangement prone to damaging insulation value and producing poor megger test results. Wires shall be trained away from heat sources within the luminaire. Wires shall be terminated so all strands are extended to the full depth of the terminal lug with the insulation removed far enough so it abuts against the shoulder of the lug, but is not compressed as the lug is tightened.

Included with the pole wiring shall be fusing located in the handhole. Fusing shall be according to Article 1065.01 with the exception that fuses shall be 6 amperes.

Each luminaire and optical assembly shall be free of all dirt, smudges, etc. Should the optical assembly require cleaning, a luminaire manufacturer approved cleaning procedure shall be used.

Horizontal mount luminaires shall be installed in a level, horizontal plane, with adjustments as needed to insure the optics are set perpendicular to the traveled roadway.

When the pole is bridge mounted, a minimum size stainless steel 1/4-20NC set screw shall be provided to secure the luminaire to the mast arm tenon. A hole shall be drilled and tapped through the tenon and luminaire mounting bracket and then fitted with the screw.

Warranty.

The entire luminaire and all of its component parts shall be covered by a 10-year warranty. Failure is when one or more of the following occur:

- 1) Negligible light output from more than 10 percent of the discrete LEDs.
- 2) Significant moisture that deteriorates performance of the luminaire.
- 3) Driver that continues to operate at a reduced output due to overheating.

The warranty period shall begin on the date of luminaire shipment. The Contractor shall verify that the Resident Engineer has noted the shipment date in the daily diary. Copy of the shipment documentation shall be submitted.

The replacement luminaire shall be of the same manufacturer, model, and photometric distribution as the original.

Basis of Payment. This work will be paid for at the contract unit price per each for LUMINAIRE, TYPE A (SPECIAL), which shall be payment in full for the material, equipment, and labor required to furnish and install the luminaire as described herein and shown in the plans.

ROADWAY LUMINAIRE, LED
Effective: April 1, 2024

Description.

This work shall consist of furnishing and installing a roadway LED luminaire as shown on the plans, as specified herein.

General.

The luminaire including the housing, driver and optical assembly shall be assembled in the U.S.A. The luminaire shall be assembled by and manufactured by the same manufacturer. The luminaire shall be mechanically strong and easy to maintain. The size, weight, and shape of the luminaire shall be designed so as not to incite detrimental vibrations in its respective pole and it shall be compatible with the pole and arm. All electrical and electronic components of the luminaire shall comply with the requirements of Restriction of Hazardous Materials (RoHS) regulations. The luminaire shall be listed for wet locations by an NRTL and shall meet the requirements of UL 1598 and UL 8750

Submittal Requirements.

The Contractor shall also submit the following manufacturer's product data for each type of luminaire:

17. Descriptive literature and catalogue cuts for luminaire, LED driver, and surge protection device. Completed manufacturer's luminaire ordering form with the full catalog number provided
18. LED drive current, total luminaire input wattage and total luminaire current at the system operating voltage or voltage range and ambient temperature of 25 C.
19. LED efficacy per luminaire expressed in lumens per watt (l/w).
20. Initial delivered lumens at the specified color temperature, drive current, and ambient temperature.
21. IES file associated with each submitted luminaire in the IES LM-63 format.
22. Computer photometric calculation reports as specified and in the luminaire performance table.

23. TM-15 BUG rating report.
24. Isofootcandle chart with max candela point and half candela trace indicated.
25. Documentation of manufacturers experience and verification that luminaires were assembled in the U.S.A. as specified.
26. Written warranty.

Upon request by the Engineer, the submittals shall also include any or all the following:

- a. TM-21 calculator spreadsheet (XLSX or PDF format) and if available, TM-28 report for the specified luminaire or luminaire family. Both reports shall be for 50,000 hours at an ambient temperature of 77 °F (25 °C).
- b. LM-79 report with National Voluntary Laboratory Accreditation Program (NVLAP) current at the time of testing in PDF format inclusive of the following: isofootcandle diagram with half candela contour and maximum candela point; polar plots through maximum plane and maximum cone; coefficient of utilization graph; candela table; and spectral distribution graph and chromaticity diagram.
- c. LM-80 report for the specified LED package in PDF format and if available, LM-84 report for the specified luminaire or luminaire family in PDF format. Both reports shall be conducted by a laboratory with NVLAP certification current at the time of testing.
- d. AGi32 calculation file matching the submittal package.
- e. In Situ Temperature Measurement Test (ISTMT) report for the specified luminaire or luminaire family in PDF format.
- f. Vibration test report in accordance with ANSI C136.31 in PDF format.
- g. ASTM B117/ASTM D1654 (neutral salt spray) test and sample evaluation report in PDF format.
- h. ASTM G154 (ASTM D523) gloss test report in PDF format.
- i. LED drive current, total luminaire input wattage, and current over the operating voltage range at an ambient temperature of 77 °F (25 °C).
- j. Power factor (pf) and total harmonic distortion (THD) at maximum and minimum supply and at nominal voltage for the dimmed states of 70%, 50%, and 30% full power.
- k. Ingress protection (IP) test reports, conducted according to ANSI C136.25 requirements, for the driver and optical assembly in PDF format.
- l. Installation, maintenance, and cleaning instructions in PDF format, including recommendations on periodic cleaning methods.
- m. Documentation in PDF format that the reporting laboratory is certified to perform the required tests.

A sample luminaire shall also be provided upon request of the Engineer. The sample shall be as proposed for the contract and shall be delivered by the Contractor to the District Headquarters. After review, the Contractor shall retrieve the luminaire.

Manufacturer Experience.

The luminaire shall be designed to be incorporated into a lighting system with an expected 20 year lifetime. The luminaire manufacturer shall have a minimum of 15 years' experience manufacturing LED roadway luminaires; parking lot, architectural, or residential luminaires are not applicable to this requirement. The manufacturer shall have a minimum of 100,000 total LED roadway luminaires installed on a minimum of 100 separate installations, all within the U.S.A.

Housing.

Material. The luminaire shall be a single device not requiring on-site assembly for installation. The driver for the luminaire shall be integral to the unit.

Finish. The luminaire shall have a baked acrylic enamel finish. The color of the finish shall be gray, unless otherwise indicated.

The finish shall have a rating of six or greater according to ASTM D1654, Section 8.0 Procedure A – Evaluation of Rust Creepage for Scribed Samples after exposure to 1000 hours of testing according to ASTM B117 for painted or finished surfaces under environmental exposure.

The luminaire finish shall have less than or equal to 30% reduction of gloss according to ASTM D523 after exposure of 500 hours to ASTM G154 Cycle 6 QUV® accelerated weathering testing.

The luminaire shall slip-fit on a mounting arm with a 2" diameter tenon (2.375" outer diameter), and shall have a barrier to limit the amount of insertion. The slip fitter clamp shall utilize four (4) bolts to clamp to the tenon arm. The luminaire shall be provided with a leveling surface and shall be capable of being tilted ± 5 degrees from the axis of attachment in 2.5 degree increments and rotated to any degree with respect to the supporting arm.

All external surfaces shall be cleaned in accordance with the manufacturer's recommendations and be constructed in such a way as to discourage the accumulation of water, ice, and debris.

The effective projected area of the luminaire shall not exceed 1.6 sq. ft.

The total weight including accessories, shall not exceed 40 lb (18.14 kg).

A passive cooling method with no moving, rotating parts, or liquids shall be employed for heat management.

The luminaire shall include a fully prewired, 7-pin twist lock ANSI C136.41-compliant receptacle. Unused pins shall be connected as directed by the Manufacturer and as approved by the Engineer. A shorting cap shall be provided with the luminaire that is compliant with ANSI C136.10.

Vibration Testing. All luminaires shall be subjected to and pass vibration testing requirements at "3G" minimum zero to peak acceleration in accordance with ANSI C136.31 requirements using the same luminaire. To be accepted, the luminaire housing, hardware, and each individual component shall pass this test with no noticeable damage and the luminaire must remain fully operational after testing.

Labels. An internal label shall be provided indicating the luminaire is suitable for wet locations and indicating the luminaire is an NRTL listed product to UL1598 and UL8750. The internal label shall also comply with the requirements of ANSI C136.22.

An external label consisting of two black characters on a white background with the dimensions of the label and the characters as specified in ANSI C136.15 for HPS luminaires. The first character shall be the alphabetical character representing the initial lumen output as specified in Table 1 of Article 1067.06(c). The second character shall be the numerical character representing the transverse light distribution type as specified in IES RP-8 (i.e. Types 1, 2, 3, 4, or 5).

Hardware. All hardware shall be stainless steel or of other corrosion resistant material approved by the Engineer.

Luminaires shall be designed to be easily serviced, having fasteners such as quarter-turn clips of the heavy spring-loaded type with large, deep straight slot heads, complete with a receptacle and shall be according to military specification MIL-f-5591.

All hardware shall be captive and not susceptible to falling from the luminaire during maintenance operations. This shall include lens/lens frame fasteners as well hardware holding the removable driver and electronic components in place.

Provisions for any future house-side external or internal shielding should be indicated along with means of attachment.

Circuiting shall be designed to minimize the impact of individual LED failures on the operation of the other LED's.

Wiring. Wiring within the electrical enclosure shall be rated at 600v, 105°C or higher.

Driver.

The driver shall be integral to the luminaire shall be capable of receiving an indefinite open and short circuit output conditions without damage.

The driver shall incorporate the use of thermal foldback circuitry to reduce output current under abnormal driver case temperature conditions and shall be rated for a lifetime of 100,000 hours at an ambient temperature exposure of 77 °F (25 °C) to the luminaire. If the driver has a thermal shut down feature, it shall not turn off the LEDs when operated at 104 °F (40 °C) or less.

The driver shall have an input voltage range of 120 to 277 volts ($\pm 10\%$) or 347 to 480 volts ($\pm 10\%$) according to the contract documents. When the driver is operating within the rated input voltage range and in an un-dimmed state, the power factor measurement shall be not less than 0.9 and the THD measurement shall be no greater than 20%.

The driver shall meet the requirements of the FCC Rules and Regulations, Title 47, Part 15 for Class A devices with regard to electromagnetic compatibility. This shall be confirmed through the testing methods in accordance with ANSI C63.4 for electromagnetic interference.

The driver shall be dimmable using the protocol listed in the Luminaire Performance Table shown in the contract.

Surge Protection. The luminaire shall comply the requirements of ANSI C136.2 for electrical transient immunity at the "Extreme" level (20KV/10KA) and shall be equipped with a surge protective device (SPD) that is UL1449 compliant with indicator light. An SPD failure shall open the circuit to protect the driver.

LED Optical Assembly

The optical assembly shall have an IP 65 or higher rating in accordance with ANSI C136.25. The circuiting of the LED array shall be designed to minimize the effect of individual LED failures on the operation of other LEDs. All optical components shall be made of glass or a UV stabilized, non-yellowing material.

The optical assembly shall utilize high brightness, long life, minimum 70 CRI, 4,000K color temperature (+/-300K) LEDs binned in accordance with ANSI C78.377. Lenses shall be UV-stabilized acrylic or glass.

Lumen depreciation at 50,000 hours of operation shall not exceed 15% of initial lumen output at the specified LED drive current and an ambient temperature of 25° C.

The luminaire may or may not have a glass lens over the LED modules. If a glass lens is used, it must be a flat lens. Material other than glass will not be acceptable. If a glass lens is not used, the LED modules may not protrude lower than the luminaire housing.

The assembly shall have individual serial numbers or other means for manufacturer tracking.

Photometric Performance.

Luminaires shall be tested according to IESNA LM-79. This testing shall be performed by a test laboratory holding accreditation from the National Institute of Standards and Technology (NIST) National Voluntary Laboratory Accreditation Program (NVLAP) for the IESNA LM-79 test procedure.

Data reports as a minimum shall yield an isofootcandle chart, with max candela point and half candela trace indicated, maximum plane and maximum cone plots of candela, a candlepower table (house and street side), a coefficient of utilization chart, a luminous flux distribution table, spectral distribution plots, chromaticity plots, and other standard report outputs of the above mentioned tests.

The luminaire shall have a BUG rating of Back Light B3 or less, Up Light rating of U0, and a Glare rating of G3 or less unless otherwise indicated in the luminaire performance table.

Photometric Calculations.

Calculations. Submitted report shall include a luminaire classification system graph with both the recorded lumen value and percent lumens by zone along with the BUG rating according to IESNA TM-15.

Complete point-by-point luminance and veiling luminance calculations as well as listings of all indicated averages and ratios as applicable shall be provided in accordance with IESNA RP-8 recommendations. Lighting calculations shall be performed using AGI32 software with all luminance calculations performed to one decimal place (i.e. x.x cd/m²). Uniformity ratios shall also be calculated to one decimal place (i.e. x.x:1). Calculation results shall demonstrate that the submitted luminaire meets the lighting metrics specified in the project Luminaire Performance Table(s). Values shall be rounded to the number of significant digits indicated in the luminaire performance table(s).

All photometry must be **photopic**. Scotopic or mesopic factors will not be allowed. The AGi32 file shall be submitted at the request of the Engineer.

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE ROADWAY LIGHTING

GIVEN CONDITIONS

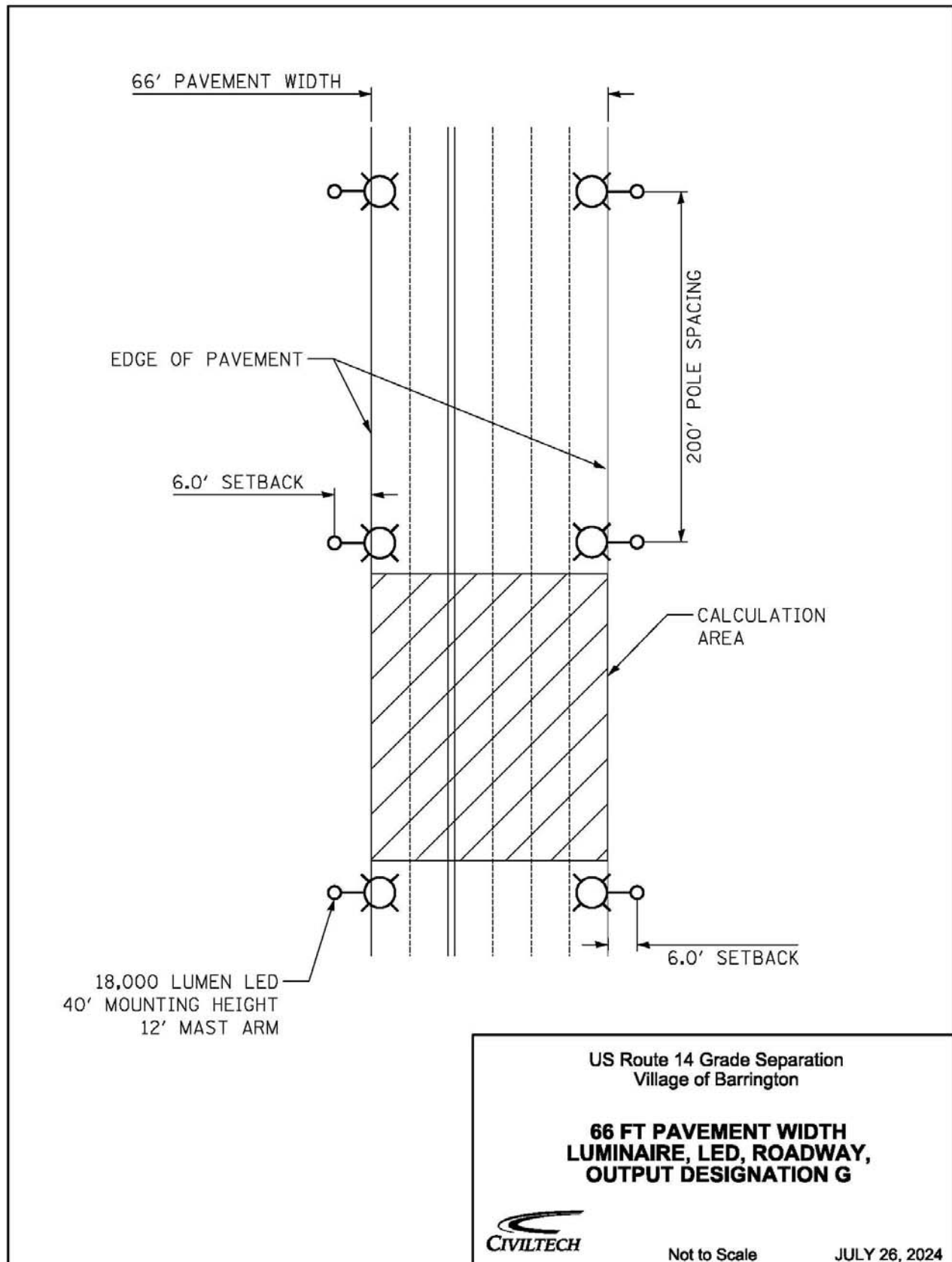
Roadway Data	Pavement Width	66	Ft
	Number of Lanes Left of Median	2	
	Number of Lanes Right of Median	4	
	Lane Width	11	Ft
	Median Width	0	Ft
	IES Surface Classification	R3	
	Q-Zero Value	0.07	
Mounting Data	Mounting Height	40	Ft
	Mast Arm Length	12	Ft
	Pole Set-Back from Edge of Pavement	6	Ft
Luminaire Data	Source	LED	
	Color Temperature	4000	°K
	Lumens	18,000	Min
	Pay Item Lumen Designation	G	
	BUG Rating		
	IES Vertical Distribution		
	IES Control of Distribution		
	IES Lateral Distribution		
Pole Layout Data	Total Light Loss Factor	0.70	
	Spacing	200	Ft
	Configuration	Opposite	
	Luminaire Overhang over E.O.P.	6	Ft

NOTE: Variations from the above specified I.E.S. distribution pattern may be requested, and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS

NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

Roadway Luminance	Average Luminance, L_{AVE} (Max)	1.2	Cd/m ²
	Average Luminance, L_{AVE} (Min)	0.9	Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0	Max
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0	Max
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3	Max



Independent Testing

When a contract has 50 or more luminaires of the same type (distribution type and lumen output/wattage), that luminaire type shall be independently tested, unless otherwise noted. The quantity of luminaires to be tested shall be as specified in the following table.

Contract Quantity	Luminaires to be Tested
1-49	0 (unless otherwise noted)
50-100	2
101-150	3
151-200	4
201-250	5
251-300	6
301-350	7

The Contractor shall coordinate the testing with the contract schedule considering submittal, manufacturing, testing, and installation lead-times and deadlines.

The Electrical Engineer shall select from all the project luminaires at the Contractor's or distributor's storage facility, within District 1, the luminaires for testing. In all cases, the selection of luminaires shall be a random selection from the entire completed lot of luminaires required for the contract. Selections from partial lots will not be allowed. An additional luminaire shall also be selected for physical inspection by the Engineer at the District Headquarters. This luminaire will be available for the Contractor to pick up at a later date to be installed under this contract. This luminaire is in addition to the luminaire required as a part of the submittal process specified elsewhere.

Alternative selection process. With the Engineer's prior approval, the Contractor shall provide a list of luminaire serial numbers for all the luminaires. The Engineer shall make a random selection of the required number of luminaires for testing from the serial numbers. That luminaire must then be photographed clearly showing the serial number prior to shipment to the selected and approved testing laboratory. The testing laboratory shall include a photograph of the luminaire along with the test results directly to the Engineer.

Luminaires shall be tested at a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory approved for each of the required tests. The testing facility shall not be associated in any way, subsidiary or otherwise, with the luminaire manufacturer. All costs associated with luminaire testing shall be included in the bid price of the luminaire.

The selection of the proposed independent laboratory shall be presented with the information submitted for review and approval.

The testing performed shall include photometric and electrical testing.

All tests shall be conducted at the luminaire system operating voltage of 240 volts unless specified differently in the contract plans.

Photometric testing shall be according to IES recommendations, performed with a goniophotometer and as a minimum, shall yield an isofootcandle chart, with max candela point and half candela trace

indicated, an isocandela diagram, maximum planned and maximum cone plots of candela, a candlepower table (House and street side), a coefficient of utilization chart, a luminous flux distribution table, BUG rating report, and complete calculations based on specified requirements and test results.

Electrical testing shall conform to NEMA and ANSI standards and, as a minimum shall include a complete check of wiring connections and a table of characteristics showing input amperes, watts, power factor, total harmonic distortion and LED drive current.

The summary report and the test results including IES photometric files shall be sent directly to the Resident Engineer, the Electrical Engineer, and the Contractor via email or other mutually agreeable means.

Photometric performance shall meet or exceed that of the specified values. If the luminaire does not meet the specified photometric values, the luminaire has failed regardless of whether the test results meet the submitted factory data.

Should any of the tested luminaires of a given type, and distribution fail to satisfy the specifications and perform according to approved submittal information, the luminaire type of that distribution type and wattage shall be unacceptable and be replaced by alternate equipment meeting the specifications with the submittal and testing process repeated in their entirety; or corrections made to achieve required performance.

In the case of corrections, the Contractor shall advise the Engineer of the proposed corrections and shall request a repeat of the specified testing and, if the corrections are deemed reasonable by the Engineer, the testing process shall be repeated in its entirety.

The number of luminaires to be tested shall be the same quantity as originally tested as required in the above table.

Retesting, should it become necessary, shall not be grounds for additional compensation or extension of time.

Submittal information shall include a statement of intent to provide the testing as well as a request for approval of the chosen laboratory.

Installation.

Each luminaire shall be installed according to the luminaire manufacturer's recommendations.

Luminaires which are pole mounted shall be mounted on site such that poles and arms are not left unloaded. Pole mounted luminaires shall be leveled/adjusted after poles are set and vertically aligned before being energized. When mounted on a tenon, care shall be exercised to assure maximum insertion of the mounting tenon. Each luminaire shall be checked to assure compatibility with the project power system. When the night-time check of the lighting system by the Engineer indicates that any luminaires are mis-aligned, the mis-aligned luminaires shall be corrected at no additional cost.

No luminaire shall be installed prior to approval. Where independent testing is required, full approval will not be given until complete test results, demonstrating compliance with the specifications, have been reviewed and accepted by the Engineer.

Pole wiring shall be provided with the luminaire. Pole wire shall run from handhole to luminaire.

Pole wire shall be sized No. 10, rated 600 V, RHW/USE-2, and have copper conductors, stranded in conformance with ASTM B 8. Pole wire shall be insulated with cross-linked polyethylene (XLP) insulation. Pole wire shall include a phase, neutral, and green ground wire. Wire shall be trained within the pole or sign structure so as to avoid abrasion or damage to the insulation.

Pole wire shall be extended through the pole, pole grommet, luminaire ring, and any associated arm and tenon. The pole wire shall be terminated in a manner that avoids sharp kinks, pinching, pressure on the insulation, or any other arrangement prone to damaging insulation value and producing poor megger test results. Wires shall be trained away from heat sources within the luminaire. Wires shall be terminated so all strands are extended to the full depth of the terminal lug with the insulation removed far enough so it abuts against the shoulder of the lug, but is not compressed as the lug is tightened.

Included with the pole wiring shall be fusing located in the handhole. Fusing shall be according to Article 1065.01 with the exception that fuses shall be 6 amperes.

Each luminaire and optical assembly shall be free of all dirt, smudges, etc. Should the optical assembly require cleaning, a luminaire manufacturer approved cleaning procedure shall be used.

Horizontal mount luminaires shall be installed in a level, horizontal plane, with adjustments as needed to insure the optics are set perpendicular to the traveled roadway.

When the pole is bridge mounted, a minimum size stainless steel 1/4-20NC set screw shall be provided to secure the luminaire to the mast arm tenon. A hole shall be drilled and tapped through the tenon and luminaire mounting bracket and then fitted with the screw.

Warranty.

The entire luminaire and all of its component parts shall be covered by a 10-year warranty. Failure is when one or more of the following occur:

- 1) Negligible light output from more than 10 percent of the discrete LEDs.
- 2) Significant moisture that deteriorates performance of the luminaire.
- 3) Driver that continues to operate at a reduced output due to overheating.

The warranty period shall begin on the date of luminaire delivery. The Contractor shall verify that the Resident Engineer has noted the delivery date in the daily diary. Copy of the shipment and delivery documentation shall be submitted with the final documentation.

The replacement luminaire shall be of the same manufacturer, model, and photometric distribution as the original.

Method of Measurement.

The rated initial minimum luminous flux (lumen output) of the light source, as installed in the luminaire, shall be according to the following table for each specified output designation.

Designation Type	Minimum Initial Luminous Flux	Designation Type	Minimum Initial Luminous Flux
A	2,200	F	12,500
B	3,150	G	15,500

C	4,400	H	25,200
D	6,300	I	33,000
E	9,450		

Where delivered lumens is defined as the minimum initial delivered lumens at the specified color temperature. Luminaires with an initial luminous flux less than the values listed in the above table will not be acceptable even if they meet the requirements given in the Luminaire Performance table shown in the contract.

Basis of Payment.

This work will be paid for at the contract unit price per each for **LUMINAIRE, LED, ROADWAY**, of the output designation specified.

UNDERPASS LUMINAIRE (SPECIAL)

Description. This work shall consist of furnishing and installing LED underpass luminaire as shown on the plans, specified herein and installation according to Section 821 of the Standard Specification.

Materials. The underpass luminaire shall be Holophane LED Wallpack HLWPC2 model number HLWPC2 P10 40K MVOLT T3M BKSDP

Material for the LED luminaire shall be according to the following:

Optics

- IP66 rated
- Type 3 medium light distribution per IESNA classification.

Performance

- Rated for -40°C to 40°C ambient air temperature range
- Color temperature of 4000K
- Fixture wattage of 28 watts with 3,017 lumens
- B1-U0-G2

Electronic Drivers

- Multi-volt 120-277 V
- 20kV/10kA level of surge protection.

Housing

- Holophane HLWPC2 Wallpack LED is 4.76" high x 15.54" wide x 11.53" depth
- Housing is die-cast aluminum and fully gasketed
- Color: Black (color must be approved with local agencies before purchasing).

Finish

- Zinc-infused super durable TGIC thermoset powder coat finish for resistance to corrosion and weathering

Mounting Brackets. The brackets shall be properly sized to accommodate the weight of the luminaire with calculations or other suitable reference documentation submitted to support the material choice. The brackets shall be constructed of 304 stainless steel

The mounting brackets shall be fully coordinated with the luminaire mounting method indicated in plans.

Installation. Each luminaire shall be installed according to the luminaire manufacturer's recommendations.

Underpass luminaires shall be either attached to structures (such as piers, etc.) or suspended from structures (such as bridge decks) as indicated or implied by the configuration on the Plans. Mounting, including all hardware and appurtenant items, shall be included as part of this item. Luminaires shall be configured with the luminaire tilt as identified in the submitted documents.

Unless otherwise indicated, suspended underpass luminaires shall be installed one-inch above the lowest underpass beam and shall be mounted using vibration dampening assemblies. All mounting hardware shall be corrosion resistant and shall be stainless steel unless otherwise indicated.

No luminaire shall be installed prior to approval. Where independent testing is required, full approval will not be given until complete test results, demonstrating compliance with the specifications, have been reviewed and accepted by the Engineer.

Luminaire wiring shall be provided with the luminaire. The wiring shall run from the junction box to the luminaire.

Luminaire wire shall be sized No. 10, rated 600 V, RHW/USE-2, and have copper conductors, stranded in conformance with ASTM B 8. Luminaire wire shall be insulated with cross-linked polyethylene (XLP) insulation. The wire shall include a phase, neutral, and green ground wire. Wires shall be trained within any raceways so as to avoid abrasion or damage to the insulation.

Included with the luminaire wiring shall be fusing located in the handhole or primary junction box. Fusing shall be according to Article 1065.01 with the exception that fuses shall be 6 amperes.

Each luminaire and optical assembly shall be free of all dirt, smudges, etc. Should the optical assembly require cleaning, a luminaire manufacturer approved cleaning procedure shall be used.

Warranty.

The entire luminaire and all of its component parts shall be covered by a 10-year warranty. Failure is when one or more of the following occur:

- 1) Negligible light output from more than 10 percent of the discrete LEDs.
- 2) Significant moisture that deteriorates performance of the luminaire.
- 3) Driver that continues to operate at a reduced output due to overheating.

The warranty period shall begin on the date of luminaire shipment. The Contractor shall verify that the Resident Engineer has noted the shipment date in the daily diary. Copy of the shipment documentation shall be submitted.

The replacement luminaire shall be of the same manufacturer, model, and photometric distribution as the original.

Basis of Payment. This work will be paid for at the contract unit price per each for UNDERPASS LUMINAIRE (SPECIAL), which shall be payment in full for the material, equipment, and labor required to furnish and install the luminaire as described herein and shown in the plans.

TEMPORARY LUMINAIRE, LED, ROADWAY

Effective: November 1, 2023

Description.

This work shall consist of furnishing and installing a temporary roadway LED luminaire as shown on the plans, as specified herein.

General.

In order to expedite the roadway work, the luminaire may be new or previously used. **The luminaire shall be of the output designation specified and the distribution pattern specified in the plans.**

The luminaire shall remain the property of the Contractor.

The luminaire shall be listed for wet locations by an NRTL and shall meet the requirements of UL 1598 and UL 8750

Used luminaires shall be no older than five years old. Documentation shall be submitted to verify compliance with this requirement.

Submittal Requirements.

The Contractor shall submit manufacturer's product data for each type of luminaire including descriptive literature and catalogue cuts.

A sample luminaire shall also be provided upon request of the Engineer. The sample shall be as proposed for the contract and shall be delivered by the Contractor to the District Headquarters. After review, the Contractor shall retrieve the luminaire.

Housing.

The luminaire shall slip-fit on a mounting arm with a 2" diameter tenon (2.375" outer diameter). The luminaire shall be provided with a leveling surface and shall be capable of being tilted ± 5 degrees from the axis of attachment in 2.5 degree increments and rotated to any degree with respect to the supporting arm.

An external label consisting of two black characters on a white background with the dimensions of the label and the characters as specified in ANSI C136.15 for HPS luminaires. The first character shall be the alphabetical character representing the initial lumen output as specified in Table 1 of Article 1067.06(c). The second character shall be the numerical character representing the transverse light distribution type as specified in IES RP-8 (i.e. Types 1, 2, 3, 4, or 5).

Wiring. Wiring within the electrical enclosure shall be rated at 600v, 105°C or higher.

Driver.

The driver shall have an input voltage range of 120 to 277 volts ($\pm 10\%$) or 347 to 480 volts ($\pm 10\%$) according to the contract documents.

The driver shall meet the requirements of the FCC Rules and Regulations, Title 47, Part 15 for Class A devices with regard to electromagnetic compatibility. This shall be confirmed through the testing methods in accordance with ANSI C63.4 for electromagnetic interference.

Surge Protection. The luminaire shall comply the requirements of ANSI C136.2 for electrical transient immunity at the "Extreme" level (20KV/10KA) and shall be equipped with a surge protective device (SPD) that is UL1449 compliant with indicator light. An SPD failure shall open the circuit to protect the driver.

Installation.

Each luminaire shall be installed according to the luminaire manufacturer's recommendations.

Luminaires which are pole mounted shall be mounted on site such that poles and arms are not left unloaded. Pole mounted luminaires shall be leveled/adjusted after poles are set and vertically aligned before being energized. When mounted on a tenon, care shall be exercised to assure maximum insertion of the mounting tenon. Each luminaire shall be checked to assure compatibility with the project power system. When the night-time check of the lighting system by the Engineer indicates that any luminaires are mis-aligned, the mis-aligned luminaires shall be corrected at no additional cost.

No luminaire shall be installed prior to approval.

Pole wiring shall be provided with the luminaire. Pole wire shall run from handhole to luminaire. Pole wire shall be sized No. 10, rated 600 V, RHW/USE-2, and have copper conductors, stranded in conformance with ASTM B 8. Pole wire shall be insulated with cross-linked polyethylene (XLP) insulation. Pole wire shall include a phase, neutral, and green ground wire. Wire shall be trained within the pole or sign structure so as to avoid abrasion or damage to the insulation.

Pole wire shall be extended through the pole, pole grommet, luminaire ring, and any associated arm and tenon. The pole wire shall be terminated in a manner that avoids sharp kinks, pinching, pressure on the insulation, or any other arrangement prone to damaging insulation value and producing poor megger test results. Wires shall be trained away from heat sources within the luminaire. Wires shall be terminated so all strands are extended to the full depth of the terminal lug with the insulation removed far enough so it abuts against the shoulder of the lug, but is not compressed as the lug is tightened.

Included with the pole wiring shall be fusing located in the handhole. Fusing shall be according to Article 1065.01 with the exception that fuses shall be 6 amperes.

Each luminaire and optical assembly shall be free of all dirt, smudges, etc. Should the optical assembly require cleaning, a luminaire manufacturer approved cleaning procedure shall be used.

Horizontal mount luminaires shall be installed in a level, horizontal plane, with adjustments as needed to ensure the optics are set perpendicular to the traveled roadway.

When the pole is bridge mounted, a minimum size stainless steel 1/4-20NC set screw shall be provided to secure the luminaire to the mast arm tenon. A hole shall be drilled and tapped through the tenon and luminaire mounting bracket and then fitted with the screw.

Method of Measurement.

The rated initial minimum luminous flux (lumen output) of the light source, as installed in the luminaire, shall be according to the following table for each specified output designation.

Designation Type	Minimum Initial Luminous Flux	Designation Type	Minimum Initial Luminous Flux
A	2,200	G	15,500
B	3,150	H	25,200
C	4,400	I	47,250
D	6,300	J	63,300
E	9,450	K	80,000+
F	12,500		

Where delivered lumens is defined as the minimum initial delivered lumens at the specified color temperature. Luminaires with an initial luminous flux less than the values listed in the above table will not be acceptable.

Basis of Payment.

This work will be paid for at the contract unit price per each for **TEMPORARY LUMINAIRE, LED, ROADWAY**, of the output designation specified.

LUMINAIRE SHIELD

Description. This work shall consist of furnishing and installing a luminaire shield on luminaires in accordance with Section 821 of the Standard Specifications including the following alterations.

The luminaire shield shall be installed on the luminaires as designated in the plans or as directed by the Engineer. The shield should block light to private property. The shield shall be installed according to manufacturer's recommendations.

Basis of Payment. This work will be paid for at the contract unit price each for LUMINIARE SHIELD which price shall include all labor, equipment and materials to complete the work specified herein.

LIGHT POLE FOUNDATION, 24" DIAMETER, OFFSET

Description. This work shall consist of excavating, constructing, and backfilling offset light pole foundations in accordance with Section 836 of the Standard Specifications except as specified herein this special provision, and the details shown in the plans. Offset foundations shall be installed at locations where the utility conflict can be resolved by laterally offsetting the drilled shaft of the foundation.

The determination of foundation type shall be made in the field by the Engineer, based upon the actual locations of utilities. Payment will be made according quantity of each foundation type installed, and no additional compensation will be allowed for subtractions or additions to contract quantities for the various foundation types.

Excavation, including shoring, material disposal, and pumping, bailing or otherwise draining the excavated area shall not be paid for separately, but shall be included in the contract unit price for offset foundations.

Backfilling and thoroughly compacting material conforming to Article 1004 and shall not be paid for separately, but shall be considered as included in the contract unit price for offset foundations. Concrete shall cure in accordance with Article 1020.13 before being backfilled.

Basis of Payment. Offset foundations will be measured for payment in accordance with Article 836.04 of the Standard Specifications, and paid at the contract unit price per foot for LIGHT POLE FOUNDATION, 24" DIAMETER, OFFSET.

TEMPORARY WOOD POLE

Description. This work shall consist of furnishing and installing a temporary wood pole according to Section 830 of the Standard Specifications, as specified herein, and as directed by the Engineer.

The wood pole material shall be according to Illinois Department of Transportation Standard Specifications for Road and Bridge Construction in Article 1069.04. The wood pole shall be installed according to Illinois Department of Transportation Standard Specifications for Road and Bridge Construction in Article 830.03 (c) and 830.04.

When specified in the contract plans, one or two 15 foot truss style mast arm(s) shall be installed on a wood pole with all the necessary hardware and accessories required. The mast arm(s) shall be set at right angles to the centerline of the pavement.

Basis of Payment. This work will be paid for at the contract unit price per each for TEMPORARY WOOD POLE, 50 FOOT, CLASS 4, 15 FT MAST ARM; or TEMPORARY WOOD POLE, 45 FT., CLASS 5; which price shall be payment in full for the material including guy wire, excavation, labor, and equipment necessary to furnish and install the wood pole and work described herein.

ELECTRIC SERVICE DISCONNECT

Description. This work shall consist of furnishing and installing an Electrical Service Disconnect as shown on the contract plans and as specified herein.

The electrical service disconnect shall be installed between the power source and the removed and relocated sign no. 1 at US 14 and Lake Zurich Road.

The pedestal enclosure of the disconnect shall be sized as specified on the lighting detail plans. The cabinet shall be UL 50, NEMA Type 3R single door design with back panel. The cabinet shall be fabricated from Type 5052 H-32 aluminum with the frame and door 0.125-inch thick, the top 0.250-inch thick and the bottom 0.500-inch thick. Seams shall be continuous welded and ground smooth. The door and door opening shall be double flanged. The locking mechanism shall be slam-latch type with a keyhole cover.

The disconnect shall consist of a surge arrester, 60 amp single pole circuit breaker, a neutral and ground bus.

Basis of Payment. This work shall be paid for at the contract unit price per each for ELECTRICAL SERVICE DISCONNECT, which price shall include all labor, equipment, and material to complete the work as specified herein including the enclosure, foundation, circuit breaker, surge arrester, ground rod, and wiring complete in place. Electric cable and galvanized steel underground conduit from the service location to the disconnect cabinet and from the disconnect cabinet to the lighting controller shall be paid for under separate pay items.

EXPOSE AND RELOCATE EXISTING UNIT DUCT

Description. This work shall consist of exposing existing unit duct and relocating the unit duct to the location shown on the plans.

The existing unit duct shall be exposed to provide sufficient length to reach the new end point of the relocation with sufficient slack to make proper connections of unit duct and cable.

The unit duct shall be relocated following the applicable portions of Article 816.03.

Method of Measurement. This item will be measured for payment in feet length of relocated unit duct. The vertical distance of the relocated unit duct required for breakaway devices, barrier walls, concrete pedestals, etc., and the depth of any burial will be measured in feet.

Basis of Payment. This work will be paid for at the contract unit price per foot for EXPOSE AND RELOCATE EXISTING UNIT DUCT.

ANTI-GRAFFITI COATING

Description: This work shall consist of the application of an anti-graffiti coating at the Form Liner Textured Surface and fully compatible Staining Concrete Structures as shown on the plans. The anti-graffiti coating shall not adjust the appearance of staining color variations.

A test area of 10 square feet shall be prepared and the stain applied to the surface to verify the surface preparation, adhesion and color. Once the Engineer has approved the results from the test area the application of the stain to the rest of the exposed surfaces may be completed.

General Requirements: The anti-graffiti protecting system shall consist of a permanent, color stable, UV, stain, chemical and abrasion resistant coating. The removal of graffiti from the protected surfaces shall be accomplished by applying a separate removal agent as recommended by the manufacturer of the permanent coating. The removal agent shall have the capability of completely removing all types of paints and stains. After graffiti removal there shall be no damage to the anti-graffiti coating or the surface to which it is applied. Additionally there shall be no evidence of ghosting, shadowing, or staining of the protected surface.

Submittal: The Contractor shall submit to the Engineer for approval evidence of the selected subcontractor's five years' experience for applying anti-graffiti coating on concrete surfaces.

The Contractor shall submit a proposed procedure for obtaining the simulated finish using the approved architectural form liner style, stain (see the special provision for FORM LINED TEXTURED SURFACE), and anti-graffiti coating. The procedure shall include plans and details for the form liner

pattern and dimensions and be submitted for the Engineer's approval no later than 30 calendar days from the date of notification of approval of the style type.

Upon approval of the form liner plans and details, the Contractor shall submit up to three 6' by 6' (minimum) sample concrete panel of the simulated stone masonry finish including the staining and anti-graffiti coating. The sample panel shall be delivered and positioned on the job site at a location to be determined by the Engineer. The approved sample panel shall be the standard for concrete staining and anti-graffiti coating to replicate the look of actual stone masonry and mortar joints throughout the project.

Surface Preparation: Prior to application of the anti-graffiti coating, all designated surfaces shall be cleaned of all loose debris, previous coatings and all foreign matter by a method as recommended by the coating manufacturer and approved by the Engineer. All surfaces shall be thoroughly cleaned, dry and free of dust that might prevent penetration of the coating. New concrete should be thoroughly cured before application of the coating. Concrete surfaces shall be properly sealed according to the manufacturer's recommendations so the application of the system does not produce any noticeable long term change in color of the surfaces being treated.

Weather Conditions: Coatings shall not be applied in the rain, snow, fog or mist, nor shall they be applied if these conditions are expected within twelve (12) hours of application. Coatings shall not be applied when surface or air temperatures are less than 40°F nor greater than 100°F, or is expected to exceed these temperatures within twelve (12) hours of application.

Application: The manufacturer's product data sheets and application guides shall be submitted to the Engineer prior to coating application. All information contained in the data sheets and application guides shall be strictly followed. The wet film thickness will be measured by the Engineer and shall be according to the manufacturer's recommendation. Application of the clear protective coatings shall take place after the application and curing of the STAINING CONCRETE STRUCTURES items as appropriate for the surface to be treated.

Method of Measurement: This work will be measured in place per square feet of surface area upon which the anti-graffiti coating has been applied and accepted by the Engineer

Basis of Payment: This work will be paid for at the contract unit price per square foot for ANTI-GRAFFITI COATING which price shall be payment in full for the cleaning of designated surfaces and the application of the anti-graffiti coating.

PERMANENT GROUND ANCHORS

This work shall consist of designing, furnishing, installing, testing and stressing permanent cement-grouted ground anchors according to the plans and the special provisions. This work also includes the furnishing and installing of the anchorage head assemblies.

This is a performance specification for a single ground anchor. The Contractor is given the responsibility for the ground anchor design, construction and performance. The anchor bond lengths shown on the plans are estimated based on the soil data and were determined according to AASHTO Specifications. The Contractor shall select the ground anchor type, the installation method and

determine the bond length and anchor diameter. The Contractor shall be responsible for installing ground anchors that will develop the design capacity indicated on the Contract Plans according to the testing subsection of this Specification.

SITE GEOLOGY AND SOILS CONDITIONS

The geologic conditions for this project are represented by the boring information shown on the plans. The Contractor, utilizing his/her expertise, shall be responsible for interpreting the data, including but not limited to, the making of additional borings as necessary to be fully familiar with the existing conditions in order to design and successfully install the permanent ground anchors as specified. Variations in geologic deposits, rock surface or ground water elevations, etc., are to be expected between borings and shall not be considered a change in site conditions as defined by Article 104.03 of the Standard Specifications.

SUBMITTALS

Qualifications. The Contractor performing the work described in this Specification shall have installed permanent ground anchors for a minimum of three (3) years. At the time of the preconstruction meeting, the Contractor shall submit a list containing at least five (5) projects, completed within the last three (3) years, where the Contractor has installed permanent ground anchors. A brief description of each project and a reference shall be included for each project listed. As a minimum, the reference shall include an individual's name, company and current phone number.

The Contractor shall submit a list identifying the engineer, drill operators and on-site supervisors who shall be assigned to the project. The list shall contain a summary of each individual's experience and it shall be complete enough for the Engineer to determine whether or not each individual has satisfied the following qualifications.

The Contractor shall assign an engineer to supervise the work with at least three (3) years of experience in the design and construction of permanently anchored structures. The Contractor may not use consultants or manufacturer's representatives in order to meet the requirements of this section. Drill operators and on-site supervisors shall have a minimum of one (1)-year experience installing permanent ground anchors with the Contractor's organization.

Work shall not be started on any ground anchor wall system nor materials ordered until approval of the Contractor's qualifications are given. The Engineer may suspend the ground anchor work if the Contractor substitutes unqualified personnel for approved personnel during construction. If work is suspended due to the substitution of unqualified personnel, the Contractor shall be fully liable for additional costs resulting from the suspension of work and no adjustments to contract time resulting from suspension will be allowed.

Shop plans. At least four weeks before work is to begin, the Contractor shall submit to the Engineer for review and approval complete shop plans and design calculations prepared and sealed by an Illinois Licensed Professional Engineer, describing the ground anchor system or systems intended for use. The submittal shall include the following:

A ground anchor schedule giving:
Ground anchor number
Ground anchor design load

Type and size of tendon
Minimum total anchor length
Minimum bond length
Minimum tendon length
Minimum unbonded length

A drawing of the ground anchor tendon and the corrosion protection system, including details for the following:

Spacers separating elements of tendon and their location
Centralizers and their location
Unbonded length corrosion protection system
Bond length corrosion protection system
Anchorage head assembly and trumpet
Anchorage cover corrosion protection system
Drilled or formed hole size
Level of each stage of grouting
Any revisions to structure details necessary to accommodate the ground anchor system intended for use.

The grout mix design and procedures for placing the grout.

No work on ground anchors shall begin until shop plans have been approved in writing by the Engineer. Such approval shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work.

MATERIALS

Prestressing Steel: Ground anchor tendons shall consist of single or multiple elements of one of the following prestressing steels:

Uncoated, seven-wire strands, conforming to AASHTO M203 (M203M)
Indented, seven-wire strands, conforming to ASTM A886 (A886M)
Epoxy coated, seven-wire strands, conforming to ASTM A882 (A882M)
Steel bars conforming to AASHTO M275 (M275M)

Prestressing Steel Couplers: Prestressing steel couplers shall be capable of developing 95 percent of the minimum specified ultimate tensile strength of the prestressing steel.

Grout: Cement shall be Type I, II or III portland cement conforming to Section 1001 of the Standard Specifications. Cement used for grouting shall be fresh and shall not contain any lumps or other indications of hydration or "pack set."

Aggregate shall conform to the requirements for fine aggregate Section 1003 of the Standard Specifications.

Admixtures may be used in the grout subject to the approval of the Engineer. Expansive admixtures may only be added to the grout used for filing sealed encapsulations, trumpets, anchorage head assemblies and covers. Accelerators shall not be used.

Water for mixing grout shall be according to Section 1002 of the Standard Specifications.

Steel Elements: Anchorage head assemblies, including bearing and wedge plates, shall be fabricated from steel conforming to AASHTO M270 (M270M) Grade 36 (250), or be a ductile iron casting conforming to ASTM A536.

Trumpets used to provide a transition from the anchorage head assembly to the unbonded length corrosion protection shall be fabricated from a steel pipe or tube conforming to the requirements of ASTM A53 (A53M) for pipe or ASTM A500 (A500M) for tubing. Minimum wall thickness shall be 0.20 inch (5 mm).

Anchorage covers used to enclose exposed anchorages shall be fabricated from steel, steel pipe, steel tube, or ductile cast iron conforming to the requirement of AASHTO M270 (M270M) Grade 36 (250) for steel, ASTM A53 (A53M) for pipe, ASTM A500 (A500M) for tubing, and ASTM A536 for ductile cast iron. Minimum thickness shall be 0.10 inch (2.5 mm).

Corrosion Protection Elements: Corrosion inhibiting grease shall conform to the requirements of the Post Tensioning Institute's "Specifications for Unbonded Single Strand Tendons," Section 3.2.5.

The sheath for the unbonded length of a tendon shall consist of one of the following:

Seamless polyethylene (PE) tube having a minimum wall thickness of 60 mils (1525 microns) plus or minus 10 mils (250 microns). The polyethylene shall be cell classification 334413 by ASTM D3350.

Seamless polypropylene tube having a minimum wall thickness of 60 mils (1525 microns) plus or minus 10 mils (255 microns). The polypropylene shall be cell classification PP210B55542- 11 by ASTM D4101.

Heat shrinkable tube consisting of a radiation crosslinked polyolefin tube internally coated with an adhesive sealant. The minimum tube wall thickness before shrinking shall be 24 mils (610 microns). The minimum adhesive sealant thickness shall be 20 mils (510 microns).

A corrugated tube conforming to the requirement of the encapsulation for the tendon bond length.

Encapsulation for the tendon bond length shall consist of one of the following:

Corrugated high density polyethylene (HDPE) tube having a minimum wall thickness of 30 mils (760 microns) and conforming to AASHTO M252 requirements.

Deformed steel tube or pipe having a minimum wall thickness of 25 mils (635 microns).

Corrugated polyvinyl chloride (PVC) tube having a minimum wall thickness of 30 mils (760 microns). (ASTM D1784) class 13464-B

Fusion-bonded epoxy conforming to the requirements of AASHTO M284 (M284M), except that it shall have a film thickness of 15 mils (380 microns).

Miscellaneous Elements: The bondbreaker for a tendon shall consist of smooth plastic tube or pipe that is resistant to aging by ultra-violet light and that is capable of withstanding abrasion, impact and bending during handling and installation.

Spacers for separation of elements of a multi-element tendon shall permit the free flow of grout. They shall be fabricated from plastic, steel or material which is not detrimental to the prestressing steel. Wood shall not be used.

Centralizers shall be fabricated from plastic, steel or material which is not detrimental to either the prestressing steel or any element of the tendon corrosion protection. Wood shall not be used.

FABRICATION

Tendons for ground anchors may be either shop or field fabricated from materials conforming to this specifications requirements. Tendons shall be fabricated as shown on the approved shop plans.

Bond Length and Tendon Bond Length: The Contractor shall determine the bond length necessary to satisfy the load test requirements. The minimum bond length shall be 10 ft (3 m) in rock, 15 ft (4.6 m) in soil. The minimum tendon bond length shall be 10 ft (3 m).

Spacers shall be placed along the tendon bond length of multi-element tendons so that the prestressing steel will bond to the grout. They shall be located at 10 ft (3 m) maximum centers with the upper one located a maximum of 5 ft (1.5 m) from the top of the tendon bond length and the lower one located a maximum of 5 ft (1.5 m) from the bottom of the tendon bond length.

Centralizers shall be able to maintain the position of the tendon so that a minimum of 0.75 inches (19 mm) of grout cover is obtained on the tendons at all locations along the tendons. They shall be located at 5 ft (1.5 m) maximum centers with the lower one located 1 ft (305 mm) from the bottom of the bond length. Centralizers are not required on tendons installed utilizing a hollow- stem auger if it is grouted through the auger and the drill hole is maintained full of a stiff grout 9 inch (230 mm) slump or less during extraction of the auger, or when installed utilizing a pressure injection system in coarse grained soils using grout pressures greater than 150 psi (1035 kPa).

Encapsulation Protected Ground Anchor Tendon: The tendon bond length shall be encapsulated by a grout-filled corrugated plastic or deformed steel tube, or by a fusion-bonded epoxy coating. The tendon can be grouted inside the encapsulation prior to inserting the tendon in the drill hole or after the tendon has been placed in the drill hole. Punching holes in the encapsulation and allowing the grout to flow from the encapsulation to the drill hole, or vice versa, will not be permitted. The tendon shall be centralized within the encapsulation and the tube sized to provide an average of 0.20 inch (5 mm) of grout cover for the prestressing steel. The anchorage device of tendons protected with fusion-bonded epoxy shall be electrically isolated from the structure.

Unbonded Length: The unbonded length of the tendon shall be a minimum of 15 ft (4.6 m) or as indicated on the plans.

Corrosion protection shall be provided by a sheath completely filled with corrosion inhibiting grout, or a heat shrinkable tube. Continuity of corrosion protection shall be provided at the transition from the bonded length to unbonded length of the tendon.

If the sheath provided is not a smooth tube, then a separate bondbreaker must be provided to prevent the tendon from bonding to the anchor grout surrounding the unbonded length.

Anchorage and Trumpet: Nonrestressable anchorages may be used unless restressable anchorages are designated on the plans.

The trumpet shall be welded to the bearing plate. The trumpet shall have an inside diameter at least 1/4 inch (6 mm) larger than the hole in the bearing plate. The trumpet shall be long enough to accommodate movements of the structure during testing and stressing. For strand tendons with encapsulation over the unbonded length, the trumpet shall be long enough to enable the tendons to

make a transition from the diameter of the tendon in the unbonded length to the diameter of the tendon at the anchorage head assembly without damaging the encapsulation. Trumpets shall be filled with grout and have a temporary seal provided between the trumpet and the unbonded length corrosion protection.

Tendon Storage and Handling: Tendons shall be stored and handled in such a manner as to avoid damage or corrosion. Damage to tendon prestressing steel as a result of abrasions, cuts, nicks, welds and weld splatter will be cause for rejection by the Engineer. Grounding of welding leads to the prestressing steel is not permitted. Prior to inserting a tendon into the drilled hole, its corrosion protection elements shall be examined for damage. Any damage found shall be repaired in a manner approved by the Engineer.

INSTALLATION

The first anchor of each type should be installed and performance tested successfully before drilling any other anchors of that type at each wall. In the event that an anchor fails the performance test, the Contractor shall re-evaluate the installation procedure and take necessary corrective action. In addition, the first two (2) anchors installed after the Contractor takes necessary corrective action shall be performance tested. The above process shall be repeated until these anchors pass the performance test.

The Contractor shall follow the same installation procedures that are used on the successful performance test anchors.

Drilling: The drilling method used may be core drilling, rotary drilling, percussion drilling, auger drilling or driven casing. The method of drilling used shall be that which prevents loss of ground above the drilled hole that may be detrimental to the structure or existing structures. Casing for anchor holes, if used, shall be removed, unless permitted by the Engineer to be left in place. Excessive amounts of water shall not be used in the drilling operation. Inclination and alignment shall be within plus or minus 3 degrees of the planned angle at the anchorage head assembly. Drilling in shale shall require the hole to be completed, tendon inserted, and grouted within the same working day.

Tendon Insertion: The tendon shall be inserted into the drilled hole to the desired depth without difficulty. When the tendon cannot be completely inserted it shall be removed and the drill hole cleaned or redrilled to permit insertion. Partially inserted tendons shall not be driven or forced into the hole.

Grouting: The grouting equipment shall produce a grout free of lumps and undispersed cement. A positive displacement grout pump shall be used. The pump shall be equipped with a pressure gauge to monitor grout pressures. The pressure gauge shall be capable of measuring pressures of at least 150 psi (1035 kPa) or twice the actual grout pressures used, whichever is greater. The grouting equipment shall be sized to enable the grout to be pumped in one continuous operation. The mixer shall be capable of continuously agitating the grout.

The grout shall be injected from the lowest point of the drilled hole. The grout may be pumped through grout tubes, casing, hollow-stem augers or drill rods. The grout may be placed before or after insertion of the tendon. The quantity of the grout and the grout pressures shall be recorded. The grout pressures and grout takes shall be controlled to prevent excessive heave of the ground or fracturing of rock formations.

Except where indicated below, the grout above the top of the bond length may be placed at the same time as the bond length grout, but it shall not be placed under pressure. The grout at the top of the drill hole shall stop 6 inches (150 mm) from the back of the trumpet.

If the ground anchor is installed in a fine-grained soil using a drilled hole larger than 6 inches (150 mm) in diameter, then the grout above the top of the bond length shall be placed after the ground anchor has been load tested. The entire drill hole may be grouted at the same time if it can be demonstrated that the ground anchor system does not derive a significant portion of its load resistance from the soil above the bond length portion of the ground anchor.

If grout protected tendons are used for ground anchors anchored in rock, then pressure grouting techniques shall be utilized. Pressure grouting requires that the drill hole be sealed and that the grout be injected until a 50 psi (345 kPa) grout pressure can be maintained on the grout within the bond length for a period of 5 minutes.

Upon completion of grouting, the grout tube may remain in the drill hole provided it is filled with grout.

After grouting, the tendon shall not be loaded for a minimum of three days.

Trumpet and Anchorage: The corrosion protection surrounding the unbonded length of the tendon shall extend into the trumpet a minimum of 6 inches (150 mm) beyond the bottom seal in the trumpet.

The corrosion protection surrounding the unbonded length of the tendon shall not contact the bearing plate or the anchorage head assembly during load testing or stressing.

The trumpet shall be completely filled with corrosion inhibiting grout. The grout shall be placed after the ground anchor has been load tested and locked off at the design load. The Contractor shall demonstrate that the procedures selected for placement of grout will produce a completely filled trumpet and anchorage head assembly.

Anchorage not encased in concrete wall fascia shall be covered with a corrosion inhibiting grout-filled steel enclosure.

TESTING AND STRESSING

Each ground anchor shall be load tested by the Contractor in the presence of the Engineer. No load greater than 10 percent of the design load may be applied to the ground anchor prior to load testing. The test load shall be simultaneously applied to the entire tendon.

Testing Equipment: Two dial gauges or vernier scales capable of measuring displacements to 1.1 inch (25 microns) shall be used to measure ground anchor movement on either side of the jack from two independent points. They shall have adequate travel so total ground anchor movement can be measured without resetting the devices.

A hydraulic jack and pump shall be used to apply the test load. The jack and a calibrated pressure gauge shall be used to measure the applied load. The pressure gauge shall be graduated in 100 psi (690 kPa) increments or less. When the theoretical elastic elongation of the total anchor length at the maximum test load exceeds the ram travel of the jack, the procedure for recycling the jack ram shall be included in the working drawings. Each increment of test load shall be applied in one minute or less.

A calibrated reference pressure gauge shall be available at the site. The reference gauge shall be calibrated with the test jack and pressure gauge.

An electrical resistance load cell and readout shall be provided when performing a creep test.

The stressing equipment shall be placed over the ground anchor tendon in such a manner that the jack, bearing plates, load cell and stressing anchorage are axially aligned with the tendon and the tendon is centered within the equipment.

Performance Test: Performance Test: At each wall, a minimum of one of each anchor type as designated on the ground anchor schedule or five percent of the ground anchors (consisting of at least one of each anchor type as designated on the ground anchor schedule), whichever is greater shall be performance tested according to the following procedures. The Engineer shall select the ground anchors to be performance tested. The remaining anchors shall be tested according to the proof test procedures.

The performance test shall be made by incrementally loading and unloading the ground anchor according to the following schedule unless a different maximum test load and schedule are indicated on the plans. The load shall be raised from one increment to another immediately after recording the ground anchor movement. The ground anchor movement, on either side of the jack, shall be measured and recorded to the nearest 0.001 inch (25 micron) with respect to the independent fixed reference points at the alignment load and at each load increment. The load shall be monitored with a pressure gauge. The reference pressure gauge shall be placed in series with the pressure gauge during each performance test. If the load determined by the reference pressure gauge and the load determined by the pressure gauge differ by more than 10 percent, the jack, pressure gauge and reference pressure gauge shall be recalibrated. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

Performance Test Schedule

<u>Load</u>	<u>Load (Continued)</u>
AL	AL
0.25DL*	0.25DL
AL	0.50DL
0.25DL	0.75DL
0.50DL*	1.00DL
AL	1.20DL*
0.25DL	AL
0.50DL	0.25DL
0.75DL*	0.50DL
AL	0.75DL
0.25DL	1.00DL
0.50DL	1.20DL
0.75DL	1.33DL*
1.00DL*	(Max. test load)
	Reduce to lock-off load (1.00DL)

Where: AL = Alignment Load
DL = Design load for ground anchor
* = Graph required

The maximum test load in a performance test shall be held for 10 minutes. The jack shall be repumped as necessary in order to maintain a constant load. The load hold period shall start as soon as the maximum test load is applied and the ground anchor movement shall be measured and recorded at 1, 2, 3, 4, 5, 6 and 10 minutes. If the ground anchor movements between 1 minute and 10 minutes exceed 0.04 inch (1 mm), the maximum test load shall be held for an additional 50 minutes. If the load hold is extended, the ground anchor movement shall be recorded at 15, 20, 25, 30, 45 and 60 minutes.

A graph shall be constructed showing a plot of ground anchor movement versus load for each load increment marked with an asterisk (*) in the performance test schedule and a plot of the residual ground anchor movement of the tendon at each alignment load versus the highest previously applied load. Graph format shall be approved by the Engineer prior to use.

Proof Test: The proof test shall be performed by incrementally loading the ground anchor according to the following schedule. The load shall be raised from one increment to another immediately after recording the ground anchor movement. The ground anchor movement, on either side of the jack, shall be measured and recorded to the nearest 0.001 inch (25 micron) with respect to the independent fixed reference points at the alignment load and at each increment of load. The load shall be monitored with a pressure gauge. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

Proof Test Schedule

<u>Load</u>	<u>Load (Continued)</u>
AL	1.00DL
0.25DL	1.20DL
0.50DL	1.33DL
0.75DL	(Max. test load)
	Reduce to lock-off load (1.00DL)

Where: AL = Alignment Load
DL = Design load for ground anchor

The maximum test load in a proof test shall be held for 10 minutes. The jack shall be repumped as necessary in order to maintain a constant load. The load hold period shall start as soon as the maximum test load is applied and the ground anchor movement shall be measured and recorded at 1, 2, 3, 4, 5, 6 and 10 minutes. If the ground anchor movement between 1 minute and 10 minutes exceeds 0.04 inch (1 mm), the maximum test load shall be held for an additional 50 minutes. If the load hold is extended, the ground anchor movement shall be recorded at 15, 20, 25, 30, 45 and 60 minutes. A graph shall be constructed showing a plot of ground anchor movement versus load for each load increment in the proof test.

Creep Test: Creep tests shall be performed only if required by the plans. The Engineer shall select the ground anchor(s) to be creep tested.

The creep test shall be made by incrementally loading and unloading the ground anchor according to the performance test schedule used. At the end of each loading cycle, the load shall be held constant for the observation period indicated in the creep test schedule below unless a different maximum test load is indicated on the plans. The times for reading and recording the ground anchor movement during each observation period shall be 1, 2, 3, 4, 5, 6, 10, 15, 20, 25, 30, 45,

60, 75, 90, 100, 120, 150, 180, 210, 240, 270 and 300 minutes as appropriate. Each load hold period shall start as soon as the test load is applied. In a creep test the pressure gauge and reference pressure gauge will be used to measure the applied load, and the load cell will be used to monitor small changes of load during a constant load hold period. The jack shall be repumped as necessary in order to maintain a constant load.

Creep Test Schedule

<u>Load</u>	<u>Observation Period (Minutes)</u>
AL	
0.25DL	10
0.50DL	30
0.75DL	30
1.00DL	45
1.20DL	60
1.33DL	300

A graph shall be constructed showing a plot of the ground anchor movement and the residual movement measured in a creep test as described for the performance test. Also, a graph shall be constructed showing a plot of the ground creep movement for each load hold as a function of the logarithm of time.

Ground Anchor Load Test Acceptance Criteria: A performance-tested or proof-tested ground anchor with a 10 minute load hold is acceptable if the:

- (1) Ground anchor resists the maximum test load with less than 0.04 inch (1 mm) of movement between 1 minute and 10 minutes; and
- (2) Total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.

A performance-tested or proof-tested ground anchor with a 60 minute load hold or a creep tested ground anchor is acceptable if the:

- (1) Ground anchor resists the maximum test load with a creep rate that does not exceed 0.08 inch (2 mm) in the last log cycle of time; and
- (2) Total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.

If the total movement of the ground anchor at the maximum test load does not exceed 80 percent of the theoretical elastic elongation of the unbonded length, the ground anchor shall be replaced at the Contractor's expense.

A ground anchor which has a creep rate greater than 0.08 inch (2 mm) per log cycle of time can be incorporated into the structure at a design load equal to one-half of its failure load. The failure load is the load resisted by the ground anchor after the load has been allowed to stabilize for 10 minutes.

When a ground anchor fails, the Contractor shall modify the design and/or the installation procedures. These modifications may include, but are not limited to, installing a replacement ground anchor, reducing the design load by increasing the number of ground anchors, modifying the installation methods, increasing the bond length or changing the ground anchor type. Any modification which requires changes to the structure shall be approved by the Engineer. Any modifications of design or construction procedures shall be without additional cost to the Department and without extension of contract time.

Retesting of a ground anchor will not be permitted, except that regouted ground anchors may be retested each time they are regouted.

Lock Off: Upon successful completion of the load testing, the ground anchor load shall be reduced to the design load indicated on the plans and transferred to the anchorage device. The ground anchor may be completely unloaded prior to lock-off. After transferring the load and prior to removing the jack, a lift-off load reading shall be made. The lift-off load shall be within 10 percent of the specified lock-off load. If the load is not within 10 percent of the specified lock-off load, the anchorage shall be reset and another lift-off load reading shall be made. This process shall be repeated until the desired lock-off load is obtained.

METHOD OF MEASUREMENT

This work will be measured per each permanent ground anchor, installed according to the plans or as approved by the Engineer, and passing the testing program(s) required in this Special Provision.

BASIS OF PAYMENT

This work will be paid for at the contract unit price each for PERMANENT GROUND ANCHOR and shall be compensation in full for designing, furnishing, installing and testing the permanent ground anchors and anchorage head assemblies.

STAINING CONCRETE STRUCTURES

Description: This work shall consist of staining the form-liner textured surfaces as shown in the plans to replicate actual stone masonry and mortar joints. The staining shall match the color variations present in natural limestone, accurately simulating the appearance of real stone masonry constructions. Final coloration of the designated concrete surfaces shall accurately simulate the appearance of actual stone including multiple colors, shades, flecking, and veining. It shall also simulate the colors that may be present due to aging, staining, oxidation, rusting and/or organic staining from soil and vegetation. An example of the desired staining is shown below.



Materials: The stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight, and/or weathering.

The stain shall be odor free and V.O.C. compliant. The stain shall meet the requirements for weathering resistance of 200 hours accelerated exposure.

Submittals and Sample Panel: The Contractor shall submit to the Engineer for approval evidence of the selected subcontractor's five years of experience making color stains to match natural stone and mortar colors on concrete surfaces.

Upon approval of the form liner type, the Contractor shall submit a manufacturer's Product Data Sheet (PDS), Material Safety Data Sheet (MSDS) and color chip palette with specific color choices indicated for the color stain and a PDS and MSDS for the finish coating. The Contractor shall also provide a surface preparation and painting plan with documentation of the application method and equipment and applicator experience and qualifications.

Upon approval of the form liner plans and details, the Contractor shall submit up to three 6' by 6' (minimum) sample concrete panel of the simulated stone masonry finish including the staining. The sample panel shall be delivered and positioned on the job site at a location to be determined by the Engineer. The approved sample panel shall be the standard for concrete staining to replicate the look of actual stone masonry and mortar joints throughout the project.

General: The surfaces to be stained shall be structurally sound, clean, dry, and fully cured. The concrete shall be at least 30 days old prior to applying the stain. Curing agents must be removed a minimum of 14 days prior to staining to allow the concrete to dry out.

Temperature and relative humidity conditions shall meet the manufacturer's application instructions. Do not apply the stain under rainy conditions or within three (3) days after surfaces become wet from rainfall or other moisture. Do not apply when the weather is foggy or overcast.

The concrete surface shall be cleaned prior to applying the stain materials. The methods and materials used for cleaning the substrate shall be as recommended by the manufacturer of the water-repellent stain. The Contractor shall insure that the surface is free of latency, dirt, dust, grease, efflorescence, paint, or other foreign material. The Contractor shall not use sandblasting as a cleaning method. The preferred method to remove latency is pressure washing with water, at a minimum 3000 psi (3-4 gal/min), using fan nozzle. The nozzle should be positioned perpendicular to and at a distance of 1-2 feet from the concrete surface. The cleaned surface shall be free of blemished, discoloration, surface voids and unnatural form marks.

The stain shall be thoroughly mixed according to the manufacturer's directions using an air-driven or other explosion-proof power mixer. Mix all containers thoroughly prior to application. Do not thin the material. Materials shall be applied at the rate as recommended by the manufacturer. Absorption rates may be increased or decreased depending upon the surface texture and porosity of the substrate so as to achieve even staining.

A test area of 10 square feet shall be prepared and the stain applied to the surface to verify the surface preparation, adhesion and color. Once the Engineer has approved the results from the test area the application of the stain to the rest of the exposed surfaces may be completed.

Take precautions to ensure that workman and work areas are adequately protected from fire and health hazards resulting from handling, mixing and application of materials. Furnish all the necessary equipment to complete the work. Provide drop cloths and other forms of protection necessary to protect all adjoining work and surfaces to render them completely free of overspray and splash from the concrete stain work. Any surfaces, which have been damaged or splattered, shall be cleaned, restored, or replaced to the satisfaction of the Engineer.

Schedule the color stain application with earthwork and back-filling of any wall areas making sure that all simulated stone texture that might fall below grade is colored prior to back-filling. Delay adjacent plantings until color application is completed. Coordinate work to permit coloring applications without interference from other trades. Where exposed soil or pavement is adjacent which may splatter dirt or soil from rainfall, or where surface may be subject to over-spray from other processes, provide temporary cover of completed work.

UV protection shall be applied to the final exposed surface.

Method of Measurement: The exposed surfaces stained will be measured in place and the area computed in square feet.

Basis of Payment: This work will be paid for at the contract unit price per square foot for STAINING CONCRETE STRUCTURES. The unit price shall include all equipment, materials and labor required to stain and finish the exposed concrete surfaces.

CONCRETE WATERPROOFING

DESCRIPTION

This work shall consist of furnishing and installing asphaltic damp-proofing of concrete surfaces as shown in the plans or as directed by the Engineer.

MATERIALS

The damp-proofing mastic shall be a cold applied, light trowel grade of an asphaltic bituminous binder, impregnated with mineral fillers and inorganic fibers. The mastic shall be uniformly troweled over the surfaces without holes, skips, or holidays at the approximate rate of 5 gallons per 100 SF. The damp-proofing mastic shall be:

1. "Sealmastic Emulsion", as manufactured by W.R. Meadows, Inc., Hampshire, IL 60140
2. "Karnak #920AF Fibered Emulsion Mastic", as manufactured by Karnak Corporation, Clark, NJ 07066,
3. "MasterSeal", as manufactured by BASF Corporation, Shakopee, MN 55379.

The protection board to be placed over the damp-proofing mastic shall be a standard protection course, approximately 1/2 inch thick, composed of a mixture of bitumens and mineral fibers sandwiched between two liners. Protection board shall be carefully butted at the edges to make a complete protection course for the damp-proofing mastic. Protection board shall be compatible with the damp-proofing mastic and shall be "Vibraflex", as produced by W.R. Meadows, Inc., "Texmastic Backerboard 501-A", as produced by Texmastic International, Inc. Dallas, TX 75211.

CONSTRUCTION REQUIREMENTS

Damp-proofing shall be applied after the forms have been removed, but before the fill is

placed. Where the new sections of the cast-in-place concrete abuts the existing new concrete the damp-proofing shall extend beyond the interface a minimum of 1-foot or as recommended by the manufacturer. The new surfaces to be damp-proofed shall be free of all dust, dirt, and loose particles by means of compressed air or wire brush prior to application of damp-proofing. A filter and oil trap shall be provided in the air line to prevent a film of oil from being deposited from the compressor. After the existing surfaces have been cleaned, each surface of the area to be damp-proofed shall be inspected to ensure proper adhesion of the damp-proofing mastic.

Method of Measurement: This work will be measured in place per square feet of surface area upon which the asphalt damp-proofing has been applied and accepted by the Engineer.

Basis of Payment: This work will be paid for at the contract unit price per square foot for CONCRETE WATERPROOFING which price shall be payment in full for the cleaning of designated surfaces and the application of the asphalt damp-proofing.

FURNISH AND INSTALL WALKWAY

Description. The work consists of furnishing and installing the walkways on the bridge spans at track level. The work includes all labor, materials, tools, equipment and incidentals necessary to install the Walkway as shown on the plans. The work shall be in accordance with Section 505 of the Standard Specifications and American Railway Engineering and Maintenance of Way Association (AREMA) "Manual for Railway Engineering", except as modified herein, as shown on the drawings and as directed by the Engineer.

SUBMITTALS

Shop, fabrication and field erection drawings showing bracket sizes, grating sizes, cutouts, field location, clearances, locations of clamps, shall be submitted for approval.

- A. The Fabricator's attention is called to the requirements for shop drawings noted in Chapter 15, Article 1.1.3 Shop Drawings of AREMA Specifications.
- B. The Contractor shall furnish at least three (3) complete sets of detailed shop drawings to the Illinois Tollway for approval prior to starting fabrication. Unchecked drawings shall not be submitted for approval. After approval of shop drawings, the Contractor shall supply the Illinois Tollway with one set of reproducible of the approved drawings.
- C. The rejection of, or the procedure for the correction of, shop drawings will not be considered as cause for delay.
- D. Original drawings and a pdf copy shall be furnished at the completion of the contract in accordance with Chapter 15, Article 1.1.3 of the AREMA Specifications. Reproducibles made by the diazo process are not acceptable. They shall be provided to the Engineer for distribution.
- E. Approval by the Engineer of shop drawings shall not relieve the Contractor from

furnishing material of proper dimensions, quantities and quality, nor will such approval relieve the Contractor from responsibility for errors of any sort in the shop drawings.

MATERIALS

A. Traction Tread Gratings:

Steel for the grating shall be in accordance with ASTM A653 or ASTM A924.

1. Fabricate grating to comply with requirements indicated below:
 - a) Grating steel shall be gauge as shown on plans.
 - b) Steel finish shall be hot-dip galvanized coating with a weight of not less than 2.0 ounces per square foot of coated surface.

B. Available Manufacturers:

Subject to compliance with requirements, manufacturers offering metal gratings that may be incorporated in the work include the following:

1. Eaton
2. McNichols Co.
3. Barnett/Bates Corp.

- C. Galvanizing: Steel specified or noted as "galvanized" must be coated by the hot-dip process conforming to ASTM A123, with a continuous uniformly thick coating of molten zinc. Average weight of coatings must be not less than 2 ounces per square foot of surface. Items must be galvanized after fabrication. Where the size of an assembly is too large for galvanizing, only that assembly may be galvanized prior to fabrication.

ERECTION

- A. Install walkway gratings per notes shown on the Plans and according to manufacturer recommendations, including installation clearances and standard anchoring details.
- B. Secure walkway gratings to supporting members with type of clamps and fasteners indicated in the Plans, or if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. After installation any damaged galvanized surface must be touched-up with an approved cold galvanizing spray.

Method of Measurement. This work will be measured by feet of walkway grating which has been incorporated into the completed and accepted work. The quantity will be based on the dimensions as shown on the Plans or from revised dimensions authorized by the Engineer.

Basis of Payment. This work will be paid for at the contract unit price per foot for FURNISH & INSTALL WALKWAY.

MEMBRANE WATERPROOFING (SPECIAL)

Description: This work shall consist of furnishing, transporting and placing of all material required to construct a membrane waterproofing, integrated protection course and deck drainage system on the new steel deck and ballast curbs of the bridge as shown on the plans. The work shall be in accordance with Section 580 of the Standard Specifications and American Railway Engineering and Maintenance of Way Association (AREMA) "Manual for Railway Engineering", except as modified herein, as shown on the drawings and as directed by the Engineer.

Materials: The materials shall be in accordance with to the following:

- A. Membrane: The waterproofing membrane shall be a spray-applied 100 mil two-component polymer system and shall be one of the following:
 - 1. Bridge Deck Membrane manufactured by Bridge Preservation of Kansas City, KS.
 - 2. Eliminator manufactured by Stirling Lloyd of Newington, CT.
- B. Protection Course: The waterproofing system shall include a 250 mil integrated protection course atop the membrane such as Bridge Preservations' Integrated Ballast Mat, or an approved equal.
- C. Deck Plate Joints: The expansion joint details shall be provided by the waterproofing manufacturer and shall meet all manufacturer's requirements and as detailed on the Plans.
- D. Welded Deck Plate Joints: Welded floor plate gaps between field welded deck plates shall be filled at the rate of one gallon per 37.9 linear feet with a multi-component, single base, non-sag polyurethane sealant, according to ASTM C 920-79 Type M, Grade NS, Class 25.

Submittals: The Contractor shall submit the following items to the Engineer for approval:

- 1. Product data sheets and installation specifications
- 2. Material Safety Data Sheets for the products to be used in the work.
- 3. Substrate preparation details
- 4. Sample of proposed membrane, eight inches square, which will demonstrate the color, texture and thickness of the proposed membrane system.
- 5. Details for sealing the deck joints indicated on the plans. The joints must be capable of supporting the rail loadings and accommodating the movement shown on the plans.

CONSTRUCTION REQUIREMENTS

A. Inspection:

1. Prior to application of primer, inspect and approve substrate preparation.

B. Preparation:

1. Provide clean, sound metal substrate.
2. Sand blast metal surfaces to remove laitance and other contamination and provide suitable 3-5 mil blast profile.
3. Prepare metal surfaces to SSPC SP10 Near White Blast or better.
4. Test prepared surface using Elcometer adhesion testing (ASTM D4541). Minimum pull strength is 150 psi or failure in the concrete substrate, if present.
5. Metal surfaces must be above dew point prior to application.
6. Mask protected surfaces prior to spray applications.
7. Erect spray curtains and partitions as required.

C. Installation:

1. Apply the membrane in accordance with the manufacture's direction and Specifications.
2. Metal and concrete surfaces must be dry, rust-free, and have proper SSPC profile and preparation.
3. Reapply primer if it has set for more than twenty-four hours.
4. Spray base coat over primed surfaces at 20 square feet per gallon (80 mils).
5. Retouch coat by filling low spots or areas with inadequate thickness.
6. Spray additional base coats to achieve specified system thickness. Retouch as required.
7. Spray ballast protection mat to the specified thickness of 250 mils (1/4"). The drain slots in the deck plate shall be blocked out as necessary to prevent the ballast mat layer from clogging the drain slots.

D. Field Quality Control:

1. Perform dry film thickness tests in accordance with SSPC-PA2 Measurement of Dry Coating Thickness as required. Bridge Deck Membrane gels too rapidly to perform wet film test. Use magnetic or ultrasonic test equipment, destructive testing, or stroke per gallon method of assuring proper film thickness.

- a. Spray equipment is calibrated and tested to a stroke count per gallon of product sprayed. This is suitable for thickness assurance on most projects.
 - b. Ultrasonic testing is usually accurate to +/- 5%.
 - c. Repair destructive testing areas by respraying or by filling with special two component gun grade material provided by manufacturer.
2. Maintain spray and other installation equipment in proper operating condition throughout installation. Provide reserve equipment as required.
- E. Cleaning:
1. Clean spills and oversprays as they occur.
 2. Consult manufacturer's literature and Material Safety Data Sheets for proper cleaning products and methods.
 3. Clean the site to the Engineer's satisfaction prior to final acceptance.
- F. Deck Drainage System
1. The material for the deck drain half-round corrugated steel pipes, bottom pans, end plates, outlet drops, reducer sections and relevant fittings and anchors shall conform to the requirements of ASTM A760.
 2. The holes in the half-round steel pipes and bottom pans shall be punched to the pattern shown on the Plans. The half-round corrugated steel pipes, bottom pans, end plates, outlet drops and reducer sections shall be given a two-ounce galvanized protective coating after all fabrication has been completed. All parts of the drainage system shall be coated uniformly with asphalt, inside and outside as specified in AASHTO M 190, Type A. Holes in the perforated pipe and bottom pans shall be blown open after coating with asphalt.
 3. Bolts, nuts and washers shall be fabricated from steel, meeting the requirements of ASTM A325, and be galvanized in accordance with ASTM A163.
 4. The downspouts shall be plain bituminous-coated corrugated steel pipe conforming to the requirements of Article 1006.01 of the Standard Specifications. The top end of the downspouts shall be protected with a temporary wood cover.
 5. The work will not be measured for payment but will be included in the cost for MEMBRANE WATERPROOFING (SPECIAL).

Method of Measurement: The MEMBRANE WATERPROOFING (SPECIAL) will be measured for payment in place, and the area computed in square feet. The area for measurement will include only the surface of the membrane waterproofing covered with a protective cover.

Basis of Payment: This work will be paid for at the contract unit price per square foot for MEMBRANE WATERPROOFING (SPECIAL).

COFFERDAM (TYPE 2)

Description: This work shall include all labor, materials and equipment required to provide a temporary structure consisting of engineered components (cofferdam) to isolate the excavations for the substructure elements for the proposed railroad bridge (SN 049-0014) from groundwater to enable construction in dry conditions while also supporting the adjacent land and Shoofly Track. This work shall be in accordance with Section 502 of the Standard Specifications except as modified herein.

The Contractor shall submit detailed drawings and design calculations, prepared and sealed by an Illinois Licensed Structural Engineer in accordance with Article 502.06(b). The cofferdams shall be designed to resist the estimated ground water elevation provided in the plans as well as the railroad surcharge in accordance with the current AREMA specifications.

Basis of Payment: COFFERDAM (TYPE 2) will be paid for at the contract unit price per each for COFFERDAM (TYPE 2) at the locations specified.

CONCRETE STRUCTURES (SPECIAL)

Description: This work shall consist of constructing cast-in-place concrete structures. The work shall be in accordance with Standard Specification Section 503 and American Railway Engineering and Maintenance of Way Association (AREMA) "Manual for Railway Engineering", Chapter 8, Concrete Structures except as modified herein, as shown on the drawings and as directed by the Engineer.

Materials: The materials shall be in accordance Section 1020 of the Standard Specifications except as modified herein:

- (a) All concrete covered in this specification shall achieve a minimum compressive strength of 5,000 PSI at 28 days. The Contractor shall submit the proposed mix design to the Engineer for approval. IDOT approved mix designs will be allowed to target this requirement.
- (b) The use of slag, fly ash or a combination of the two will not be permitted.
- (c) Cement.
 - 1. The cement used in the concrete for all grade separations shall be low alkali cement. The Contractor shall obtain and furnish to the Engineer, a statement signed by an officer or chemist of the cement manufacturer, certifying that the cement furnished does not exceed 0.6 percent alkali equivalent as measured by the percent of sodium oxide plus 0.658 times the percent of potassium oxide.
 - 2. If the above cement type is proven to be unavailable, alternative cement proposed must be tested for alkali aggregate reactivity utilizing mortar bar accelerated expansion test or other acceptable tests. The concrete to be tested shall be based on the proposed design concrete mix and source of aggregates, which is project specific. The CN Railway Senior Engineer must approve the acceptance of the cement.
 - 3. Portland Cement: ASTM C150, domestic brand, Type I or Type IL, normal portland cement. The same brand of portland cement shall be used for exposed concrete throughout the job unless a change is approved by the Engineer. Air entraining cement is not acceptable.

- (d) High-early strength concrete may be used subject to the Engineer's approval. All provisions of the specifications shall apply, except that the 7-day compressive strength equals the 28-day strength required for normal concrete.
- (e) Coarse Aggregate: ASTM C33, Sections 7 through 10 for crushed stone, and shall meet the following requirements: Size CA-7, for slabs, walls and foundations.
- (f) Fine Aggregate: ASTM C33, Sections 3 through 6 for natural sand.
- (g) Admixtures: Use air-entraining admixture in all concrete covered in this special provision. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having an air content of not less than 5% nor more than 8% of the volume of the concrete.
- (h) Water-reducing Admixture: ASTM C494, Type A, "Pozzolith 322N" (Master Builders Co.) "WRDA" (W.R. Grace & Co.) or "Plastocrete 161" (Sika Chemical Corp.).
- (i) Air-entraining Admixture: ASTM C260, "Darex" (W.R. Grace & Co.) or "A.E.R." (Sika Chemical Corp.), "MBVR STD." (Master Builders Co.).
- (j) Calcium Chloride: Shall not be used.
- (k) Water: Shall be potable.
- (l) Bonding Agent: Epoxy type: "Resiweld Concrete Bonding R7650 Adhesives" (H. B. Fuller Co.), "PR-930" (Products Research Co.), "Epoweld 812" (Coast Pro-Seal & Manufacturing Co.), "Sta-Crete T1": (Sta-Crete Inc.). Use Bonding Agent where bonded construction joints are required, subject to the Engineer's approval. Apply according to the manufacturer's printed instructions.

Submittals: The Contractor shall submit the proposed mix designs for the review and approval of the Engineer. The Contractor, at his own expense, shall employ a technical agency, approved by the Engineer, familiar with local construction conditions and materials to design concrete mixes. Alternately, the Contractor may provide IDOT mix designs approved for the ready-mix supplier.

- (a) Mix Designs: Mix designs which are not IDOT approved shall be formulated with ample lead time (6 weeks) to allow testing and verification of the design as hereinafter specified so that mixes can be reviewed by the Engineer prior to job use.
- (b) Mix designs reviewed by the Engineer are to be on file in the Contractor's field office prior to pouring concrete.
- (c) Concrete mix designs which are not IDOT approved shall be made on the basis of "Laboratory Trial Batches" or of "Field Experience" with the material to be employed, for each type of concrete required, in accordance with the Drawings and Specifications. Chapter 5: "Concrete Quality" of ACI 318 shall apply unless specified otherwise herein.
- (d) The design mixes shall adhere to the following:
 - 1. All concrete shall be normal weight type, with water reducing admixture.

2. Strength requirements shall be 5,000 psi at 28 days as noted on the drawings.
 3. The maximum slump shall be 3 inches, plus or minus 1 inch, for unpumped concrete; 4-1/2 inches, plus or minus 1 inch for pumped concrete and lean concrete.
 4. A water-reducing admixture shall be used in strict accordance with the manufacturer's information on the varying quantities to be used to suit variations in temperatures.
 5. All weather exposed concrete shall be air-entrained 5% to 8% of volume.
- (e) Verify the adequacy of the design mixes which are not IDOT approved for compressive strength in accordance with ACI 301, and with a minimum of 12 cylinders; 6 tested at 7 days and 6 tested at 28 days with appropriate ASTM procedures for compressive and split cylinder strength.
- (f) The Contractor shall immediately notify the technical agency and the Engineer, if, at any time during construction, the concrete, resulting from the approved mix design, proves to be unsatisfactory for any reason, such as: too much water; lack of sufficient plasticity to prevent segregation, honeycomb, etc.; or insufficient strength. The technical agency shall modify the design, subject to approval of the Engineer, until a satisfactory concrete is obtained.
- (g) The Engineer will review the concrete test reports (when required) and the design mix for the concrete, to check that all required tests are made and laboratory tests are submitted, to order such changes for the concrete mix as required to produce concrete construction for compliance with the specifications and approved plans, and to report to the Department any deviation from the requirements of these specifications as indicated by records of inspection and reports of tests.

Sampling: The Contractor shall engage and pay the costs associated with engaging an independent testing laboratory to execute the following concrete tests:

- a. A minimum of four (4) cylinders be made for each 50 cubic yards or portion thereof for each class of concrete for each day are required, two (2) for checking strength at 14-day compressive strength and two (2) for 28-day compressive strength testing.
- b. The air content of freshly mixed air-entrained concrete shall be checked at least twice for each 50 cubic yards or portion thereof for each class of concrete for each day.
- c. A minimum of two (2) determinations for slump shall be made for each 50 cubic yards or portion thereof for each class of concrete for each day.

Depositing Concrete: Chutes, pipelines or baffles made of aluminum or aluminum alloy components shall not be used.

Curing: All concrete shall be cured as follows:

- (a) Concrete shall be protected from freezing, abnormally high temperatures, premature drying and moisture loss.

(b) All concrete surfaces shall be moist cured for a minimum of seven (7) consecutive days at a minimum of 50 deg. F (10 deg. C) or for the time necessary to attain 70% of the specified 28-day compressive strength.

(c) The use of curing compounds will not be permitted unless approved by the Senior Engineer.

Method of Measurement: This work shall be measured in cubic yards according to the requirements specified in Section 503.21 of the Standard Specifications.

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for CONCRETE STRUCTURES (SPECIAL).

FORM LINER TEXTURED SURFACE

Description: This work shall consist of the construction of form liner textured surfaces on designated surfaces in the contract plans.

Materials: The materials shall be according to Article 503.02 of the "Standard Specifications" and the following:

Form liners for Form Liner Textured Surface shall duplicate closely the appearance of natural stone masonry and be non-repeating. Seam lines or match lines caused from two or more molds coming together will not be apparent when viewing final wall.

The molds shall not compress more than ¼ inch when concrete is poured at a rate of 10 vertical feet per hour. The molds shall be removable without causing deterioration of surface or underlying concrete.

The forms shall be constructed so that the completed concrete structures conform to the shape, lines and dimensions of the members of the approved pattern. The forms shall be properly braced or tied together to maintain position and shape. The forms shall be made sufficiently tight to prevent leakage of the mortar. The formwork shall have the strength and stability to ensure finished concrete dimensions within the tolerances specified herein.

Pre-approval of the form liner does not include material acceptance at the job site.

Form liners shall be according to Article 503.06(a) and the requirements detailed in this specification.

The form ties shall be made of either metal or fiberglass. Metal ties, which result in a portion of the tie permanently embedded in the concrete, shall be designed to separate at least one inch back from finished surface, leaving only a neat hole that can be plugged with patching material. Contractor shall submit the type of form ties to the Engineer, for approval prior to use in this work,

The joints shall be colored to simulate real mortar.

Class SI concrete used for cast-in-place structures shall contain a high range water-reducing admixture according to Article 1021.03(c) of the "Standard Specifications" to obtain a 5"-7" slump.

Sample Panel: The Contractor shall select a form liner pattern that satisfies the requirements in the above table. The form liner shall be according to Article 503.06(a) and the following:

For a proposed equivalent the Contractor shall submit to the Engineer one (1) specification and catalog cut sheet for the style(s) of architectural form liner proposed for use on the project. Note that

the same style of form liner shall be used on all surfaces within the projects limits. The submittal shall be made no later than 14 calendar days from the date of notification to proceed with the contract. Upon receipt of the information, the Engineer, in consultation with Lake County and other local government agencies will have 30 calendar days to approve and notify the Contractor of which style of form liner is to be used on the project.

Upon receipt of notification of the style of form liner to be used or if the Contractor is proposing a form liner from the pre-approved list, he/she shall submit a proposed procedure for obtaining the simulated finish. The procedure shall include plans and details for the form liner pattern and dimensions, and be submitted for the Engineer's approval no later than 30 calendar days from the date of notification of approval of the style type. If such plans and details are not satisfactory to the Engineer, the Contractor shall make any changes as may be required by the Engineer at no additional cost to the Department.

Upon approval of the form liner plans and details, the Contractor shall submit a 3' by 3' (minimum) sample concrete panel of the simulated stone masonry finish. The sample panel shall be delivered and positioned on the job site at a location to be determined by the Engineer. The sample shall also include the concrete stain if it is included in the contract.

General: The work shall be performed according to Article 503.06 of the "Standard Specifications" and the following:

The form liners shall be installed according to the manufactures' recommendations to achieve the highest quality concrete appearance possible. The form liners shall withstand the concrete placement pressures without leakage, physical or visual defects.

The Contractor shall clean the form liners, removing any buildup prior to each use. The Contractor shall inspect each form for blemished or tears and make repairs as needed following manufacturer's recommendations.

The Contractor shall install the form liners with less than 1/4 inch separation between them. The molds shall be attached securely to the forms following manufacturer's recommendations. The panels shall be attached to each other with flush seams and seams filled as necessary to eliminate visible evidence of seams in the cast concrete.

The liner butt joints shall be blended into the pattern so as to eliminate visible vertical or horizontal seams and conspicuous form butt joint remarks. The liner joints shall fall within patterns joints or reveals. The finished textures shall be continuous without visual disruption and properly aligned over adjacent and multiple liner panels. Continuous or single liner panels shall be used where liner joints may interrupt the intended pattern. Panel remnants shall not be pieced together.

The Contractor shall notify the Engineer at least 48 hours prior to placing concrete. Concrete shall not be placed until the Engineer has inspected the formwork and the placement of reinforcing bars for compliance with the plans.

The Contractor shall apply the form release agent to all surfaces of the form liner which will come in contact with concrete, according to the manufacturers' recommendations.

The Contractor shall employ proper consolidation methods to ensure the highest quality finish. Internal vibration shall be achieved with a vibrator of appropriate size, the highest frequency and low to moderate amplitude. Concrete placement shall be in lifts not to exceed 1.5 feet. Internal vibrator operation shall be at appropriate intervals and depths and withdrawn slowly enough to assure a minimal amount of surface air voids and the best possible finish without causing segregation. An external form vibrator may be required to assure the proper results. The use of an external form vibrator must be approved by the form liner manufacturer and the Department.

The Contractor shall coordinate concrete pours to prevent visible differences between individual pours or batches. Concrete pours shall be continuous between construction or expansion joints. Cold joints shall not occur within continuous form liner pattern fields.

The form liners shall be stripped between 12 and 24 hours as recommended by the manufacturer. When stripping the forms the Contractor shall avoid creating defects in finished surface.

Wall ties shall be coordinated with the liner and form to achieve the least visible result. Place form ties at thinnest points of molds (high points of finished wall). Neatly patch the remaining hole after disengaging the protruding portion of the tie so that it will not be visible after coloring the concrete surface

Where an expansion joint must occur at a point other than at mortar or rustication joints, such as at the face of concrete texture, which is to have the appearance of stone, consult manufacturer for proper treatment of expansion material.

Curing methods shall be according to Article 1020.13 of the "Standard Specifications" and compatible with the desired aesthetic result. The use of curing compounds will not be allowed. No rubbing of flat areas or other repairs should be required after form removal. The finished exposed formed concrete surfaces shall be free of visible vertical seams, horizontal seams, and butt joint marks. Grinding and chipping of finished formed surfaces shall be avoided.

Method of Measurement: Form Liner Textured Surfaces will be measured for payment in place and the area computed in square feet.

Basis of Payment: This work will be paid for at the contract unit price per square feet for FORM LINER TEXTURED SURFACE.

BRIDGE FENCE RAILING (SPECIAL)

Description: This work shall consist of furnishing and erecting a steel Bridge Fence Railing (Special) which includes all rails, posts, bars, plates, anchor devices, bolts, nuts, washers, screws, and fabric pads as shown on the plans and as specified herein. The railing including connection hardware shall be first galvanized and then powder coated.

This work shall be performed in accordance with Section 509 and Article 1006.34 of the Standard Specifications, except as modified herein.

Materials: The manufactured galvanized railing shall be subjected to a thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a zinc-rich thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils. The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils. The color shall be as specified on the standard drawing included in the plans. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in the following table.

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).

Corrosion Resistance	B117 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822, D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 1 – Coating Performance Requirements

Method of Measurement: The Bridge Fence Railing (Special) will be measured for payment in feet. The length measured will be the overall length measured along the top longitudinal railing member through all posts and gaps.

Basis of Payment: This work will be paid for at the contract unit price per foot for BRIDGE FENCE RAILING (SPECIAL), which payment shall include all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified.

ORNAMENTAL RAILING

General. This work shall consist of furnishing and erecting ornamental railings in accordance with Section 509 of the Standard Specifications and the railing manufacturer's recommendations except as modified herein. The Ornamental Railing shall be fabricated and installed as detailed in the contract plans.

Submittal. Before beginning fabrication, the Contractor shall submit shop drawings to the Engineer for approval.

Material.

A. Steel material for fence framework (i.e., tubular pickets, rails, and posts), when galvanized after forming, shall conform to the requirements of ASTM A1011/1011M, with a minimum yield strength of 50,000 psi (344 MPa). The exterior shall be hot-dip galvanized with a 0.45 oz/ft² (138 g/m²) minimum zinc weight. The interior surface shall be coated with a minimum 81% nominal zinc pigmented coating, 0.3 mils (0.0076mm) minimum thickness.

B. Steel material for fence framework (i.e., tubular pickets, rails, and posts), when galvanized prior to forming, shall conform to the requirements of ASTM A924/924M, with a minimum yield strength of 50,000 psi (344 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft² (276 g/m²), Coating Designation G-90.

C. The manufactured galvanized framework shall be subjected to a thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a zinc-rich thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color is specified on the standard drawing included in the plans. The stratification-

coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
Weathering Resistance	D822, D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

Table 1 – Coating Performance Requirements

Fabrication

A. Pickets, rails, and posts shall be precut to specified lengths. Horizontal rails shall be pre-punched to accept pickets.

B. Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal upper raceway of the horizontal rails. (Note: This can best be accomplished by using an alignment template.) Retaining rods shall be inserted into each horizontal rail so that they pass through the predrilled holes in each picket, thus completing the panel assembly.

C. Completed panels shall be capable of supporting a 600 lb. load (applied at midspan) without permanent deformation. Panels without rings shall be biasable to a 25% change in grade; panels with rings shall be biasable to a 12.5% change in grade.

D. Gates shall be fabricated using the same components as the fence system. Panel material and gate ends having the same outside cross-section dimensions as the horizontal rail. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined either by welding or by the same retaining rod process used for panel assembly.

Method of Measurement: The work will be measured for payment in feet. The length measured will be the overall length measured along the top longitudinal railing member through all posts and gaps.

Basis of Payment: This work will be paid for at the contract unit price per foot for ORNAMENTAL RAILING, which payment shall include all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified.

ORNAMENTAL FENCE

General. This work shall consist of furnishing and erecting ornamental railings in accordance with Section 509 of the Standard Specifications and the railing manufacturer's recommendations except as

modified herein. The Ornamental Fence shall be fabricated and installed as detailed in the contract plans.

Submittal. Before beginning fabrication, the Contractor shall submit shop drawings to the Engineer for approval.

Material.

A. Steel material for fence framework (i.e., tubular pickets, rails, and posts), when galvanized after forming, shall conform to the requirements of ASTM A1011/1011M, with a minimum yield strength of 50,000 psi (344 MPa). The exterior shall be hot-dip galvanized with a 0.45 oz/ft² (138 g/m²) minimum zinc weight. The interior surface shall be coated with a minimum 81% nominal zinc pigmented coating, 0.3 mils (0.0076mm) minimum thickness.

B. Steel material for fence framework (i.e., tubular pickets, rails, and posts), when galvanized prior to forming, shall conform to the requirements of ASTM A924/924M, with a minimum yield strength of 50,000 psi (344 MPa). The steel shall be hot-dip galvanized to meet the requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft² (276 g/m²), Coating Designation G-90.

D. The manufactured galvanized framework shall be subjected to a thermal stratification coating process (high-temperature, in-line, multi-stage, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish. The base coat shall be a zinc-rich thermosetting epoxy powder coating (gray in color) with a minimum thickness of 2 mils (0.0508mm). The topcoat shall be a "no-mar" TGIC polyester powder coat finish with a minimum thickness of 2 mils (0.0508mm). The color is specified on the standard drawing included in the plans. The stratification-coated framework shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8" coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625" ball).
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Table 1 – Coating Performance Requirements

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B. Grommets shall be inserted into the pre-punched holes in the rails and pickets shall be inserted through the grommets so that pre-drilled picket holes align with the internal upper raceway of the horizontal rails. (Note: This can best be accomplished by using an alignment template.) Retaining rods shall be inserted into each horizontal rail so that they pass through the predrilled holes in each picket, thus completing the panel assembly.

C. Completed panels shall be capable of supporting a 600 lb. load (applied at midspan) without permanent deformation. Panels without rings shall be biasable to a 25% change in grade; panels with rings shall be biasable to a 12.5% change in grade.

D. Gates shall be fabricated using the same components as the fence system. Panel material and gate ends having the same outside cross-section dimensions as the horizontal rail. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined either by welding or by the same retaining rod process used for panel assembly.

Method of Measurement: The ORNAMENTAL FENCE will be measured for payment in feet. The length measured will be the overall length measured along the top longitudinal railing member through all posts and gaps.

Basis of Payment: This work will be paid for at the contract unit price per foot for ORNAMENTAL FENCE, which payment shall include all materials, labor, equipment, tools, and incidentals necessary to complete the work as specified.

STORM SEWERS JACKED IN PLACE, 42"

Description. This work for storm sewers jacked in place under the Canadian National/Wisconsin Central Limited (CN/WCL) Railroad at locations shown on the plans shall conform to Article 552 of the Standard Specifications except as herein modified:

General. The strength and thickness of the steel casing, shall be in accordance with Canadian National Railroad Utility Crossing requirements. See CN/WCL Railroad Storm Sewer Jacking Requirements Details in the plans for all requirements.

Track monitoring of the area around the pipe jacking within the CN/WCL Right of Way will be required. This work shall be as described in the specification for "Track Monitoring".

Basis of Payment. This work will be paid for at the contract unit price per foot of STORM SEWERS JACKED IN PLACE, 42". This price shall include all costs for the excavation, work pits, receiving pits, dewatering, sheeting, bracing, backfilling, caps, plugs, grout, spacers, lubricants, drilling fluids, auguring, concrete collars, reinforcement material, and disposal of the augured material, and all other labor, equipment, and materials necessary to install the work as specified. All work required for Track Monitoring shall be included in the cost of Storm Sewer Jacked In Place, 42".

TRACK MONITORING

Description:

This work shall consist of providing pre-construction, during construction, and post-construction track surveys and daily monitoring of the CN/WCL Railroad (CN/WCL) track for vertical and horizontal

potential displacements during operations associated with the jacking of the steel casing pipes underneath the railroad corridor and track. These operations include, but are not limited to:

1. Excavation of jacking and receiving pits
2. Jacking of steel casing pipes
3. Insertion of storm sewer pipes into casing pipes
4. Backfilling and restoration of jacking and receiving pits
5. Documenting all conditions photographically

The Contractor shall submit a track monitoring plan to the Engineer a minimum of forty five (45) calendar days prior to start of any work within the CN/WCL right of way for the Engineer's and the CN/WCL's review and approval. The purpose of the track monitoring plan is to ensure that there will be no horizontal and/or vertical displacement of railroad track due to proposed work within railroad right of way. The track monitoring plan shall be in compliance with the description of the work described below.

The Contractor will not be allowed to begin work within the CN/WCL Railroad right of way until written approval of the Contractor's track monitoring plan is received from the CN/WCL and the supervising engineer.

Pre-Construction:

A pre-construction track survey and inspection shall be performed prior to the start of any construction operations taking place which shall consist of the following:

- The Contractor will establish an existing track alignment for each set of rails extending 1,000 feet along the track in both directions from the centerline of the proposed pipe.
- The survey shots will be taken every 50 feet along the top of all existing rails
- The survey shall be taken for a period of fourteen (14) consecutive calendar days prior to the start of the jacking operation.
- The survey shall be coordinated with the Engineer and the CN/WCL Railroad at least fourteen (14) calendar days prior to any activity that precedes construction.
- The pre-construction track survey shall be documented and tabulated for weekly submittal to the Engineer and the CN/WCL Railroad for review.

During Construction:

Daily monitoring shall consist of the Contractor surveying the same points taken during the pre-construction track survey, taking horizontal and vertical measurements. Daily monitoring shall only occur from the date the Contractor begins work through the date the Contractor completes work within the CN/WCL ROW.

Track conditions shall be documented and tabulated for weekly submittal to the Engineer and the CN/WCL for review. If any measurements exceed $\frac{1}{4}$ " of the pre-construction track survey, the Contractor must discontinue construction operations immediately and notify the Engineer and CN/WCL to evaluate the track condition.

The Contractor shall perform any restorative work at his/her own expense prior to resuming construction operations. If track repairs are required, the Contractor shall use a qualified specialty contractor experienced in CN/WCL track work and approved by CN/WCL in advance to perform corrective track repairs to the satisfaction of CN/WCL, and the Engineer. These repairs can

include, but are not limited to elevation adjustments, realignment, replacement of track units or hardware or other work to restore the existing tracks to pre-construction conditions and shall be performed at no additional cost to the Department or CN/WCL.

Post-Construction:

The Contractor shall complete a post-construction track survey and inspection after completion of the operation. The post-construction track survey shall consist of the Contractor surveying the same points taken during the pre-construction track survey, taking horizontal and vertical measurements, for a period of fourteen (14) consecutive calendar days.

The post-construction track survey shall be documented and tabulated for weekly submittal to the Engineer and the CN/WCL for review.

Method of Measurement.

This work will not be measured for payment.

Basis of Payment.

This work shall be included in the contract unit price for STORM SEWERS TO BE JACKED IN PLACE, of the diameter specified in the contract documents and shall include all track monitoring involved for the specified operation.

BOLLARD REMOVAL

Description. This work consists of removing and disposing of existing metal bollards and their foundations. This work shall include all materials, labor, and equipment to remove the bollards and foundations. After removal, the bollards and foundations shall become the property of the Contractor and shall be legally disposed of or recycled.

Method of Measurement. This work will be measured per each bollard removed.

Basis of Payment. This work will be paid for at the contract unit price per each for BOLLARD REMOVAL.

REMOVE EXISTING PARKING BLOCKS

Description. This work shall consist of the removal and the disposal of the parking blocks, at the locations shown in the plans, as supplemented herein, and as directed by the Engineer. The steel pins that anchor the existing parking blocks shall be pulled out and disposed of.

Method of Measurement. This work will be measured per each parking block removed.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING PARKING BLOCKS, which price shall include removal of parking blocks and pins to an approved disposal site.

RETAINING WALL REMOVAL

Description. This work shall include all labor, material, and equipment necessary to remove and dispose of existing retaining wall systems at locations shown on the plans in accordance with Section 501 and as specified herein.

The retaining wall shall to be removed in its entirety including below the ground surface.

Excavated and surplus materials shall be disposed of according to Article 202.03 of the Standard Specifications. The excavation shall be backfilled with aggregate material or suitable excavated material in accordance with Section 1004.

Method of Measurement. The concrete retaining wall will be measured along the bottom of the wall to determine the length.

Basis of Payment. This work will be measured in place and paid for at the contract unit price per foot for RETAINING WALL REMOVAL, which shall include all labor, material, and equipment required to complete the work as specified herein.

KEEPING ROADS OPEN TO TRAFFIC

All roads shall remain open to traffic unless otherwise shown on the plans. When necessary to close one lane because of construction, the Contractor shall maintain one-way traffic during construction hours with the use of signs and flagmen as shown on the Traffic Control Standards. Two lanes of traffic will be maintained during nights and weekends when no construction activities are being carried on.

FENCE REMOVAL

Description. This shall consist of the removal of the existing fence.

General. The fence removal shall include the removal of existing fencing of various materials, posts and foundations in their entirety. The existing fence shall be removed in a logical sequence, and with continuity at a distance that will not result in unusually long delays between fence removal and new fence replacement.

The resulting void from the removal of the post or foundation holes shall be backfilled with compacted (hand tamped as a minimum) course aggregate material (CA-6, CA-10 or CA-12). If the holes are in turf, areas at finished grade they shall be capped with four (4) inches of topsoil graded to match

existing ground. Any ruts resulting from these operations shall be filled with topsoil and graded smooth. No additional compensation shall be made for the off-site disposal of materials and for filling of foundation holes or ruts.

Existing posts which are set in concrete shall be removed completely.

Any damage to public or private property which results from the removal of existing fence shall be repaired by the Contractor to the satisfaction of the Engineer at no additional cost.

Method of Measurement. This work will be paid for payment in feet, in place and standing prior to removal.

Basis of Payment. This work will be paid for at the contract unit price per foot for FENCE REMOVAL.

SUB-BALLAST

Description: This work shall consist of furnishing, placing, and compacting sub-ballast on the prepared subgrade at locations shown on the plans.

General: Work and material shall conform to the requirements of Section 311 of the SSRBC for Subbase Granular Material, Type A with the following modifications:

1. The maximum lift thickness shall be 6 in.
2. The compaction requirement shall be not less than 100 percent of the standard laboratory density.
3. The material shall be crushed stone in accordance with Article 1004.04 of the SSRBC. 4. The gradation shall be CA-6 in accordance with Article 1004.04 of the SSRBC, except that the gradation of the No. 200 sieve shall be 3-8 percent.

Submittals: Submittals shall be made in accordance with Section 106 of the SSRBC and the Bureau of Materials Policy Memorandum "Aggregate Gradation Control System". Weekly stockpile/loadout tests shall be submitted to the Engineer.

Basis of Payment: This work shall be paid for at the contract unit price per cubic yard for SUB-BALLAST.

REMOVE SUB-BALLAST

Description: Subballast shall be removed as shown on the contract plans and according to the requirements of excavation of ground as described within these specifications. This item shall include the entire cost of all labor, materials, superintendence, equipment, transportation, disposal, and any incidentals required for the removal of subballast from the roadbed.

Method of Measurement: This work shall be measured for payment in place per cubic yard for REMOVE SUBBALLAST.

Basis of Payment: This work shall be paid for at the contract unit price per cubic yard for REMOVE SUB-BALLAST.

PRE-BALLAST TRACK, 8"

Description: Pre-ballast shall be placed as shown on the contract plans and according to the requirements of subballast as described within these specifications. This item shall include the entire cost of all labor, materials, superintendence, equipment, transportation, and any incidentals required for the placement of ballast on the roadbed in advance of the tracks and turnouts, and compacting the ballast as outlined herein.

Method of Measurement: This work shall be measured for payment in place per cubic yard for PRE-BALLAST TRACK, 8".

Basis of Payment: This work shall be paid for at the contract unit price per cubic yard for PRE-BALLAST TRACK, 8".

REMOVE SIGN (SPECIAL)

Description: The project includes the removal of existing business sign, including framing, lighting, and full removal of the foundation, as shown in the plans. The removed items shall become the property of the contractor and shall be disposed of according to Article 202.03. All holes left from the removal of the posts and wiring shall be backfilled with suitable material approved by the Engineer and the surface of the filled holes shall be treated to match the surrounding area.

Method of Measurement: This work shall be measured for payment in place as each Remove Sign (Special).

Basis of Payment: This work shall be paid for at the contact unit price per each for REMOVE SIGN (SPECIAL).

BRICK WALL REMOVAL

Description: This work shall consist of removal and disposal of existing brick wall, according to Article 202.03, as shown on the plans or as directed by the Engineer. The foundation of the wall shall be completely removed.

Method of Measurement: This work will be measured for payment in place, in feet, along the centerline of the wall.

Basis of Payment: This work will be paid at the contract unit price per foot for BRICK WALL REMOVAL, measured as removed.

CONCRETE MEDIAN SURFACE, 6 INCH

This Special Provision amends Section 606 (CONCRETE GUTTER, CURB, MEDIAN, AND PAVED DITCH) of the Standard Specifications for Road and Bridge Construction as follows:

Revise the first sentence of the second paragraph of Article 606.15, Basis of Payment as follows:

"Concrete median will be paid for at the contract unit price per square foot for CORRUGATED MEDIAN; CONCRETE MEDIAN SURFACE, 4 INCH, CONCRETE MEDIAN SURFACE, 6 INCH or

CONCRETE MEDIAN, of the type specified. For solid concrete median the unit price will also include concrete curb and gutter“.

DEBRIS REMOVAL

This work shall consist of the complete removal and satisfactory disposal of debris located on the subject parcels that are to be removed as described herein, the applicable portions of Section 202 of the Standard Specifications and as directed by the Engineer.

The Contractor shall remove all debris for the subject parcels.

Basis of Payment: This work will paid at the contract unit price per lump sum for DEBRIS REMOVAL.

REMOVE AND RELOCATE SIGN

Description. This work consists of removing, storing, and re-installing sign in new location. Any electrical shall be disconnected in a manner for reuse. The signs shall be reinstalled at locations determined by the Engineer with coordination with the property owner. The relocations will occur after all work is completed to a satisfactory point where the grading is completed and damage to the sign is minimized. The work will include new foundations as necessary to reinstall the sign.

The sign locations are as follows:

- Sign No. 1 – Barrington Park District
- Sign No. 2 – JourneyCare
- Sign No. 3 – Barrington Area Library
- Sign No. 4 – Wayfinding sign at Lake Zurich Road and Citizens Park Entrance

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE AND RELOCATE SIGN of the number specified.

CONCRETE HEADWALL REMOVAL, PARTIAL

Description: This work consists of removal of portions of the headwall necessary to extend the culvert per the details in the plans.

This work shall be done in accordance with Section 501 of the Standard Specifications and as described herein. The Contractor shall saw cut as needed to the elevation as shown on the plans in order to sever the broken sections that are to be removed.

Method of Measurement: This work will be measured for payment in place for each.

Basis of Payment: This work will be paid for at the contract unit price per each for CONCRETE HEADWALL REMOVAL PARTIAL, which price shall include all labor, equipment and materials necessary to complete the work as specified herein.

RAILROAD FLAGGING (WCL)

Description. This work shall be performed as in accordance with Sections 107.12 and 109.05 of the Standard Specifications.

General Requirements. The flagging costs incurred for the work associated at the location of US 14 and the Wisconsin Central, Ltd. (WCL) grade crossing will be reimbursed by IDOT in accordance with Section 109.05 of the Standard Specifications. The Contractor is responsible for prepaying the CN in advance for flagging services provided. The Contractor shall deposit the cost of flagging services for thirty (30) days with the CN. If the Contractor uses less than 30 days, then the Contractor will be charged for the days used and the balance will be reimbursed back to the Contractor. The Contractor will then be reimbursed by IDOT for the actual number of flagging days used. The Contractor is required to conduct operations at all times in full compliance with the rules, regulations and requirements of the WCL Special Provisions contained in the Contract Specifications and as described below.

The Contractor shall give thirty (30) days advance written notice to the Engineering Superintendent of the Railroad or his authorized representative prior to commencement of any construction work on the Improvement affecting the railroad property. The Contractor shall notify the Railroad sufficiently in advance of when the protective services are required. The Contractor shall make every effort to notify the Railroad in advance if a previously requested flagger will not be needed for any reason. Any costs for flagging protection provided by the Railroad at the Contractor's request for those days when the Contractor does not work shall be borne by the Contractor.

Basis of Payment. RAILROAD FLAGGING (WCL) will be paid for according to Article 109.05 of the Standard Specifications.

TREE REMOVAL AND FORESTRY WORK RESTRICTIONS – ENDANGERED SPECIES ACT

This work shall be according to Section 201 of the Standard Specifications, except shall only be allowed between November 2 and March 31, when the endangered species are not present.

Work includes tree pruning and tree limb removal of live or dead branches, clearcutting, selective clearing, and the removal of live or dead trees measuring 3 inches (3") in diameter or greater at a point of 4.5 feet (4.5') above the highest ground level at the base of the tree.

Work that is considered hazardous or a safety concern can be removed any time during the calendar year with written approval by the Engineer.

No additional compensation or extension of time will be allowed to comply with these restrictions.

FAILURE TO COMPLETE PLANT CARE AND ESTABLISHMENT WORK ON TIME

Should the Contractor fail to complete the plant care and/or supplemental watering work as per the standard specifications or within 36 hours notification from the Engineer, or within such extended times as may have been allowed by the Department, the Contractor shall be liable to the Department in the amount of:

- \$50.00 per tree/per day
- \$40.00 per large shrub/per day
- \$35.00 per small shrub/per day
- \$20.00 per vine/per day
- \$20.00 per perennial/per day
- \$20.00 per sq yd sod/per day

not as penalty but as liquidated damages, for each calendar day or a portion thereof of overrun in the contract time or such extended time as may have been allowed.

In fixing the damages as set out herein, the desire is to establish a mode of calculation for the work since the Department's actual loss, in the event of delay, cannot be predetermined, would be difficult of ascertainment, and a matter of argument and unprofitable litigation. This said mode is an equitable rule for measurement of the Department's actual loss and fairly takes into account the loss of the tree(s) if the watering or plant care is delayed. The Department shall not be required to provide any actual loss in order to recover these liquidated damages provided herein, as said damages are very difficult to ascertain. Furthermore, no provision of this clause shall be construed as a penalty, as such is not the intention of the parties.

A calendar day is every day shown on the calendar and starts at 12:00 midnight and ends at the following 12:00 midnight, twenty-four hours later.

SUPPLEMENTAL WATERING

This work will include watering sod, trees, shrubs, vines, and perennials at the rates specified and as directed by the Engineer.

Schedule: Watering will only begin after the successful completion of all period of establishment requirements. Water trees, shrubs, and vines every 7 days throughout the growing season (April 1 to November 30). Water perennials, plugs, and sod a minimum of twice a week. The Engineer may direct the Contractor to adjust the watering rate and frequency depending upon weather conditions.

Watering must be completed in a timely manner. When the Engineer directs the Contractor to do supplemental watering, the Contractor must begin the watering operation within 24 hours of notice. **The Contractor shall give an approximate time window of when they will begin at the work location to the Engineer. The Engineer shall be present during the watering operation.** A minimum of 10 units of water per day must be applied until the work is complete.

Should the Contractor fail to complete the work on a timely basis or within such extended times as may have been allowed by the Department, the Contractor shall be liable to the Department liquidated damages as outlined in the **"Failure to Complete Plant Care and Establishment Work on Time" special provision.**

In fixing the damages as set out herein, the desire is to establish a mode of calculation for the work since the Department's actual loss, in the event of delay, cannot be predetermined, would be difficult of ascertainment, and a matter of argument and unprofitable litigation. This said mode is an equitable rule for measurement of the Department's actual loss and fairly takes into account the loss of the trees if the watering is delayed. The Department shall not be required to provide any actual loss in order to recover these liquidated damages provided herein, as said damages are very difficult to ascertain. Furthermore, no provision of this clause shall be construed as a penalty, as such is not the intention of the parties.

A calendar day is every day shown on the calendar and starts at 12:00 midnight and ends at the following 12:00 midnight, twenty-four hours later.

Source of Water: The Contractor shall notify the Engineer of the source of water used and provide written certification that the water does not contain chemicals harmful to plant growth.

Rate of Application: The normal rates of application for watering are as follows. The Engineer will adjust these rates as needed depending upon weather conditions.

- 35 gallons per tree
- 25 gallons per large shrub
- 15 gallons per small shrub
- 4 gallons per vine
- 3 gallons per perennial plant (Gallon)
- 2 gallons per perennial plant (Quart)
- 2 gallons per perennial plant (Plug)
- 27 gallons per square yard for Sodded Areas

Method of Application: A spray nozzle that does not damage small plants must be used when watering all vegetation. Water shall be applied at the base of the plant to keep as much water as possible off plant leaves. An open hose may be used to water trees, shrubs, and seedlings if mulch and soil are not displaced by watering. The water shall be applied to individual plants in such a manner that the plant hole shall be saturated without allowing the water to overflow beyond the earthen saucer. Watering of plants in beds shall be applied in such a manner that all plant holes are uniformly saturated without allowing the water flow beyond the periphery of the bed. Water shall slowly infiltrate into soil and completely soak the root zone. The Contractor must supply metering equipment as needed to assure the specified application rate of water.

Method of Measurement: Supplemental watering will be measured in units of 1000 gallons of water applied as directed.

Basis of Payment: This work will be paid for at the contract unit price per unit of SUPPLEMENTAL WATERING, measured as specified. Payment will include the cost of all water, equipment and labor needed to complete the work specified herein and to the satisfaction of the Engineer.

EROSION CONTROL BLANKET, SPECIAL (WILDLIFE SAFE)

This Special Provision revises Section 251 of the Standard Specifications for Road and Bridge Construction to eliminate the use of Excelsior Blanket for Erosion Control Blanket. This work shall consist of furnishing, transporting, and placing 100 % biodegradable erosion control blanket over seeded areas as detailed on the plans, according to Section 251 except as modified herein.

Delete “either excelsior blanket or” of the first sentence of Article 251.04 Erosion Control Blanket.

Delete “excelsior and” of the second sentence of Article 251.04 Erosion Control Blanket.

Delete Article 1081.10 (a) Excelsior Blanket.

Delete the first paragraph of Article 1081.10 (b) Knitted Straw Mat and substitute the following:

Knitted Straw Mat. Knitted straw mat shall be a machine-produced mat of 100% clean, weed free agricultural straw. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the blanket with a functional longevity of up to 12 months. The blanket shall be covered on top and bottom sides with a 100% biodegradable woven natural organic fiber netting. No plastic netting will be allowed. Netting shall be “leno-weave” with movable joints (not fixed or welded). The netting consists of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands to form an approximate 0.50 x 1.0 - inch (1.27 x 2.54 cm) mesh. The blanket shall be sewn together with flexible joints on 1.50 - inch (3.81 cm) centers with biodegradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2 - 5 inches (5 - 12.5cm) from the edge) as an overlap guide for adjacent mats.

Delete the first paragraph of Article 1081.10 (c) (2) Knitted Straw Mat and substitute the following:

Knitted Straw Mat. The blanket shall be machine-produced 100% biodegradable blanket, which contains 70% agricultural straw and 30% coconut fiber with a functional longevity of up to 18 months. The blanket shall be of consistent thickness with the straw and coconut evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with 100% biodegradable woven natural organic fiber netting. The top netting shall be “leno-weave,” with movable joints (not fixed or welded). The netting consists of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine strands to form an approximate 0.50 x 1.0 - inch (1.27 x 2.54 cm) mesh. The blanket shall be sewn together on 1.50 - inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2 - 5 inches (5 - 12.5cm) from the edge) as an overlap guide for adjacent mats.

Delete Article 1081.10(d) Wire Staples.

Add the following to Article 1081.10 (e) Wood Stakes:

Biodegradable plastic stakes will be allowed. The biodegradable plastic anchor shall be approximately 6 - inches (15.24 cm) in length. No metal wire stakes will be allowed.

Add the following to Article 251.06(b) Method of Measurement:

- (b) Measured Quantities. EROSION CONTROL BLANKET, SPECIAL will be measured for payment in place in square yards of actual surface area covered.

Add the following to Article 251.07 Basis of Payment:

EROSION CONTROL BLANKET, SPECIAL shall be paid at the Contract unit price per square yard.

PIPE CULVERTS, SPECIAL 30"

Description: This work shall consist of all labor, materials and equipment necessary to install the Pipe Culverts, Special of the size indicated at Sta. 1213+40. This work shall be performed in accordance with Section 542 of the Standard Specifications.

The piping is to be smooth steel pipe (SSP), according to ASTM A139, with a minimum wall thickness of 0.50". Pipe is to be Grade B and steel shall have a minimum yield strength of 35,000 psi. Pipe shall be rated for the Cooper E-80 loading according to the current AREMA Manual for Railway Engineering.

Smooth steel pipe shall have a welded straight longitudinal seam. The ends of each section shall be square cut. One end shall be suitably beveled for field welding sections together.

Method of Measurement: This work will be measured for payment in place per foot.

Basis of Payment: This work will be paid for at the contract unit price per FOOT for PIPE CULVERTS, SPECIAL of the size indicated.

PIPE CULVERTS, SPECIAL 60"

Description: This work shall consist of all labor, materials and equipment necessary to install the Pipe Culverts, Special of the equivalent size indicated. This work shall be performed in accordance with Section 542 of the Standard Specifications.

The piping is to be 10 ga. plain galvanized corrugated steel pipe arch, furnished with 2-2/3" x 1/2" corrugations, according to Section 1006.01 in the Standard Specifications. The pipe shall be rated for the loading shown on the plans. The ends of each section shall be square cut.

Method of Measurement: This work will be measured for payment in place per foot.

Basis of Payment: This work will be paid for at the contract unit price per FOOT for PIPE CULVERTS, SPECIAL of the equivalent size indicated.

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES (Project specific)

Description. This work shall consist of the removal and disposal of regulated substances according to Section 669 of the Standard Specifications as revised below.

Contract Specific Sites. The excavated soil and groundwater within the areas listed below shall be managed as either "uncontaminated soil", hazardous waste, special waste or non-special waste. For stationing, the lateral distance is measured from centerline and the farthest distance is the offset distance or construction limit, whichever is less.

Soil Disposal Analysis. When the waste material requires sampling for landfill disposal acceptance, the Contractor shall secure a written list of the specific analytical parameters and analytical methods required by the landfill. The Contractor shall collect and analyze the required number of samples for the parameters required by the landfill using the appropriate analytical procedures. A copy of the required parameters and analytical methods (from landfill email or on landfill letterhead) shall be provided as Attachment 4A of the BDE 2733 (Regulated Substances Final Construction Report). The price shall include all sampling materials and effort necessary for collection and management of the samples, including transportation of samples from the job site to the laboratory. The Contractor shall be responsible for determining the specific disposal facilities to be utilized; and collect and analyze any samples required for disposal facility acceptance using a NELAP certified analytical laboratory registered with the State of Illinois.

Site 2599V2-21. Commercial Building, 101-135 W. Northwest Highway, Barrington, Lake County.

- Station 70+85 to Station 73+40 (CL IL 59), 0 to 65 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(3). Contaminants of concern sampling parameters: Benzo(a)pyrene and Manganese.

Site 2599V2-25. ROW, 100 block of W. Northwest Highway, Barrington, Lake County.

- Station 201+20 to Station 203+10 (Proposed CL US 14), 0 to 40 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Benzo(a)pyrene and Manganese.
- Station 203+10 to Station 205+75 (Proposed CL US 14), 0 to 40 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.
- Station 205+75 to Station 210+85 (Proposed CL US 14), 0 to 50 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Lead, Iron and Manganese.
- Station 210+85 to Station 212+20 (Proposed CL US 14), 0 to 140 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic, Iron and Manganese.
- Station 212+20 to Station 213+40 (Proposed CL US 14), 0 to 230 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Arsenic and Manganese.
- Station 213+40 to Station 214+60 (Proposed CL US 14), 0 to 230 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.
- Station 214+60 to Station 215+80 (Proposed CL US 14), 0 to 200 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 215+80 to Station 217+00 (Proposed CL US 14), 0 to 85 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Benzo(a)pyrene, Arsenic and Manganese.
- Station 217+00 to Station 218+45 (Proposed CL US 14), 0 to 70 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 218+45 to Station 219+70 (Proposed CL US 14), 0 to 60 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Iron, Lead and Manganese.
- Station 219+70 to Station 226+40 (Proposed CL US 14), 0 to 60 feet RT. The Engineer has

determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Iron, Lead and Manganese.

- Station 226+40 to Station 226+95 (Proposed CL US 14), 0 to 100 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Iron, Lead and Manganese.
- Station 226+95 to Station 227+35 (Proposed CL US 14), 0 to 100 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 227+35 to Station 228+10 (Proposed CL US 14), 0 to 40 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 228+10 to Station 229+90 (Proposed CL US 14), 0 to 40 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminant of concern sampling parameter: Manganese.
- Station 229+90 to Station 230+00 (Proposed CL US 14), 0 to 115 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Manganese.
- Station 201+20 to Station 202+90 (Proposed CL US 14), 0 to 40 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Manganese.
- Station 202+90 to Station 208+50 (Proposed CL US 14), 0 to 40 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Lead and Manganese.
- Station 208+50 to Station 210+45 (Proposed CL US 14), 0 to 30 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(3). Contaminants of concern sampling parameters: Benzo(a)pyrene and Manganese.
- Station 210+45 to Station 211+90 (Proposed CL US 14), 0 to 30 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Iron and Manganese.
- Station 211+90 to Station 214+70 (Proposed CL US 14), 0 to 30 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 214+70 to Station 217+10 (Proposed CL US 14), 0 to 140 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic, Lead and Manganese.
- Station 217+10 to Station 218+80 (Proposed CL US 14), 0 to 85 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Arsenic and Manganese.
- Station 217+10 to Station 218+80 (Proposed CL US 14), 85 to 260 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic.
- Station 218+80 to Station 219+90 (Proposed CL US 14), 0 to 195 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Arsenic, Lead and Manganese.
- Station 219+90 to Station 220+65 (Proposed CL US 14), 0 to 175 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 220+65 to Station 221+75 (Proposed CL US 14), 0 to 125 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.

- Station 221+75 to Station 222+50 (Proposed CL US 14), 0 to 200 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 222+50 to Station 223+20 (Proposed CL US 14), 0 to 140 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 223+20 to Station 225+00 (Proposed CL US 14), 0 to 125 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Arsenic, Lead and Manganese.
- Station 225+00 to Station 226+95 (Proposed CL US 14), 0 to 100 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Arsenic, Lead and Manganese.
- Station 226+95 to Station 227+25 (Proposed CL US 14), 0 to 100 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(3). Contaminants of concern sampling parameters: Benzo(a)pyrene, Iron and Manganese.
- Station 227+25 to Station 228+00 (Proposed CL US 14), 0 to 70 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(3). Contaminants of concern sampling parameters: Benzo(a)pyrene, Iron and Manganese.
- Station 228+00 to Station 228+90 (Proposed CL US 14), 0 to 70 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 228+90 to Station 229+00 (Proposed CL US 14), 0 to 70 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(6). Contaminants of concern sampling parameters: TCLP Cadmium and Manganese.
- Station 229+00 to Station 230+00 (Proposed CL US 14), 0 to 70 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.

At the ROW property, Cadmium was detected at a concentration exceeding the TCLP Characteristic Hazardous Waste Limit in soil boring ROW-29, from the sample interval 0 to 3 feet deep, as noted in the Final Preliminary Site Investigation Report for this project, submitted August 16, 2024 by Weston Solutions, Inc. Procedures shall be implemented to protect site workers and observers from hazards encountered during construction activities in locations containing contaminated materials, pursuant to Article 669 of the Standard Specifications for Road and Bridge Construction manual. Details of the occurrence and locations of contaminants, and the associated construction worker precautions and suggested engineering controls, are presented in Section 5.18 of the Final Preliminary Site Investigation Report noted above.

Site 2599V2-28. Langendorf Park, 235 Lions Drive, Barrington, Lake County.

- Station 901+00 to Station 903+15, 25 feet RT (CL Lyons Drive), 0 to 25 ft LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Arsenic, Iron, Lead and Manganese.

Site 2599V2-29. Barrington Courte Offices, 101-111 Lions Drive, Barrington, Lake County.

- Station 68+20 to Station 70+85 (CL IL 59), 0 to 130 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Arsenic and Manganese.

Site 2599V2-31. Commercial Building, 500 N. Hough Street, Barrington, Lake County.

- Station 67+70 to Station 68+20 (CL IL 59), 0 to 145 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Arsenic and Manganese.

Site 2599V2-38. Commercial Building, 107 Elm Road, Barrington, Lake County.

- Station 201+20 to Station 202+90 (Proposed CL US 14), 40 to 60 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.

Site 2599V2-39. Commercial Building, 113 Elm Road, Barrington, Lake County.

- Station 202+90 to Station 203+90 (Proposed CL US 14), 40 to 60 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Lead and Manganese.

Site 2599V2-40. Residences, 102-135 Covington Drive, Lake County.

- Station 203+90 to Station 205+50 (Proposed CL US 14), 40 to 160 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Lead and Manganese.
- Station 205+50 to Station 207+45 (Proposed CL US 14), 35 to 90 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Lead and Manganese.
- Station 207+45 to Station 208+50 (Proposed CL US 14), 30 to 185 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 208+50 to Station 209+00 (Proposed CL US 14), 85 to 185 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 208+50 to Station 209+00 (Proposed CL US 14), 30 to 85 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(3). Contaminants of concern sampling parameters: Benzo(a)pyrene and Manganese.

Site 2599V2-43. Commercial Building, 557 N. Hough Street, Barrington, Lake County.

- Station 201+20 to Station 203+10 (Proposed CL US 14), 40 to 250 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Benzo(a)pyrene and Manganese.
- Station 203+10 to Station 203+35 (Proposed CL US 14), 40 to 250 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.

Site 2599V2-44. Vacant Lot, 117 E. Northwest Highway, Barrington, Lake County.

- Station 203+35 to Station 204+70 (Proposed CL US 14), 40 to 210 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.

Site 2599V2-45. Creekside Pointe, 541-543 N. Hough Street, Barrington, Lake County.

- Station 67+85 to Station 70+90 (CL IL 59), 0 to 40 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Benzo(a)pyrene and Manganese.

Site 2599V2-46. Shorely Wood, 510-599 Shorely Drive, Barrington, Lake County.

- Station 205+75 to Station 206+15 (Proposed CL US 14), 45 to 175 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Lead, Iron and Manganese.
- Station 206+15 to Station 208+45 (Proposed CL US 14), 45 to 120 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Lead, Iron and Manganese.
- Station 208+45 to Station 210+35 (Proposed CL US 14), 45 to 215 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Lead, Iron and Manganese.
- Station 210+35 to Station 210+85 (Proposed CL US 14), 45 to 85 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Lead, Iron and Manganese.

Site 2599V2-48. Railroad, 100-300 blocks of W. Northwest Highway, Barrington, Lake County.

- See Site 2599V2-25, ROW property for special provisions for this site.

Site 2599V2-49. Residences & Vacant Lot, 651-713 Bent Ridge Lane, 881-885 Bosworthfield Road, 303-653 Elm Road, 870-885 Georgetown Lane, 707 Magnolia Road, 250253 Maple Road, 657-663 New Bridge Court, 617-749 Oak Road, 666-678 Stillwater Lane and 710730 Walnut Road, Barrington, Lake County.

- Station 209+00 to Station 211+85 (Proposed CL US 14), 85 to 185 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 209+00 to Station 210+45 (Proposed CL US 14), 30 to 85 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(3). Contaminants of concern sampling parameters: Benzo(a)pyrene and Manganese.
- Station 210+45 to Station 211+90 (Proposed CL US 14), 30 to 85 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Iron and Manganese.
- Station 211+90 to Station 214+70 (Proposed CL US 14), 30 to 85 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 211+85 to Station 214+70 (Proposed CL US 14), 85 to 185 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminant of concern sampling parameter: Lead and Manganese.
- Station 214+70 to Station 216+00 (Proposed CL US 14), 30 to 140 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic, Lead and Manganese.
- Station 214+70 to Station 217+10 (Proposed CL US 14), 140 to 200 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Lead and Manganese.

Site 2599V2-51. Citizen's Park, 511 N. Lake Zurich Road, Barrington, Lake County.

- Station 501+50 to Station 504+40 (CL Proposed Lake Zurich Road), 90 feet LT to 60 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Lead and Manganese.
- Station 504+40 to Station 506+35 (CL Proposed Lake Zurich Road), 50 feet LT to 55 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.

- Station 350+55 to Station 351+90 (CL Citizens Park Entrance Road), 25 feet LT to 25 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 72+00 to Station 74+50 (CL Lake Zurich Road), 0 to 45 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 72+00 to Station 74+00 (CL Lake Zurich Road), 0 to 80 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminant of concern sampling parameter: 4,4-DDE.
- Station 74+00 to Station 74+70 (CL Lake Zurich Road), 0 to 80 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.

Site 2599V2-53. Residences & Vacant Lot, 402-446 E. Berry Road, 410-447 E. Drury Lane, 443-557 North Avenue, 514-520 N. Northwest Highway, 410-456 Park Lane and 411-454 E. Valencia Avenue, Barrington, Lake County.

- Station 400+30 to Station 402+10 (CL Park Lane), 15 feet LT to 15 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.
- Station 402+10 to Station 405+70 (CL Park Lane), 15 feet LT to 15 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Iron and Manganese.
- Station 600+50 to Station 601+90 (CL North Avenue), 30 feet LT to 30 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.
- Station 601+90 to Station 602+90 (CL North Avenue), 30 feet LT to 30 feet. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.
- Station 602+90 to Station 604+40 (CL North Avenue), 30 feet LT to 30 feet. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminant of concern sampling parameter: Manganese.
- Station 700+30 to Station 702+05 (CL Drury Lane), 30 feet LT to 30 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Benzo(a)pyrene and Manganese.
- Station 704+40 to Station 707+00 (CL Drury Lane), 30 feet LT to 30 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminant of concern sampling parameter: Manganese.

Site 2599V2-54. Barrington Public Library, 505 N. Northwest Highway, Barrington, Barrington, Lake County.

- See Site 2599V2-25, ROW property for special provisions for this site.

Work Zones

Three distinct OSHA HAZWOPER work zones (exclusion, decontamination, and support) shall apply to projects adjacent to or within sites with documented leaking underground storage tank (LUST) incidents, or sites under management in accordance with the requirements of the Site Remediation Program (SRP), Resource Conservation and Recovery Act (RCRA), or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or as deemed necessary. For this project, the work zones apply for the following ISGS PESA Sites: **Site 25 (ROW)**

Engineered Barrier. An engineered barrier shall be installed in storm sewer, sanitary sewer and/or

water main trenches to limit the exposure and control the migration of contamination from the contaminated soil that remains within the trench excavation. It shall be placed beneath the trench backfill material at the following locations:

- Station 228+90 to Station 229+00 (Proposed CL US 14), 0 to 70 feet LT (ROW, PESA Site 2599V2-25, 100 block of W. Northwest Highway, Barrington) – hazardous waste. Contaminants of concern sampling parameters: TCLP Cadmium and Manganese.

The engineered barrier shall consist of a geosynthetic clay liner system, geomembrane liner, or equivalent material as approved by the Engineer. A geosynthetic clay liner shall be composed of a bentonite clay liner approximately 0.25 inches thick. The engineered barrier shall have a permeability of less than 10^{-7} cm/sec. Installation of the geosynthetic clay liner system shall be in accordance with the manufacturer's recommendations except that all laps shall face down-slope.

The geomembrane liner shall have a minimum thickness of 30 mils. The geomembrane liner shall line the entire trench and in accordance with the manufacturer's recommendations.

No equipment will be allowed on the engineered barrier until it is covered by a minimum of 1 foot of backfill. Any damage to the engineered barrier caused by the Contractor shall be repaired at no additional expense to the Department in accordance with the manufacturer's recommendations and as directed by the Engineer.

Method of Measurement: The engineered barrier will be measured for payment in place and the area computed in square yards.

Basis of Payment: The engineered barrier will be paid for at the contract unit price per square yard for ENGINEERED BARRIER.

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END OF SECTION

SECTION 01 11 00

SUMMARY OF WORK

PART 1—GENERAL

1.01 PROJECT SCOPE

- A. The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction," adopted January 1, 2022 (Hereinafter referred to as the Standard Specifications) and the "Supplemental Specifications and Recurring Special Provisions" adopted January 1, 2024 herein which apply to and govern the reconstruction of US ROUTE 14 AT IL ROUTE 59, US ROUTE 14 (NORTHWEST HIGHWAY), Section 11-00087-00-GS, Lake County, Contract No. 61J87. In case of conflict with any part or parts of said specifications, the said Special Provisions shall take precedence and shall govern.
- B. CONTRACTOR shall provide all items, articles, materials, operations or methods mentioned or scheduled on the Drawings or herein specified: including all labor, supervision, equipment, incidentals, taxes, and permits necessary to complete the Work as described within the Contract Documents.

1.02 SUMMARY OF PAY ITEMS FOR PUMP STATION WORK

- A. Standard IDOT pay items which do not have a special provision shall be measured and paid for according to the Standard Specifications. Descriptions, materials, equipment, methods of measurement, and basis of payment can be found in the Standard Specifications for Road and Bridge Construction. The following Pay Items for Road and Bridge Construction are included in the Pump Station Work.
 - 1. 50200100 STRUCTURE EXCAVATION: STRUCTURE EXCAVATION shall be paid for at the contract cubic yard price as specified in the applicable requirements of the Special Provisions, Division 01, and Division 31.
 - 2. 50300225 CONCRETE STRUCTURES: CONCRETE STRUCTURES; shall be paid for at the contract cubic yard price as specified in the applicable requirements of the Special Provisions, Division 01, and Division 03.
 - 3. 50800205 REINFORCEMENT BARS, EPOXY COATED: REINFORCEMENT BARS, EPOXY COATED shall be paid for at the contract pound price as specified in the applicable requirements of the Special Provisions, Division 01, and Division 03.
 - 4. 50800515 BAR SPLICERS: BAR SPLICERS shall be paid for at the contract each price as specified in the applicable requirements of the Special Provisions, Division 01, and Division 03.
 - 5. 52200020 TEMPORARY SOIL RETENTION SYSTEM: TEMPORARY SOIL RETENTION SYSTEM shall be paid for at the contract square foot price as specified in the applicable requirements of the Special Provisions, Division 01, and Division 31.
 - 6. 80400100 ELECTRICAL SERVICE INSTALLATION: ELECTRICAL SERVICE INSTALLATION shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 26 21 00—Electrical Service System.

7. 80400200 ELECTRICAL UTILITY SERVICE CONNECTION: ELECTRICAL UTILITY SERVICE CONNECTION shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 26 21 00–Electrical Service System and Section 26 05 43–Underground Concrete Duct Banks..
- B. IDOT has Miscellaneous Special Pay Items that are created for the user’s convenience. They are pay items that have been used on previous contracts at the request of the designers; however, they are considered temporary pay items. The Special Provisions for Pump Station 49 include summary of work, descriptions, methods of measurement, and basis of payment. The following Design Temporary Pay Items are included in the Pump Station Work, along with related Special Provision Specification Sections.
 1. X0301028 PUMP STATION SCADA EQUIPMENT: PUMP STATION SCADA EQUIPMENT shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 40 94 23–Controls and Instrumentation.
 2. X0320034 HEATING AND VENTILATION WORK: HEATING AND VENTILATION WORK shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under the following Sections:
 - a. Section 23 05 29–Hangers and Supports for HVAC Equipment.
 - b. Section 23 05 93–Testing, Adjusting, and Balancing.
 - c. Section 23 07 13–Ductwork Insulation for Heating, Ventilation, and Air Conditioning.
 - d. Section 23 09 13–Temperature Controls and Instrumentation.
 - e. Section 23 31 00–Ductwork and Ductwork Supports.
 - f. Section 23 33 00–Air Duct Accessories.
 - g. Section 23 34 13–Axial HVAC Fans.
 - h. Section 23 34 16–Centrifugal HVAC Fans.
 - i. Section 23 37 08–Louvers.
 - j. Section 23 37 13–Diffusers, Registers, and Grilles.
 - k. Section 23 81 26–Split-System Air Conditioners.
 - l. Section 23 82 39–Unit Heaters.
 3. X0320035 LOW FLOW PUMP: LOW FLOW PUMP shall be paid for at the contract unit price per each as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 43 25 10–Vertical Dry-Pit Submersible Pumps.
 4. X0320036 MAIN PUMPS: MAIN PUMPS shall be paid for at the contract unit price per each as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 43 25 10–Vertical Dry-Pit Submersible Pumps.
 5. X0322121 SHEET WATERPROOFING MEMBRANE SYSTEM: SHEET WATERPROOFING MEMBRANE SYSTEM shall be paid for at the contract square yard price as specified in the applicable requirements of the Special Provisions and Division 01.
 6. X0323880 COMPLETE SPARE MAIN PUMP ASSEMBLY: COMPLETE SPARE MAIN PUMP ASSEMBLY shall be paid for at the contract lump sum price per each as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 43 25 10–Vertical Dry-Pit Submersible Pumps.

7. X0326618 ADDRESSABLE FIRE ALARM SYSTEM: ADDRESSABLE FIRE ALARM SYSTEM shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions and Division 01.
8. X0335700 PUMP STATION GENERAL WORK: PUMP STATION GENERAL WORK shall include all work which is not listed as a specific pay item, but which is required for compliance with the specifications and for a complete operational facility. This item shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under the following Sections:
 - a. Section 01 91 00—Starting of Systems.
 - b. Section 03 11 00—Concrete Formwork.
 - c. Section 03 20 00—Concrete Reinforcement.
 - d. Section 03 30 00—Cast-in-Place Concrete.
 - e. Section 03 41 13—Precast Concrete Hollow Core Planks.
 - f. Section 04 05 13—Mortar and Masonry Grout.
 - g. Section 04 20 00—Unit Masonry System.
 - h. Section 05 50 00—Metal Fabrications.
 - i. Section 05 56 00—Anchor Bolts and Post-Installed Anchors.
 - j. Section 06 11 00—Wood Framing and Sheathing.
 - k. Section 06 11 10—Wood Blocking and Curbing.
 - l. Section 06 17 53—Plate Connected Wood Trusses.
 - m. Section 06 60 00—Fiberglass Fabrications.
 - n. Section 06 61 10—Fiberglass Grating.
 - o. Section 07 14 00—Fluid-Applied Waterproofing.
 - p. Section 07 21 12—Board Insulation.
 - q. Section 07 21 13—Batt and Blown-In Insulation.
 - r. Section 07 26 00—Vapor and Air Barrier.
 - s. Section 07 31 13—Fiberglass Shingle Roofing.
 - t. Section 07 62 00—Flashing and Sheet Metal.
 - u. Section 07 71 00—Manufactured Roof Specialties.
 - v. Section 07 71 23—Gutters and Downspouts.
 - w. Section 07 84 00—Firestopping.
 - x. Section 07 90 00—Caulking and Sealants.
 - y. Section 08 11 00—Standard Steel Doors and Frames.
 - z. Section 08 31 13—Access Doors and Frames.
 - aa. Section 08 71 00—Door Hardware.
 - bb. Section 09 91 00—Painting.
 - cc. Section 10 00 20—Miscellaneous Specialties.
 - dd. Section 31 23 00—Excavation, Fill, Backfill, and Grading.
 - ee. Section 41 22 23—Hoists and Cranes.
9. X0783300 PUMP STATION ELECTRICAL WORK: PUMP STATION ELECTRICAL WORK shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under the following Sections:
 - a. Section 26 05 00—General Electrical Requirements.
 - b. Section 26 05 19—Wire.
 - c. Section 26 05 23—Instrument and Communication Wire and Cable.
 - d. Section 26 05 26—Secondary Grounding.
 - e. Section 26 05 29—Supporting Devices.

- f. Section 26 05 33–Conduit.
 - g. Section 26 05 35–Boxes.
 - h. Section 26 05 44–Handholes.
 - i. Section 26 05 53–Electrical Identification.
 - j. Section 26 05 73–Power System Study.
 - k. Section 26 09 10–Controls and Instrumentation Drawings.
 - l. Section 26 21 00–Electrical Service System.
 - m. Section 26 27 26–Wiring Devices.
 - n. Section 26 28 00–Overcurrent Protective Devices.
 - o. Section 26 28 16–Disconnect Switches.
 - p. Section 26 36 14–Generator Docking Stations.
 - q. Section 26 41 13–Lightning Protection for Buildings and Structures.
 - r. Section 26 43 13–Surge Protective Devices (SPD).
 - s. Section 26 51 13–Lighting.
 - t. Section 27 10 00–Structured Cabling.
10. X0783500 PUMP STATION MECHANICAL WORK: PUMP STATION MECHANICAL WORK shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under the following Sections:
- a. Section 20 05 53–Identification for Plumbing and HVAC Piping and Equipment.
 - b. Section 22 05 00–Common Work Results for Plumbing.
 - c. Section 22 05 23–General-Duty Valves for Plumbing Piping.
 - d. Section 22 05 29–Hangers and Supports for Plumbing Piping and Equipment.
 - e. Section 22 13 16–Sanitary Waste and Vent Piping.
 - f. Section 22 13 29–Submersible Sump Pumps.
 - g. Section 40 05 00–Piping and Appurtenances.
11. X1400162 PUMP STATION MOTOR CONTROL CENTER: PUMP STATION MOTOR CONTROL CENTER shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 26 24 19–Motor Control.
12. X1400163 AEGIS PANEL: AEGIS PANEL shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Paragraph 3.06 in Specification Section 40 94 23–Controls and Instrumentation.
13. X1400165 GAS DETECTION PANEL: GAS DETECTION PANEL shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Paragraph 2.18 in Specification Section 40 94 23–Controls and Instrumentation.
14. X1400328 AUTOMATIC TRANSFER SWITCH: AUTO TRANSFER SWITCH shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 26 36 23–Automatic Transfer Switches.
15. X5021507 DEWATERING: DEWATERING shall be paid for at the contract lump sum price as specified in the applicable requirements of the Special Provisions, Division 01, and all applicable requirements listed under Section 31 23 19–Dewatering.

1.03 CONTRACT DOCUMENTS—INTENT AND USE

A. Intent of Documents:

1. Singular notations and specifications shall be considered plural where application is reasonably inferred.
2. Mention or indication of extent of work under any division or Specification section is done only for convenience of CONTRACTOR and shall not be construed as describing all work required under that division or section.
3. Some individual sections may contain a list of related sections. The list of related sections in individual sections is provided for the convenience of CONTRACTOR and is not necessarily all-inclusive. CONTRACTOR may not rely upon this listing for determination of scope of work. Other sections of the Specifications not referenced in individual sections shall apply as required for proper performance of the Work.
4. Command type sentences may be used in the Contract Documents. These sentences refer to and are directed to CONTRACTOR.
5. Symbols for various elements and systems are shown on the Drawings. Should there be any doubt regarding the meaning or intent of the symbols used, a written interpretation shall be obtained from ENGINEER.

B. Use of Documents:

1. CONTRACTOR shall examine all Specifications and Drawings for the Work, including those that may pertain to Work CONTRACTOR does not normally perform with its own forces.
2. CONTRACTOR shall use all of the Project Drawings and Specifications:
 - a. For a complete understanding of the Project.
 - b. To determine the type of construction and systems required.
 - c. For coordination with other contractors.
 - d. To determine what other work may be involved in various parts or phases.
 - e. To anticipate and notify others when work by others will be required.
 - f. And all other relevant matters related to the project.
3. CONTRACTOR is also bound by all requirements of the Contract Documents which are applicable to, pertain to, or affect its Work as may be shown or inferred by the entire set of Project Drawings and Specifications.

1.04 CONTRACTOR USE OF SITE

A. General:

1. The “area of the site” referred to in these Specifications shall be as shown on the Drawings. If the “area of the site” is not shown, OWNER's property lines, the Project right-of-way and/or any easements obtained for the Project shall be considered the “area of the site.”
2. Construction activities shall be confined within the “area of the site” limits.
3. From the start of work to completion CONTRACTOR is responsible for the care of the site and the premises which are affected by operations of Work of this Contract.
4. Except for permanent site improvements provided under the Contract, CONTRACTOR shall restore property disturbed during the Work, to the conditions which previously existed.

5. Work in occupied spaces shall be restricted to specified Work and essential activities, such as making necessary connections and extending services or constructing temporary access ways. Such work shall be scheduled in advance with OWNER.

1.05 EXISTING SERVICES, OVERHEAD UTILITIES, AND UNDERGROUND FACILITIES INCLUDING STRUCTURES

- A. Work shall not commence until all labor, materials, and equipment are available so Work can continue without interruption or delay.
- B. Should uncharted or incorrectly charted services or Underground Facilities be encountered during installation, notify OWNER and consult with utility owner immediately.
- C. Cooperate with OWNER and utility companies in keeping respective services and Underground Facilities in operation and repair any damage.
- D. CONTRACTOR shall not interrupt existing services and Underground Facilities occupied and used by OWNER or others, except when permitted in writing by OWNER.
- E. Any accidental interruption of services and Underground Facilities shall be repaired immediately, including provision of temporary facilities until permanent repairs can be made.
- F. Prior to any excavation, demolition, or drilling on site, CONTRACTOR shall contact owners of the Underground Facilities in and near the construction area of the intent to excavate, demolish, or drill. As part of this notification requirement, CONTRACTOR shall contact "JULIE" (811 or 1-800-892-0123). CONTRACTOR shall be aware that not all owners participate in "JULIE." A call to this agency shall not absolve CONTRACTOR of the requirements for contacting owners of all Underground Facilities in and near the construction area. CONTRACTOR shall give reasonable advance notice to "JULIE" and other owners for the notification which shall not be less than the minimum advance notification required.
- G. Locations and elevations of services and Underground Facilities as shown on the Drawings are approximate. It shall be CONTRACTOR's responsibility to determine their exact location when in their vicinity. To this end, CONTRACTOR shall proceed with caution in the excavation and preparation of the Site so the exact location of services and Underground Facilities can be determined. CONTRACTOR shall include in the Contract Price any costs for temporary or permanent relocations of such services and Underground Facilities required to complete the Work unless specifically indicated otherwise in the Specifications.
- H. Where potential grade conflicts might occur with existing services and Underground Facilities, CONTRACTOR shall uncover such services and Underground Facilities sufficiently in advance of construction so that elevations may be determined to allow any necessary adjustments to be made.
- I. CONTRACTOR shall coordinate with overhead utility companies prior to the Work. CONTRACTOR shall provide all necessary temporary and permanent support relocation or temporary and permanent restraint to maintain overhead utilities in service.

- J. CONTRACTOR shall keep an accurate and complete record of all such services and Underground Facilities encountered and shall provide OWNER a copy of this record. The record shall include a description of the item encountered, opinion as to conditions, and adequate measurements and depths so that the item can be located in the future.
- K. CONTRACTOR shall inspect all services and Underground Facilities for condition and soundness. Unsound conditions shall be reported to OWNER immediately after exposing. CONTRACTOR shall not proceed with the Work until the service or facility owner has been notified. Service or facility owner shall then be given time to inspect and correct, if required, the service or Underground Facility. CONTRACTOR may make claim under the provisions of Articles 11 and 12 of the General Conditions should CONTRACTOR feel a price or time adjustment is justified.
- L. Any additional costs incurred because of failure of CONTRACTOR to report the condition of any and all existing services and Underground Facility encountered shall be paid for by CONTRACTOR.
- M. Whenever ENGINEER feels it is necessary to explore and excavate to determine the location of existing services and Underground Facilities, CONTRACTOR shall make explorations and excavations for such purposes. If CONTRACTOR is required to perform additional Work in making the explorations and excavations, extra compensation will be allowed as provided for in the General Conditions.

1.06 PROTECTION OF WORK AND IMPROVEMENTS

- A. CONTRACTOR shall protect the property of OWNER, existing improvements, and the Work installed by CONTRACTOR and others from abuse, damage, dust, debris, and other objectionable materials resulting from construction activities.
- B. CONTRACTOR shall provide suitable covers, partitions, or other dust and fume containment devices to suit construction operations.
- C. CONTRACTOR shall keep property, existing improvements, and the Work including structures, mains, fittings, and accessories free from dirt and foreign matter at all times.
- D. CONTRACTOR shall provide temporary plugging of openings, holes, and pipe ends that are existing or that CONTRACTOR has installed.
- E. Property, improvements, and Work damaged by CONTRACTOR shall be repaired or replaced by CONTRACTOR to the satisfaction of OWNER.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

Section 01 11 00-8

SECTION 01 29 00

CONTRACT CONSIDERATIONS

PART 1-GENERAL

1.01 SCHEDULE OF VALUES, PAYMENT AND INVOICES

- A. Schedule of Values and invoices shall be submitted as payment basis for each pay item of Pump Station General Work, Pump Station Electrical Work, and Pump Station Mechanical Work.
- B. CONTRACTOR shall submit a Schedule of Values, as specified herein, at least 15 days prior to submitting the first payment estimate and shall provide information as requested to substantiate the prices included in the Schedule of Values.
- C. The Schedule of Values shall be approved by ENGINEER prior to any project payments.
- D. Complete Schedule of Values:
 - 1. The Schedule of Values shall be typewritten on 8 1/2-inch by 11-inch paper in a format approved by ENGINEER.
 - 2. The Schedule of Values shall be used to determine the value of work completed for payment purposes. After review by ENGINEER, CONTRACTOR shall revise and resubmit the Schedule of Values as required.
 - 3. The Schedule of Values shall have each pay item further itemized by Specification Division as listed in the Specification index.
 - 4. For the item Pump Station General Work, Pump Station Electrical Work and Pump Station Mechanical Work, each pay item which has an installed value of over \$10,000, a list of the costs for the major products or operations shall be indicated under each pay item. Round off figures to the nearest 10 dollars. The "value" for each pay item listed shall be the supplied, installed and operational start-up cost incurred to CONTRACTOR for that pay item (overhead and profit included). The sum total of all pay items in the Schedule shall be equal to the payment reflecting total contract value.
- E. Unit Price for Change Order: If there is no bid unit prices for change order, CONTRACTOR shall follow applicable sections of the Standard Specifications.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

Section 01 29 00-1

SECTION 01 33 00

SUBMITTALS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Whenever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.
 - 2. To facilitate CONTRACTOR's understanding of the design intent, procedures have been established for advance submittal of design data and for its review or rejection by ENGINEER.
 - 3. The type of submittal requirements specified in this section include construction progress schedule, submittal schedule, shop drawings, product data, samples, maintenance manuals, and other miscellaneous work-related submittals.
- B. Related work described elsewhere: More detailed requirements for submittals are described in other sections of these specifications for some materials and equipment. They are to be considered additional requirements to supplement the requirements specified in this section. Submittals shall conform to Article 7 of the General Conditions.
- C. Definitions: "Electronic Submittal" is defined as any submittal transmitted electronically to ENGINEER for review.

1.02 IDENTIFICATION OF SUBMITTALS

- A. CONTRACTOR shall completely identify each submittal and resubmittal by showing at least the following information:
 - 1. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.
 - 2. Name and location of project and identification number.
 - 3. Drawing number and specifications section number to which the submittal applies.
 - 4. Include the date of each submittal or resubmittal.

1.03 GROUPING OF SUBMITTALS

- A. Unless otherwise specifically permitted by ENGINEER, CONTRACTOR shall make all submittals in groups containing all associated items so that information is available for checking each item when it is received.
- B. Partial submittals may be rejected as not complying with the provisions of the Contract Documents.

1.04 TIMING OF SUBMITTALS

- A. CONTRACTOR shall make all submittals far enough in advance of scheduled dates of installation to provide required time for reviews, for securing necessary approval, for possible revision and resubmittal, and for placing orders and securing delivery.
- B. The review period for submittals that are received after 3 P.M. shall commence on the following business day.

1.05 SUBMITTAL REQUIREMENTS

- A. Except as specified elsewhere herein, materials and equipment shall be in conformance with the requirements of Section 106 of IDOT Standard Specifications for Road and Bridge Construction.
- B. Materials and equipment shall be the products of established and reputable manufacturers and shall be suitable for the service required. Unless otherwise specifically indicated, all materials and equipment shall be new. CONTRACTOR is obligated to conduct his own search into the timely availability of the specified equipment and materials so that they are in strict conformance with the contract documents and that delivery schedules are compatible with project time constraints. Materials or equipment items which are similar or identical shall be the product of the same manufacturer. The cost of submittals, certifications, any required samples, and similar costs shall not be separately paid for but shall be included in the pay item bid price for the respective material or work.
- C. All equipment, products and materials incorporated in the work shall be submitted for approval.
- D. Each submittal shall be accompanied by a transmittal containing the following information:
 - 1. CONTRACTOR's Name.
 - 2. Supplier's Name.
 - 3. Manufacturer's Name.
 - 4. Date of submittal and dates of previous submittals containing the same material.
 - 5. Project Route/Name.
 - 6. Section.
 - 7. Submittal and transmittal number.
 - 8. Contract identification.
 - 9. Identification of equipment and material with equipment identification numbers, motor numbers, and Specification section number. Variations from Contract Documents and any limitations which may impact the Work Drawing sheet and detail number as appropriate.
 - 10. Variations from Contract Documents and any limitations which may impact the Work.
 - 11. Drawing sheet and detail number as appropriate. Multi-part submittal forms will be provided by the Department to the CONTRACTOR to facilitate the submittal and review process. The CONTRACTOR shall complete all submittal information on the form and shall sign the submittal as indicated.
 - 12. The resubmittal shall be complete in all respect and shall supersede earlier submittal in entirety and should not require referring to earlier multiple piece meal submittals.

13. Each submittal shall be dedicated for each subject. The different subjects and or systems associated with different engineering disciplines shall not be combined or mixed up together in one package of submittal.
- E. Exceptions, Deviations, and Substitutions:
1. In general, exceptions to and deviations from the requirements of the Contract Documents will not be allowed. It is the CONTRACTOR's responsibility to note any deviations from Contract requirements at the time of submittal and to make any requests for deviations in writing. In general, substitutions must demonstrate that the proposed substitution is superior to the equipment or material required by the Contract Documents. No exceptions, deviations, or substitutions will be permitted without approval.
 2. Data for items to be submitted for review, as substitution shall be collected into one submittal for each item of material or equipment.
 3. Request shall be submitted with other scheduled submittals for the material or equipment allowing time for ENGINEER to evaluate the additional information required to be submitted. If CONTRACTOR requests to substitute for material or equipment specified but not identified in Specifications as requiring submittals, substitution submittal request shall be included in Submittal schedule and submitted as scheduled.
- F. When submittals are marked "Examined and Returned for Correction or disapproved", Work covered by submittal shall not proceed. Work covered by submittal shall not be used at Project site or elsewhere where Work is in progress. The submittal shall be revised or a new submittal shall be prepared in accordance with ENGINEER's notations in accordance with Re-submittal Preparation procedures specified in this section. The submittal shall be resubmitted without delay and repeated if necessary to obtain different action marking.
- G. CONTRACTOR's Stamp:
1. Prior to submittal, CONTRACTOR shall review the submittal material and shall affix his stamp of approval, with comments as applicable, signed by a responsible representative, to each appropriate submittal item. In the case of Subcontractor's submittals, both the Sub-contractor and the General Contractor shall review and stamp the submittal. Submittals which are not approved or approved-as-noted by CONTRACTOR shall not be submitted to ENGINEER. CONTRACTOR shall not give an approved-as-noted status to submittals having incompleteness or major corrective notations as this will only delay the ultimate approval process.
 2. The receipt of submittal information from CONTRACTOR will be construed as CONTRACTOR's assurance that he has reviewed the submittal information and attests to the submittal's accuracy and conformance to the requirements of the contract documents. Submitted information shall be complete and in sufficient detail to demonstrate compliance with all requirement of the contract documents, including fitting in the space provided and meeting all salient features of the specifications.
- H. Except for submittals for record and similar purposes, where action and return on submittals are required or requested, ENGINEER will review each submittal, mark with appropriate action, and return. Where submittal must be held for coordination, ENGINEER will also advise CONTRACTOR without delay. ENGINEER will stamp each submittal with uniform, self-explanatory action stamp, appropriately marked with submittal action.

- I. Where submittals are marked "Approved", Work covered by submittal may proceed, provided it complies with contract documents. Acceptance of Work will depend upon that compliance.
- J. When submittals are marked "Approved as Noted" or "Approved Subject to Corrections Marked", Work covered by submittal may proceed provided it complies with both ENGINEER's notations or corrections on submittal and with Contract Documents. Acceptance of Work will depend on that compliance. The complete re-submittal shall be required for the "Approved as Noted" until the submittal attain "Approved" status, unless the reviewer's remarks indicate "Resubmittal is not required" which shall only be exercised for minor comments.
- K. When submittals are marked "Examined and Returned for Correction or disapproved", Work covered by submittal shall not proceed. Work covered by submittal shall not be used at Project site or elsewhere where Work is in progress. The submittal shall be revised or a new submittal shall be prepared in accordance with ENGINEER's notations in accordance with Re-submittal preparation procedures specified in this section. The submittal shall be resubmitted without delay and repeated if necessary to obtain different action marking.
- L. Any need for more than one resubmission, or any other delay in ENGINEER's review of submittals, will not entitle CONTRACTOR to extension of the Contract Time.
- M. Coordination:
 - 1. Preparation and processing of submittals shall be coordinated with performance of the work, other submittals and related activities such as substitution requests, testing, purchasing, fabrication, delivery, and similar activities that require sequential activity.
 - 2. Submission of different units of interrelated work shall be coordinated so that one submittal will not be delayed by ENGINEER's need to review a related submittal. ENGINEER may withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.
- N. Unless otherwise indicated, warranties as specified herein shall be included with the submittal information of all applicable equipment and materials. Incompleteness, inaccuracy, or lack of coordination shall be grounds for rejection. CONTRACTOR shall clearly understand no equipment or material shall be installed prior to approval and that any equipment or material installed prior to approval is subject to removal from the right-of-way solely at CONTRACTOR's expense.

1.06 CONSTRUCTION PROGRESS AND SUBMITTAL SCHEDULES

- A. Schedule of Shop Drawings and Samples shall be per Section 105.04 of IDOT Standard Specifications for Road and Bridge Construction.
- B. Informational Submittals: Submittals showing compliance with required qualifications submitted 20 calendar days prior to any work beginning using the subject qualifications.
- C. Submittals Requiring ENGINEER Review and Approval:
 - 1. Reports and Installation Certifications: Submit to ENGINEER within seven calendar days of conducting testing, installation, or examination.

2. Record Drawings: Deliver to ENGINEER at the completion of the Contract and before final payment is made.
- D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration for each activity. Identify activities that are on the critical path.
- E. Include line items for milestones (if any), Substantial, and Final Completion.
- F. Submit updated schedules with each Application for Payment, identifying changes since previous version.
- G. Indicate estimated percentage of completion for each item of Work at each submission.
- H. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates.

1.07 SHOP DRAWINGS

- A. Shop drawings shall include specially prepared technical data for this project including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements, and similar information not in standard printed form for general application to a range of similar projects. Shop drawings shall be submitted for all manufactured or fabricated items. See individual technical sections for special requirements. CONTRACTOR shall thoroughly review submittal and so that the submittal is complete and meets contract documents. Any shop drawing submitted more than two times requires the contractor to be charged for all costs incurred by IDOT.
- B. The catalog cuts shall be highlighted identifying all selected options and project specific details. Generic catalog cuts shall be unacceptable.
- C. Any deviation hidden in the submittals shall be unacceptable. The deviations if any shall be highlighted and CONTRACTOR shall provide cost analysis justifying equal or better product. The ENGINEER shall be the sole authority for the acceptance or rejection without any justification.
- D. CONTRACTOR shall make all shop drawings accurately to scale and sufficiently large to show all pertinent aspects of the item and its method of connection to the work.
- E. Shop drawings shall be checked, approved, and stamped by CONTRACTOR in accordance with the General Conditions before transmittal to ENGINEER for review and approval.
- F. Complete shop drawings and descriptive data shall be submitted on all manufactured or fabricated items prior to 50% completion of the Work. Applications for payment beyond 50% of the Contract amount will not be recommended for payment until all shop drawings are submitted, including color hard copies if requested by OWNER, or a revised schedule for any remaining submittals is agreed to by OWNER and ENGINEER.
- G. CONTRACTOR shall submit shop drawings following the electronic submittal procedure described below.

- H. Shop drawings submitted to ENGINEER will be reviewed and stamped "Approved," "Approved as Noted," "Approved as Noted-Resubmit," or "Not Approved." CONTRACTOR shall resubmit shop drawings stamped "Approved as Noted-Resubmit" and "Not Approved," and will continue this process until shop drawings are stamped "Approved" or "Approved as Noted." If drawings are stamped "Approved as Noted-Resubmit," fabrication may proceed in accordance with the marked-up shop drawings. Installation shall not proceed until shop drawings have been resubmitted and stamped "Approved" or "Approved as Noted."
- I. If shop drawings are stamped "Approved as Noted" or "Approved as Noted-Resubmit" and CONTRACTOR does not agree with revisions or cannot conform with revisions, fabrication shall not proceed and shop drawings shall be resubmitted with explanation of CONTRACTOR's position.
- J. All shop drawings used for construction site activities shall bear the "Approved" or "Approved as Noted" stamp of ENGINEER.
- K. Electronic Submittal Procedures
 - 1. Summary:
 - a. Shop drawing and product data submittals shall be transmitted to ENGINEER in electronic (PDF) format using Submittal Exchange, or equal, a website service designed specifically for transmitting submittals between construction team members, or equal.
 - b. The intent of electronic submittals is to expedite the construction process by reducing paperwork, improving information flow, and decreasing turnaround time.
 - c. The electronic submittal process is not intended for color samples, color charts, or physical material samples.
 - 2. Procedures:
 - a. CONTRACTOR shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer/product, dimensions and coordination of information with other parts of the work.
 - b. CONTRACTOR shall transmit each submittal to ENGINEER using the Submittal Exchange website, www.submittalexchange.com, or equal.
 - c. ENGINEER review comments will be made available on the Submittal Exchange website for downloading. CONTRACTOR will receive email notice of completed review.
 - d. Distribution of reviewed submittals to subcontractors and suppliers is the responsibility of CONTRACTOR.
 - e. Electronically submitted shop drawings shall follow the following format:
 - (1) Filenames for the shop drawing submittals shall follow a XX XX XX.YYY-Z. Description convention where XX XX XX is the specification section number, YYY is the submittal number, .Z is the resubmittal number, and description is a short description of what the submittal includes. Submittals shall be consecutively numbered in direct sequence of submittal. Resubmittals shall be consecutively numbered with the first submittal numbered with a -0 and the first resubmittal numbered with a -1. Example file name: 03 20 00.016-1. Structure 10 Concrete Reinforcement. This would be the first revision of the sixteenth submittal and contain information on concrete reinforcement.

- (2) All files shall be delivered in PDF format with a minimum resolution of 300 dpi unless otherwise requested by ENGINEER. Scanned in material shall be scanned in color and any markings by CONTRACTOR shall be made in red. Pages shall be rotated to the appropriate position for easy reading on a computer monitor such that the majority of text is vertical.
- (3) Files shall be delivered without security features activated.
- (4) Shop Drawings shall be uploaded as individual files. Files combined into a zip drive are not acceptable. All pages of one submittal should be contained in one file.
- (5) The file shall open to a cover page containing, at a minimum, the following information:
 - (a) Submittal date and revision dates.
 - (b) Project name, division number and descriptions.
 - (c) Detailed specifications section number and page number.
 - (d) Identification of equipment, product or material.
 - (e) Name of CONTRACTOR and Subcontractor with contact information.
 - (f) Name of Supplier and Manufacturer.
 - (g) Relation to adjacent structure or material.
 - (h) Field dimensions, clearly identified.
 - (i) Standards or Industry Specification references.
 - (j) Identification of deviations from the Contract Documents.
 - (k) CONTRACTOR's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
 - (l) Physical location and location relative to other connected or attached material at which the equipment or materials are to be installed.
- f. Once a shop drawing has been "Approved" or "Approved as Noted," CONTRACTOR shall provide five hard color copies and one electronic copy of the "Approved" or "Approved as Noted" shop drawings to ENGINEER. CONTRACTOR is responsible for the hard copy color replication of ENGINEER's "Approved" or "Approved as Noted" shop drawings for use by CONTRACTOR. Hard copy shop drawings shall be submitted in 3-ring binders or 3-tab report covers.
- L. Shop drawings shall include verification that the item meets applicable codes and standards.
- M. Materials, products or systems shall not be installed until copy of applicable product data showing only approved information is in possession of installer. One set of product data (for each submittal) shall be maintained at Project site. Five additional copies shall be marked with the date of approval and forwarded to ENGINEER for use in field and for OWNER'S records.
- N. Shop drawing submittal shall include pump control schematics and HVAC equipment, SCADA panel drawings, and detailed control system descriptions for auto/manual controls and operation and monitoring and monitoring of main and low flow pumps from the SCADA Panel and from the float control mode and also remote monitoring system descriptions.

1.08 COLORS AND PATTERNS

- A. Unless the precise color and pattern is specifically described in the Contract Documents, whenever a choice of color or pattern is available in a specified product, CONTRACTOR

shall submit accurate color charts and pattern charts to ENGINEER for OWNER's review and selection.

- B. Unless all available colors and patterns have identical wearing capabilities and are identically suited for the installation, CONTRACTOR shall completely describe the relative capabilities of each.

1.09 SAMPLES AND FIELD MOCKUPS

- A. CONTRACTOR shall provide samples and field mockups where noted or specified. At CONTRACTOR's option, and depending upon nature of anticipated response from ENGINEER, initial submittal of samples may be either preliminary or final submittal.
- B. A preliminary submittal, consisting of a single set of samples, is required where specifications indicate ENGINEER's selection of color, pattern, texture or similar characteristics from manufacturer's range of standard choices is necessary. Preliminary submittals will be reviewed and returned with ENGINEER's "Action" marking. Three sets of samples shall be submitted in final submittal, one set will be returned. The returned final set of samples shall be maintained at Project site, in suitable condition and available for quality control comparisons throughout course of performing work. Returned samples intended or permitted to be incorporated in the Work are indicated in Specification sections, and shall be in undamaged condition at time of use.
- C. Samples are physical examples which illustrate materials, equipment, or workmanship and establish standards by which the work will be judged.
- D. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product and full range of color, texture, and pattern.
- E. Samples shall have labels firmly attached, bearing the following information:
 - 1. Name of project.
 - 2. Description of product and finish.
 - 3. Name of CONTRACTOR.
 - 4. Trade name and number of product.
 - 5. Standards met by the product.
- F. Approval of samples must be obtained prior to proceeding with any work affected by material requiring sample approval.
- G. Samples, unless otherwise noted, become the property of OWNER.
- H. In situations specifically approved by ENGINEER, the retained sample may be used in the construction as one of the installed items.
- I. Field Mockups:
 - 1. CONTRACTOR shall erect field mockups at the project site in a location acceptable to ENGINEER and OWNER.
 - 2. When accepted by ENGINEER, the mockup will become the basis for comparison of the actual work.
 - 3. Remove mockup at conclusion of the work if it was not incorporated into the work.

1.10 PRODUCT DATA

- A. Required product data shall be collected into a single submittal for each element of work or system. Where product data has been printed to include information on several similar products, some of which are not required for use on Project or are not included in submittal, copies shall be marked to clearly show such information is not applicable.
- B. Where product data must be specially prepared for required products, materials or systems, because standard printed data are not suitable for use, data shall be submitted as a Shop Drawing and not as product data.
- C. Submittal is for information and record, and to determine that products, materials, and systems comply with Contract Documents. Submittal shall be final when returned by ENGINEER marked "Approved".
- D. Five submittal copies and one draft electronic version in PDF, in addition to the number the CONTRACTOR requires returned, including those required for RECORD DRAWINGS, shall be submitted to the ENGINEER.
- E. Materials, products or systems shall not be installed until copy of applicable product data showing only approval information is in possession of installer. One set of product data (for each submittal) shall be maintained at Project site, available for reference by ENGINEER and others.

1.11 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by ENGINEER.
- B. Shop Drawings and Product Data:
 - 1. Revise initial drawings or data and resubmit as specified for initial submittal.
 - 2. Itemize in a cover letter any changes which have been made other than those requested by ENGINEER.
- C. CONTRACTOR shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three submittals. ENGINEER will record ENGINEER's time for review subsequent submittals of shop drawings, samples, or other items required for approval and CONTRACTOR shall reimburse OWNER and ENGINEER's charges for such time.
- D. In the event that CONTRACTOR requests a substitution for previously approved item, CONTRACTOR shall reimburse OWNER for ENGINEER's charges for its review time unless the need for such change is beyond control of CONTRACTOR.

1.12 MANUFACTURER'S DIRECTIONS

- A. Manufactured articles, materials, and equipment shall be stored, commissioned, operated, applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer, unless specified to the contrary.

- B. Wherever specifications call for work to be performed or materials to be installed in accordance with the manufacturer's printed instructions or directions, CONTRACTOR shall furnish copies as required for shop drawings of those instructions or directions to ENGINEER before installing the material or performing the work.

1.13 OPERATION AND MAINTENANCE MANUAL

- A. Five copies and one draft electronic version in PDF format of an operation and maintenance manual shall be furnished to ENGINEER for all equipment and associated control systems furnished and installed for review and approval. Five hard copies of approved O&M manuals and four electronic versions in PDF format on USB thumb drives shall be submitted for ENGINEER's use. PDF document shall not be password protected or locked.
- B. CONTRACTOR shall submit three manuals for engineer, IDOT O&M and IDOT engineer's independent review when construction is at 80% complete stage. Based on the consolidated review comments and compliance, the contractor shall organize and compile required number of sets of O&M manuals and resubmit for review and approval along with point to point response to the previous comments. If it is determined by ENGINEER that the manuals does not contain required details and are not revised per the previous comments, then all manuals shall be returned back to CONTRACTOR for corrective action until the manuals are approved by ENGINEER.
- C. The manual shall consist of the following and shall be prepared and arranged subject wise and chronological order as follows:
 - 1. Table of contents broken down per discipline.
 - 2. A section of a pump station data sheet (see sample form at end of section).
 - 3. A section of an equipment data summary (see sample form at end of section) for each item of equipment.
 - 4. A section of an equipment preventive maintenance data summary (see sample form at end of section) for each item of equipment.
 - 5. A section of the equipment manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment, preventive and repair maintenance, lubrication, troubleshooting, parts list and recommended spare parts.
 - 6. List of electrical relay settings and control and alarm contact settings.
 - 7. Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems.
 - 8. One valve schedule giving valve number, location, fluid, and fluid destination for each valve installed. All valves in same piping systems shall be grouped together in the schedule. A sample of the valve numbering system shall be obtained from ENGINEER.
 - 9. All O&M Manual material and catalog pages shall be on 8 1/2-inch by 11-inch commercially printed or typed forms or an acceptable alternative format. Paper shall be minimum 32-pound weight with hole punches reinforced to prevent tearing.
 - 10. Comprehensive technical data sheets for pumps, motors, equipment within switchgear, MCC, switchgear, transformers, breakers, valves, SCADA and control panel.
 - 11. Details of equipment nameplates and technical ratings.
 - 12. Detailed summary of quantities and bill of material with technical descriptions for major equipment such as MCC, switchgear, SCADA, and control panels, etc.

13. The manuals shall contain catalog cuts highlighting features and selected options of the equipment.
 14. Legible 11-inch by 17-inch shop drawing and each shop drawing shall have "Record" stamp, signatures and date. Paper shall be minimum 32-pound weight with hole punches reinforced to prevent tearing.
 15. The catalog cuts of each device/equipment shall have engineer's "Approved" stamp, signature and date.
 16. The manual shall include shop drawings of SCADA, control panels, MCC, switchgear, front and internal views, internal wiring and field interconnection termination details/terminal schedules.
 17. The manual shall have CAD produced contract drawings having changes identified by red ink and contract documents shall have "Record" stamp, signature and date.
 18. The manual shall include control schematic shop drawings for pumps and discharge/recirculation gate valves.
 19. Mechanical and HVAC equipment schedules.
 20. The manual shall contain a section for detailed system description of sequence of pump operations during rising and falling wet well water level through SCADA primary and backup level controls, float mode control, manual and auto operation of various level systems, remote monitoring of pump station signals and communications method.
 21. All documents shall be legible.
 22. Five copies of Record Drawings and one electronic version in PDF format shall be submitted to ENGINEER for review.
- D. Each manual shall be organized into sections paralleling the equipment specifications. Each section shall be identified using heavy section dividers with reinforced holes and numbered plastic index tabs. The data shall be compiled in high-quality heavy-weight, hard cover binders with piano style metal hinges or in an alternate approved format. 11-inch by 17-inch reduced size legible drawings and other materials which would be opened or removed for reading shall be provided with heavy clear plastic pouches within the binders. The number of binders shall be as required to hold all required material without over-filling. Various sections, as appropriate shall have suitable dividers. All volumes shall be labeled. All loose data shall be punched for binding. Composition and printing shall be arranged so that punching does not obliterate any data. The project title, and manual title, as furnished and approved by ENGINEER shall be printed on the cover and binding edge of each manual.
- E. All operating and maintenance material that comes bound by the equipment manufacturer shall be left in its original bound state. The appropriate sections of CONTRACTOR's O&M manual shall be cross-referenced to the manufacturers' bound manuals.
- F. The O&M Manuals must be submitted and must be acceptable to ENGINEER prior to final acceptance.
- G. Miscellaneous Submittals:
1. Inspection and Test Reports: Each inspection and test report shall be classified as either "Shop Drawings" or "product data", depending on whether report is specially prepared for Project or standard publication of workmanship control testing at point of production. Inspection and test reports shall be processed accordingly.

2. Guarantees, Warranties, Maintenance Agreements, and Workmanship Bonds:
 - a. Refer to Specification sections and section Guarantees and Warranties of this Division for specific requirements. Submittal is final when returned by ENGINEER marked "Approved" or "Approved as Noted."
 - b. In addition to copies desired for CONTRACTOR's use, 2 executed copies shall be furnished. Two additional copies shall be provided where required for maintenance data.
 3. Certifications:
 - a. Refer to Specification sections for specific requirements on submittal of certifications. Seven copies shall be submitted. Certifications are submitted for review of conformance with specified requirements and information. Submittal shall be final when returned by ENGINEER marked "Approved".
 - b. Where certifications are specified, the information submitted for approval shall incorporate certification information. When a certification can be made prior to manufacture, the certification shall be included with initial submittal information. When certification is possible only after manufacture, the initial submittal information shall include a statement intent to furnish the certification after equipment approval and manufacture. Certifications involving inspections and/or tests shall be complete with all test data presented in a neat, descriptive format, with all test data, applicable dates, times, and persons responsible.
 4. Tools:
 - a. Spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units shall be submitted.
 - b. Special tools are considered to be those tools which, because of their limited use, are not normally available but which are necessary for maintenance of particular equipment.
 - c. For each type of equipment provided under this CONTRACT, a complete set of all special tools shall be furnished including grease guns and other lubricating devices, which may be needed for the adjustment, operation, maintenance, and disassembly of such equipment. Tools shall be of high grade, smooth forged alloy tool steel. Grease guns shall be of the lever type.
 - d. One or more neat and substantial steel wall cases or cabinets shall be furnished and erected with flat key locks and clips or hooks to hold each special tool in a convenient arrangement.
- H. Submittal information must be particularly detailed in every respect. Product data shall present information to demonstrate the complete nature of the product, including dimensions, wiring diagrams, operating information, and the like. Shop drawings shall be extremely detailed and shall include all appropriate dimensions, fabrication details, component bill of material, information relative to mounting, detailed wiring, finish, and the like. Wiring diagrams shall include both schematic and point-to point representations, complete with references to circuiting as indicated on the Contract Drawings as well as terminal points of component devices.
- I. Unless required elsewhere, submittals shall be distributed to Subcontractors, suppliers, governing authorities, and others as necessary for proper performance of work.

1.14 WARRANTIES

- A. All equipment shall be furnished complete with the manufacturer's standard trade warranty, applicable to the Illinois Department of Transportation, from the date of final acceptance. Such warranty shall accompany submittal shop drawings and product data.
- B. Prior to final payment, the original and one copy of all bonds, warranties, and similar documents, including those customarily provided by manufacturers and suppliers which cover a period greater than the one-year correction period shall be delivered to ENGINEER.
- C. The warranties shall include parts and labor and shall begin from the date of final acceptance.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END SECTION

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. OSHA requirements.
 - 2. 35 Ill. Adm. Code 652.
 - 3. 35 Ill. Adm. Code 1100.
 - 4. Roadway limits.
 - 5. Permits.
 - 6. Wage rates.

1.02 OSHA REQUIREMENTS

- A. All work including site safety, equipment, materials, and fabricated items provided under the Contract shall comply with the provisions of the "Occupational Safety and Health Act."

1.03 35 ILL. ADM. CODE 652

- A. CONTRACTOR shall comply with 35 Ill. Adm. Code 652 during the project and shall use protective coatings personnel to carry out corrosion prevention and mitigation methods and use inspectors so that best practices and standards are adhered to.

1.04 35 ILL. ADM. CODE 1100

- A. CONTRACTOR shall comply with 35 Ill. Adm. Code 1100 when disposing of clean construction or demolition debris (CCDD) or uncontaminated soil at a CCDD or uncontaminated soil fill operation.

1.05 ROADWAY LIMITS

- A. CONTRACTOR shall comply with roadway weight restrictions including seasonal weight restrictions.

1.06 PERMITS

- A. No permits were obtained by OWNER for this Project. CONTRACTOR shall obtain required permits. Where the requirements of any permit are more restrictive than the Drawings or the Specifications, the permit requirements shall govern.
- B. A building permit will be required from OWNER. However, Village of Barrington will waive fees associated with the permit.

- C. Any permits required for dewatering operations shall be obtained and paid for by CONTRACTOR.

1.07 WAGE RATES

- A. CONTRACTOR and any subcontractor shall pay all laborers, workers, and mechanics performing work under the Contract not less than the prevailing wage rates adopted by OWNER or determined by the court on review and filed with the Secretary of State in Springfield. A copy of the Schedule of Prevailing Wage Rates is attached hereto.
- B. CONTRACTOR shall keep or cause to be kept a record of employees and wages paid as required by the Prevailing Wage Act (820 ILCS 130/1-12). CONTRACTOR shall also require each subcontractor employed on the project to keep these same records. In accordance with Illinois Public Act 94-0515, CONTRACTOR shall submit certified payroll records on a monthly basis to OWNER, along with a statement affirming that such records are true and accurate, that the wages paid to each worker are not less than the required prevailing rate and that CONTRACTOR is aware that filing records he or she knows to be false is a Class B misdemeanor.
- C. The certified payroll records shall include for every worker employed on the project the name, address, telephone number, social security number, job classification, hourly wages paid in each pay period, number of hours worked each day, and starting and ending time of work each day.
- D. If at the time this Contract is executed, or if during the term of this Contract, there is excessive unemployment in Illinois as defined in the Employment of Illinois Workers on Public Works Act, 30 ILCS 570, as two consecutive months of unemployment exceeding 5%, CONTRACTOR agrees to employ a work force that is comprised of at least 90% Illinois laborers. An "Illinois laborer" is defined as any person who has resided in Illinois for at least 30 days and intends to become or remain an Illinois resident.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 42 00

REFERENCE STANDARDS AND DEFINITIONS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Reference Standards:
 - a. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
 - b. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is CONTRACTOR's responsibility to provide materials and workmanship which meet or exceed that specifically named code or standard.
 - c. It is also CONTRACTOR's responsibility, when so required by the Contract Documents, to deliver to ENGINEER all required proof that the material or workmanship, or both, meet or exceed the requirements of the specifically named code or standard.
 - 2. Definitions:
 - a. A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including the Drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon.
 - b. Certain terms used in the Contract Documents are defined generally in this section to supplement definitions of the Agreement, General Conditions, Supplementary Conditions, and other general contract documents.
 - c. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the Work.
- B. Related Work Described Elsewhere: The specific naming of codes or standards occurs on the Drawings and in other sections of these Specifications.

1.02 QUALITY ASSURANCE

- A. Familiarity with Pertinent Codes and Standards:
 - 1. It is CONTRACTOR's responsibility to verify the requirements of the specifically named codes and standards and to verify that the items procured for use in this Work meet or exceed the specified requirements.
 - 2. When required by individual sections of these specifications, CONTRACTOR shall obtain a copy of each pertinent code or standard and maintain the copies at the job site during submittals, planning, and progress of the Work until Substantial Completion of the Work is attained.

- B. Overlapping or Conflicting Requirements:
1. Where compliance with two or more industry standards or sets of requirements are specified, and the overlapping of those standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement (which is generally recognized to be also most costly) is intended and will be enforced, unless more detailed language written directly into Contract Documents clearly indicates that a less stringent requirement is acceptable.
 2. Refer all uncertainties to ENGINEER for decision before proceeding.

1.03 REFERENCE STANDARDS

- A. Applicable standards of the construction industry are made a part of the Contract Documents by reference as if copied directly into the Contract Documents, or as if published copies were bound herewith. See Article 3.02 of the General Conditions for additional provisions regarding references.
- B. Standards referenced directly in the Contract Documents or by governing regulation, have precedence over nonreferenced standards which are recognized in industry for applicability to the Work.
- C. Nonreference standards are hereby defined to have no particular applicability to the Work except as a general measurement of whether the Work complies with standards recognized in the construction industry.
- D. Reference standards and codes listed in these specifications may include, but are not necessarily limited to, standards or codes published by the following agencies and organizations:
1. AA Aluminum Association
1525 Wilson Boulevard, Arlington, VA 22209
 2. AAMA American Architectural Manufacturer's Association
1827 Walden Office Square Suite 550, Schaumburg, IL 60173-4268
 3. AASHTO American Association of State Highway & Transportation Officials
444 North Capitol Street NW Suite 249, Washington, DC 20001
 4. ACI American Concrete Institute
38800 Country Club Drive, Farmington Hills, MI 48331-3439
 5. AI Asphalt Institute
2696 Research Park Drive, Lexington, KY 40511-8480
 6. AISC American Institute of Steel Construction
One East Wacker Drive Suite 700, Chicago, IL 60601-1802

7. AISI American Iron and Steel Institute
25 Massachusetts Avenue NW Suite 800, Washington, DC 20001
8. ANSI American National Standards Institute
25 West 43rd Street, New York, NY 10036
9. APA American Plywood Association
7011 South 19th, Tacoma, WA 98466-5333
10. API American Petroleum Institute
1220 L Street NW, Washington, DC 20005-4070
11. ARI Air-Conditioning & Refrigeration Institute
4100 North Fairfax Drive Suite 200, Arlington, VA 22203
12. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
1791 Tullie Circle NE, Atlanta, GA 30329
13. ASME American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990
14. ASSE American Society of Sanitary Engineering
901 Canterbury Suite A, Westlake, OH 44145
15. ASTM ASTM International
100 Barr Harbor Drive, West Conshohocken, PA 19428-2959
16. AWI Architectural Woodwork Institute
46179 Westlake Drive Suite 120, Potomac Falls, VA 20165-5874
17. AWWPA American Wood Protection Association
P.O. Box 361784, Birmingham, AL 35236-1784
18. AWS American Welding Society
8669 Doral Boulevard Suite 130, Doral, FL 33166
19. AWWA American Water Works Association
6666 West Quincy Avenue, Denver, CO 80235
20. BHMA Builder's Hardware Manufacturers Association
355 Lexington Avenue 15th floor, New York, NY 10017
21. BIA Brick Industry Association
1850 Centennial Park Drive Suite 301, Reston, VA 20191

- 22. CRSI Concrete Reinforcing Steel Institute
9333 North Plum Grove Road, Schaumburg, IL 60173
- 23. DOT U.S. Department of Transportation
1200 New Jersey Avenue, SE, Washington, DC 20590
- 24. EJMA Expansion Joint Manufacturers Association
25 North Broadway, Tarrytown, NY 10591
- 25. FM FM Global
FM Global Corporate Offices, 270 Central Avenue, Johnston, RI 02919
- 26. FTI Facing Tile Institute
Box 8880, Canton, OH 44711
- 27. GA Gypsum Association
6525 Belcrest Road Suite 480, Hyattsville, MD 20782
- 28. GANA Glass Association of North America
800 SW Jackson Street Suite 1500, Topeka, KS 66612-1200
- 29. ICC International Code Council
500 New Jersey Avenue NW 6th Floor, Washington, DC 20001
- 30. IES Illuminating Engineering Society
120 Wall Street, Floor 17, New York, NY 10005-4001
- 31. MIL Military Specifications
Naval Publications and Forms Center
5801 Tabor Avenue, Philadelphia, PA 19120
- 32. NAAMM National Association of Architectural Metal Manufacturers
800 Roosevelt Road Building C Suite 312, Glen Ellyn, IL 60137
- 33. NCMA National Concrete Masonry Association
13750 Sunrise Valley Drive, Herndon, VA 20171-4662
- 34. NECA NECA
National Electrical Contractors Association
3 Bethesda Metro Center Suite 1100, Bethesda, MD 20814
- 35. NEMA National Electrical Manufacturers Association
1300 North 17th Street Suite 1752, Rosslyn, VA 22209
- 36. NFPA National Fire Protection Association
1 Batterymarch Park, Quincy, MA 02169-7471

- 37. NIST National Institute of Standards and Technology
(U.S. Department of Commerce), 100 Bureau Drive, Stop 1070
Gaithersburg, MD 20899-1070
- 38. NRCA National Roofing Contractors Association
10255 West Higgins Road Suite 600, Rosemont, IL 60018-5607
- 39. NSF National Sanitation Foundation International
P.O. Box 130140, 789 North Dixboro Road, Ann Arbor, MI 48113-0140
- 40. OSHA Occupational Safety & Health Administration
200 Constitution Avenue NW, Washington, DC 20210
- 41. PCA Portland Cement Association
5420 Old Orchard Road, Skokie, IL 60077
- 42. PCI Prestressed Concrete Institute
200 West Adams Street Suite 2100, Chicago, IL 60606
- 43. SAE Society of Automotive Engineers
SAE World Headquarters
400 Commonwealth Drive, Warrendale, PA 15096-0001
- 44. SDI Steel Deck Institute
P.O. Box 25, Fox River Grove, IL 60021
- 45. SDI Steel Door Institute
30200 Detroit Road, Westlake, OH 44145-1987
- 46. SIGMA Sealed Insulating Glass Manufacturers Assoc.
401 North Michigan Avenue Suite 2400, Chicago, IL 60611
- 47. SJI Steel Joist Institute
234 Cheves Street, Florence, SC 29501
- 48. SMACNA Sheet Metal and Air Conditioning
Contractor's National Association
4201 Lafayette Center Drive, Chantilly, VA 20151-1219
- 49. SSPC Society for Protective Coatings
40 24th Street 6th Floor, Pittsburgh, PA 15222-4656
- 50. TCA Tile Council of America
100 Clemson Research Boulevard, Anderson, SC 29625

51. UL Underwriters Laboratories
333 Pfingston Road; Northbrook, IL 60062

1.04 SUBMITTALS

- A. For OWNER's records, CONTRACTOR shall submit copies of permits, licenses, certifications, inspection reports, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

1.05 DEFINITIONS

- A. Indicated:
1. The term "indicated" is a cross-reference to details, notes, or schedules on the drawings, to other paragraphs or schedules in the specifications and to similar means of recording requirements in the Contract Documents.
 2. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping the reader locate cross-reference, and no limitation is intended except as specifically noted.
- B. Approve (or Words of Similar Nature):
1. Where used in conjunction with ENGINEER's response to submittals, requests, applications, inquiries, reports, and claims by CONTRACTOR, the meaning of the term "approve" will be held to the limitation of ENGINEER's responsibilities and duties as specified in Paragraph 1.02.B.1. of the General Conditions.
 2. In no case will "approval" by ENGINEER be interpreted as a release of CONTRACTOR from responsibility to fulfill requirements of the Contract Documents.
- C. Minimum Requirements:
1. Indicated requirements are for a specific minimum acceptable level of quality or quantity, as recognized in the industry.
 2. Actual work must comply with (or within specified tolerances) or exceed minimums.
 3. CONTRACTOR shall refer uncertainties to ENGINEER before proceeding.
- D. Abbreviations: Abbreviations, where not defined in the Contract Documents, will be interpreted to mean the normal construction industry terminology.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

PART 1--GENERAL

1.01 SUMMARY

- A. Work Includes:
 - 1. Quality Assurance--Control of Installation.
 - 2. Tolerances.
 - 3. Manufacturers' Field Services and Reports.
 - 4. Testing.

1.02 QUALITY ASSURANCE--CONTROL OF INSTALLATION

- A. CONTRACTOR shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality.
- B. CONTRACTOR shall comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, CONTRACTOR shall request clarification from ENGINEER before proceeding.
- D. CONTRACTOR shall comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Work shall be performed by persons qualified to produce workmanship of specified quality.
- F. CONTRACTOR shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
- G. Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized test codes of the ANSI, ASME, or IEEE, except as may otherwise be stated herein.
- H. At all times during the progress of the Work and until the date of final completion, afford ENGINEER every reasonable, safe, and proper facility for observing the Work at the site. The observation of any work will not relieve CONTRACTOR of any obligations to perform proper and satisfactory work as specified. Work rejected due to faulty design, inferior, or defective materials, poor workmanship, improper installation, excessive wear, or nonconformity with the requirements of the Contract Documents, shall be replaced at no additional cost to the Department. Finished or unfinished work found not to be in strict accordance with the Contract shall be replaced as requested even though such work may have been previously approved and payment made therefore.

- I. Failure or neglect on the part of ENGINEER to condemn or reject bad or inferior work or materials does not imply an acceptance of such work or materials. Neither is it to be construed as barring ENGINEER at any subsequent time from recovering damages or a sum of money needed to build anew all portions of the Work in which inferior work or improper materials were used.
- J. Cooperate with ENGINEER and laboratory testing representatives. At least fifteen (15) working days notice shall be given prior to when specified testing is required. Labor and materials, and necessary facilities shall be provided by CONTRACTOR at the site as required by ENGINEER and the testing laboratory.
- K. Except as expressly provided elsewhere herein, all the costs of shop and field tests of equipment and other tests specifically called for in the Contract Documents shall be included in the Contract Price.
- L. If the acceptance tests reveal defects in material or equipment, or if the material or equipment in any way fails to comply with the requirements of the Contract Documents, such deficiencies shall be promptly corrected. Failure or refusal to correct the deficiencies, or if the improved materials or equipment, when tested again, fail to meet warranty or specified requirements, ENGINEER, notwithstanding its partial payment for work and materials or equipment, may reject said materials or equipment and may request that CONTRACTOR remove the defective work from the site at no addition to the Contract Price, and replace it with material or equipment which meets the Contract Documents.

1.03 TOLERANCES

- A. CONTRACTOR shall monitor tolerance control of installed products to produce acceptable work and shall not permit tolerances to accumulate.
- B. CONTRACTOR shall comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, CONTRACTOR shall request clarification from ENGINEER before proceeding.
- C. CONTRACTOR shall adjust products to appropriate dimensions; position before securing products in place.

1.04 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. When specified in individual specification sections or when requested by ENGINEER, CONTRACTOR shall require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, and quality of workmanship.
- B. CONTRACTOR shall submit qualifications of observer to ENGINEER 30 days in advance of required observations.
- C. CONTRACTOR shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

- D. CONTRACTOR shall submit report in duplicate within 30 days of observation to ENGINEER for information.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES

PART 1--GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Temporary utilities.
 - 2. Temporary stairs and access.
 - 3. Temporary support facilities.
 - 4. Removal of temporary facilities.
- B. CONTRACTOR shall arrange for and provide temporary facilities as required for proper and expeditious prosecution of the Work.
- C. CONTRACTOR shall pay all costs, except as otherwise specified, until final acceptance of the Work unless OWNER makes arrangements for use of completed portions of the Work after substantial completion in accordance with the provisions of the General Conditions.
- D. CONTRACTOR shall make all temporary connections to utilities and services in locations acceptable to OWNER and local authorities having appropriate jurisdiction.
 - 1. Furnish all necessary labor and materials.
 - 2. Make all installations in a manner subject to the acceptance of such authorities and OWNER.
 - 3. Maintain such connections.
 - 4. Remove temporary installation and connection when no longer required.
 - 5. Restore services and sources of supply to proper operating conditions.

1.02 TEMPORARY UTILITIES

- A. Temporary Toilets: CONTRACTOR shall provide and maintain sanitary temporary chemical toilets located where approved by OWNER and in sufficient number required for the work force employed by CONTRACTOR.
- B. Temporary Electrical Services:
 - 1. CONTRACTOR shall make all necessary arrangements, furnish, install, and maintain necessary temporary electrical services at the Site. CONTRACTOR shall remove all temporary services when Project is complete.
 - 2. All utility charges for installation of the temporary services shall be paid for by CONTRACTOR. All metering installation charges and all energy charges for electric current used for temporary lighting and power are to be paid by CONTRACTOR.
 - 3. No permanent electrical equipment or wiring shall be used without express written permission of OWNER. Such approval, if given, shall not affect guarantee period. If OWNER authorizes use of permanent service facilities, CONTRACTOR shall pay all metering costs until acceptance or occupancy (whichever occurs first) of building by OWNER.

- C. Weather Protection and Temporary Heat:
 - 1. CONTRACTOR shall provide weather protection to protect the Work from damage because of freezing, rain, snow, and other inclement weather.
 - 2. CONTRACTOR shall provide temporary heat within buildings, without cost to OWNER, from the time the buildings or portions thereof are enclosed until the Project is accepted or occupied by OWNER, whichever occurs first. The building work is to be heated during construction so a minimum temperature of 50°F is maintained at all times. Temporary heating equipment shall be properly vented.
 - 3. No permanent heating equipment shall be used on a temporary basis without express written permission by OWNER. Such approval, if given, shall not affect the guarantee period. If OWNER authorizes use of permanent heating equipment, CONTRACTOR shall pay all related energy costs until acceptance or occupancy (whichever occurs first) of the building by OWNER.
- D. Temporary Water: CONTRACTOR shall supply its own water during construction. CONTRACTOR shall also provide its own piping, valves, and appurtenances for its requirements.
- E. Temporary Fire Protection: CONTRACTOR and Subcontractor(s) who maintain or provide an enclosed shed or trailer shall provide and maintain in operating order in each shed or trailer a minimum of one fire extinguisher. More extinguishers shall be provided as necessary. Fire extinguishers shall be minimum dry chemical, nonfreezing-type, UL rating 2A-30BC, with 10-pound capacity for Class A, B, and C fires.
- F. CONTRACTOR's and Subcontractor(s)' personnel shall refrain from smoking during excavation, laying pipe, backfilling, and other work at the Site which may involve potential contact with explosive vapors or gasoline products.

1.03 TEMPORARY STAIRS AND ACCESS

- A. CONTRACTOR shall provide and maintain all equipment such as temporary stairs, ladders, ramps, runways, chutes, and so on as required for proper execution of the Work. CONTRACTOR shall be responsible for providing its own scaffolds, hoists, etc.
- B. All such apparatus, equipment, and construction shall meet all requirements of OSHA, the labor laws, and other applicable State and local laws. Provide stairs with handrails. As soon as possible and where applicable, permanent stairs shall be installed.
- C. As soon as permanent stairs are created, provide temporary protective treads, handrails, and shaft protection.
- D. Provide barricades at hazardous locations, complete with signs, temporary general lighting, warning lights, and similar devices as required.

1.04 TEMPORARY SUPPORT FACILITIES

- A. CONTRACTOR shall provide whatever facilities and services which may be needed to properly support primary construction process and meet compliance requirements and governing regulations.
- B. CONTRACTOR shall not use permanent facilities except as otherwise indicated, unless authorized by OWNER.

1.05 REMOVAL OF TEMPORARY FACILITIES

- A. Remove temporary materials, equipment, services, and construction as soon as practicable but no later than just prior to substantial completion inspection.
- B. Clean and repair damage caused by installation or use of temporary facilities and restore existing facilities used during construction to specified, or to original, condition.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 57 00
TEMPORARY CONTROLS

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Dust Control.
 - 2. Water, Erosion, and Sediment Control.
 - 3. Noise Control.
 - 4. Traffic Control.
 - 5. Site Security.
 - 6. Daily Cleanup.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 DUST CONTROL

- A. CONTRACTOR shall execute the Work by methods to minimize raising dust from construction operations.
- B. CONTRACTOR shall provide positive means to prevent airborne dust from dispersing into atmosphere.
- C. CONTRACTOR shall provide partitions, enclosures, etc., within buildings as necessary to confine dust and protect adjacent areas.

3.02 WATER, EROSION, AND SEDIMENT CONTROL

- A. CONTRACTOR shall grade site to drain and shall maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. CONTRACTOR shall protect Site from puddling or running water.
- C. CONTRACTOR shall provide erosion control measures as necessary to control discharge of sediment laden water to surface waters and wetlands.
- D. Except as provided for in the document, overland discharge of water from dewatering operations shall not be allowed. Depending on water quality, such water shall either be piped directly to the surface water or shall be directed to sedimentation basins or other such

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structures or features prior to discharge to surface waters so as not to cause damage to existing ground and improvements, erosion, or deposition in the discharge area.

- E. CONTRACTOR shall use jute or synthetic netting, silt fences, straw bales, dikes, channels, and other applicable measures to prevent erosion of soils disturbed by its construction operation.
- F. Restoration of the Site shall proceed concurrently with the construction operation. See Drawings and Specifications for erosion control measures in addition to that which may be required above.
- G. Erosion control measures shall comply with the following document: "Standard Specifications for Soil Erosion and Sediment Control," of the Illinois Environmental Protection Agency, IEPA/WPC 87-012.

3.03 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.

3.04 TRAFFIC CONTROL

- A. CONTRACTOR shall be responsible for providing all signs, barricades, flagmen, and other traffic control devices in the construction zone.
- B. Conduct operations with minimum interference to roadways.
- C. Maintain two-way traffic on streets at all times.
- D. All traffic control measures shall meet the requirements of Illinois Manual on Uniform Traffic Control Devices for Streets and Highways, Latest Edition, and the Standard Specifications for Traffic control Items, Latest Edition.
- E. Do not close or obstruct roadways without approval of OWNER.

3.05 SITE SECURITY

- A. CONTRACTOR shall have the sole responsibility of safeguarding the Site perimeter to prevent unauthorized entry to the Site throughout the duration of the Project. CONTRACTOR shall at all times provide such permanent and temporary fencing or barricades or other measures as may be necessary to restrict unauthorized entry to its construction area including construction in public rights-of-way or easements. Site security measures shall include safeguards against attractive nuisance hazards as a result of construction activity.
- B. CONTRACTOR shall at all times be responsible for the security of the Work including materials and equipment. OWNER will not take any responsibility for missing or damaged equipment, tools, or personal belongings. CONTRACTOR shall have the sole responsibility of safeguarding the Work and the Site throughout the duration of the Project.

3.06 DAILY CLEANUP

- A. CONTRACTOR shall clean up the Site and remove all rubbish on a daily basis.
- B. CONTRACTOR shall clean up public streets and highways and remove any dirt, mud, or other materials due to project traffic on daily basis and shall comply with all local and state ordinances and permit requirements.

END OF SECTION

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: CONTRACTOR shall be responsible for the delivery, handling, storage and protection of all material and equipment required to complete the Work as specified herein.
- B. Related Sections and Divisions: Specific requirements for the handling and storage of material and equipment are described in other sections of these Specifications.

1.02 PRODUCTS

- A. Components required to be supplied in quantity within a Specification section shall be the same, and shall be interchangeable.
- B. CONTRACTOR shall not use materials and equipment removed from existing construction, except as specifically required, or allowed, by the Contract Documents.
- C. When any construction deviations from the Drawings and/or Specifications necessary to accommodate equipment supplied by CONTRACTOR, result in additional costs to CONTRACTOR or other contractors, such additional costs shall be borne by CONTRACTOR. CONTRACTOR shall also pay any additional costs necessary for revisions of Drawings and/or Specifications by ENGINEER.
- D. Each major component of equipment shall bear a nameplate giving the name and address of the manufacturer and the catalogue number or designation.

1.03 TRANSPORTATION AND HANDLING

- A. Materials, products and equipment shall be properly containerized, packaged, boxed, and protected to prevent damage during transportation and handling.
- B. CONTRACTOR shall not overload any portion of the structure in the transporting or storage of materials.
- C. CONTRACTOR shall not damage other construction by careless transportation, handling, spillage, staining or impact of materials.
- D. CONTRACTOR shall provide equipment and personnel to handle products, including those provided by OWNER, by methods to prevent soiling and damage.
- E. CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

- F. CONTRACTOR shall handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

1.04 DELIVERY AND RECEIVING

- A. CONTRACTOR shall arrange deliveries of products in accordance with the Progress Schedule, allowing time for observation prior to installation.
- B. CONTRACTOR shall coordinate deliveries to avoid conflict with the Work and conditions at the Site; work activities of other contractors or OWNER; limitations on storage space; availability of personnel and handling equipment and OWNER's use of premises.
- C. CONTRACTOR shall deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.
- D. CONTRACTOR shall clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.
- E. Immediately on delivery, CONTRACTOR shall inspect shipment to review that:
 - 1. Product complies with requirements of Contract Documents and reviewed submittals.
 - 2. Quantities are correct.
 - 3. Accessories and installation hardware are correct.
 - 4. Containers and packages are intact and labels legible.
 - 5. Products are protected and undamaged.

1.05 STORAGE AND PROTECTION

- A. General:
 - 1. CONTRACTOR shall store products, immediately on delivery, in accordance with manufacturer's instructions, with all seals and labels intact and legible.
 - 2. Any additional off-site space required shall be arranged by CONTRACTOR.
 - 3. CONTRACTOR shall allocate the available storage areas and coordinate their use by the trades on the job.
 - 4. CONTRACTOR shall arrange storage in a manner to provide access for maintenance of stored items and for observation.
- B. In enclosed storage, CONTRACTOR shall:
 - 1. Provide suitable temporary weather tight storage facilities as may be required for materials that will be damaged by storage in the open.
 - 2. Maintain temperature and humidity within ranges stated in manufacturer's instructions.
 - 3. Provide ventilation for sensitive products as required by manufacturer's instructions.
 - 4. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
 - 5. Store solid materials such as insulation, tile, mechanical and electrical equipment, fittings, and fixtures under shelter, in original packages, away from dampness and other hazards.
 - 6. Store liquid materials away from fire or intense heat and protect from freezing.

- C. At exterior storage, CONTRACTOR shall:
 - 1. Store unit materials such as concrete block, brick, steel, pipe, conduit, door frames, and lumber off ground, out of reach of dirt, water, mud and splashing.
 - 2. Store tools or equipment that carry dirt outside.
 - 3. Store large equipment so as not to damage the Work or present a fire hazard.
 - 4. Cover products subject to discoloration or deterioration from exposure to the elements, with impervious sheet material and provide ventilation to avoid condensation.
 - 5. Completely cover and protect any equipment or material which is prime coated or finish painted with secured plastic or cloth tarps. Store out of reach of dirt, water, mud and splashing.
 - 6. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
 - 7. Provide surface drainage to prevent erosion and ponding of water.
 - 8. Prevent mixing of refuse or chemically injurious materials or liquids.
 - 9. Cover aggregates such as sand and gravel in cold wet weather.
 - 10. Remove all traces of piled bulk materials at completion of work and return site to original or indicated condition.

1.06 MAINTENANCE OF STORAGE

- A. CONTRACTOR shall periodically inspect stored products on a scheduled basis.
- B. CONTRACTOR shall verify that storage facilities comply with manufacturer's product storage requirements, and verify that manufacturer required environmental conditions are maintained continually.
- C. CONTRACTOR shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of Contract Documents.
- D. CONTRACTOR shall perform scheduled maintenance of equipment in storage as recommended by the manufacturer. A record of the maintenance shall be kept and turned over to ENGINEER when the equipment is installed.

1.07 INSTALLATION REQUIREMENTS

- A. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise specified.
- B. After installation, CONTRACTOR shall protect all materials and equipment against weather, dust, moisture, and mechanical damage.
- C. CONTRACTOR shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment until completion and final acceptance of the Work by OWNER. Damaged material and equipment shall be immediately removed from the Site.

1.08 EQUIPMENT WARRANTIES

- A. Warranties shall be nonprorated, include all parts and labor, and be in written form. Warranties shall specifically exclude buyer's indemnification language. Warranty language shall not eliminate manufacturer's responsibility for sizing of the equipment. During warranty period, manufacturer shall be responsible for any travel expenses, outside contractor fees, and rental equipment fees associated with providing warranty service. Manufacturer shall pay expenses incurred for repairs and parts replacement not made by manufacturer if manufacturer's response is not within 72 hours of notification by OWNER. Warranty language shall be provided with the shop drawings.

1.09 CONCRETE EQUIPMENT BASE

- A. Cast-in-place concrete equipment bases shall be provided for all new and relocated equipment including electrical control panels, motor control centers, switchgear, etc. Concrete equipment bases shall be provided by CONTRACTOR except where specifically noted to be provided by others. Bases shall be 3 1/2-inch minimum height and shall be a minimum of 3 inches larger than equipment being supported. Grouting of equipment bases shall be as recommended by equipment manufacturer.
- B. Concrete and grout shall meet Section 03 30 00—Cast-in-Place Concrete.
- C. Provide all anchor bolts, metal shapes and templates to be cast in concrete or used to form concrete for support of equipment.
- D. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and IEEE C2.

PART 2—PRODUCTS

NOT APPLICABLE

PART 3—EXECUTION

NOT APPLICABLE

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Closeout procedures.
 - 2. Final cleaning.
 - 3. Adjusting.
 - 4. Project record documents.
 - 5. Warranties.

1.02 CLOSEOUT PROCEDURES

- A. CONTRACTOR shall provide submittals to ENGINEER that are required by governing or other authorities.
- B. CONTRACTOR shall comply with General Conditions and Supplementary Conditions and complete the following before requesting ENGINEER's observation of the Work or designated portion thereof for substantial completion.
 - 1. Submit executed warranties, workmanship bonds, maintenance agreements, inspection certificates, and similar required documentation for specific units of Work, enabling OWNER's unrestricted occupancy and use.
 - 2. Submit record documentation, maintenance manuals, tools, spare parts, keys, and similar operational items.
 - 3. Submit consent of surety (if surety required in Contract).
 - 4. Complete final cleaning, touch-up work of marred surfaces, and remove temporary facilities and tools.

1.03 FINAL CLEANING

- A. It is CONTRACTOR's responsibility to completely clean up the inside and outside of all buildings and the construction site at the completion of the Work.
- B. CONTRACTOR shall clean areas of the building in which painting and finishing work is to be performed just prior to the start of this work and maintain these areas in satisfactory condition for painting and finishing. This cleaning includes:
 - 1. Removal of trash and rubbish from these areas.
 - 2. Broom cleaning of floors.
 - 3. Removal of any plaster, mortar, dust, and other extraneous materials from finish surfaces, including but not limited to exposed structural steel, miscellaneous metal, masonry, concrete, mechanical equipment, piping, and electrical equipment.
- C. In addition to the cleaning specified above and the more specific cleaning that may be required in various technical sections of the Specifications, CONTRACTOR shall prepare

the Project for occupancy by a thorough cleaning throughout, which shall include the following:

1. Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
2. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
3. Replace filters of operating equipment.
4. Clean debris from roofs, gutters, downspouts, and drainage systems.
5. Clean site; sweep paved areas, rake clean landscaped surfaces.
6. Remove waste and surplus materials, rubbish, and construction facilities from the Site.

1.04 ADJUSTING

- A. CONTRACTOR shall adjust operating products and equipment to provide smooth and unhindered operation.

1.05 PROJECT RECORD DOCUMENTS

- A. CONTRACTOR shall maintain on Site one set of the following record documents to record actual revisions to the Work:
 1. Drawings.
 2. Specifications.
 3. Addenda.
 4. Change orders and other modifications to the Contract.
 5. Reviewed shop drawings, product data, and samples.
 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. CONTRACTOR shall make entries that are complete and accurate, enabling future reference by OWNER.
- C. CONTRACTOR shall store record documents separate from documents used for construction.
- D. CONTRACTOR shall record information concurrent with construction progress.
- E. Specifications: CONTRACTOR shall legibly mark and record at each Product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by addenda and modifications.
- F. Record Drawings: CONTRACTOR shall legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.

5. Details not on original Contract drawings.

G. Operation and Maintenance Manuals.

H. CONTRACTOR shall complete the Pump Station 49 Data Sheet, Equipment Data, and Preventative Maintenance Summaries following this Section.

1.06 RECORD DRAWINGS

A. Record Drawings shall consist of three copies of 11-inch by 17-inch bond media Contract Drawings reflecting all changes made during construction.

B. Drawings shall be stamped "Record Drawings" and shall be marked with CONTRACTOR's stamp, the date, and signature of CONTRACTOR's representative.

C. Record Drawings shall reflect the actual field installed equipment, locations, nameplates, electrical control logic, conduit locations with corresponding labeling, and wiring changes etc. Any deletions of the design drawings shall cross reference to the replaced drawings.

D. The Record Drawings must be submitted and must be acceptable to ENGINEER prior to final acceptance.

E. The Record Drawings shall be submitted in PDF format on CDROM as well as hardcopy for review and approval. In addition to the Record Drawings, copies of the final catalog cuts which have been Approved or Approved as Noted shall be submitted in PDF format along with the Record Drawings. The PDF files shall clearly indicate either by filename or PDF table of contents the respective pay item number. Specific part or model numbers of items which have been selected shall be clearly visible.

F. In addition to the specified Record Drawings, CONTRACTOR shall record GPS coordinates of the following electrical components:

1. Hand holes.
2. Conduit crossings.
3. Buildings.
4. Electric service locations.

G. Record drawings shall include the following electric utility information:

1. Utility pole numbers.
2. Utility substation names and locations which feeds the pump station.
3. Route of utility lines from substations to pump station.

1.07 WARRANTIES

A. CONTRACTOR shall provide warranties beyond project the date of Final Acceptance of the entire Project by ENGINEER one-year warranty as required by technical sections.

B. Submit warranty information as follows:

1. Provide original copies bearing authorized signatures.

2. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers, and provide Table of Contents and assemble in three-ring binder with durable cover.
3. Submit with request for certificate of Substantial Completion.
4. For items of work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance listing date of acceptance as start of warranty period.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

NOT APPLICABLE

END OF SECTION

Pump Station 49 Data Sheet

Location: Describe Location and Address

Network IP Addresses:

Voice & AEGIS IP Address:

SCADA IP Address:

Main Flow Pumps: 2 @ 900 GPM

Pump: Describe complete model # and manufacturer's name

Motor: Describe complete model #, motor HP, amps, voltage and manufacturer's name

Low Flow Pumps: 1 @ 900 GPM.

Pump: Describe complete model # and manufacturer's name

Motor: Describe complete model #, motor HP, amps, voltage and manufacturer's name

Spare Pump: 1 @ 900 GPM.

Pump: Describe complete model # and manufacturer's name

Motor: Describe complete model #, motor HP, amps, voltage and manufacturer's name

Pump Station Firm Capacity: 1,800 GPM

Pit Type: Dry Pit

Outlet: 24" Diameter Outfall Sewer

Electrical Service:

1) Normal Power: Describe amps, cable and conduit size

2) Emergency Power: Describe amps, cable and conduit size

MCC:

1) MCC: Describe tech ratings, model # and manufacturer's name

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

STORMWATER PUMP STATION NO. 49

Operation and Maintenance Manual

Equipment Data Summary

Equipment Name: Specification:

Manufacturer
Name:

Address:

Telephone:

Number Supplied: Location / Service:

Model No.: Serial No.:

Type:

Size / Speed / Capacity / Range (as applicable):

Power Requirement (Phase / Volts / Hertz):

Local Representative

Name:

Address:

Telephone:

NOTES:

DEPARTMENT OF TRANSPORTATION

STORMWATER PUMP STATION NO. 49

Section 01 80 02-1

Operation and Maintenance Manual

Preventive Maintenance Summary

Equipment Name: Location:

Manufacturer

Name:

Address:

Telephone:

Model No.: Serial No.:

Maintenance Task Lubricant/Part D W M Q S A A

NOTES:

SECTION 01 91 00

STARTING OF SYSTEMS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. General.
 - 2. Equipment and System Installation.
 - 3. Starting Equipment and Systems.
 - 4. Demonstration, Instructions, and Operator Training.
 - 5. Start-Up and Testing.
 - 6. Equipment Systems Requiring Certification of Proper Installation.
- B. CONTRACTOR shall perform the Work described in the following subsections.

1.02 GENERAL

- A. The number of days for manufacturer's services stated in the Specifications shall be considered as the minimum number of days. Should additional time be required for services because of equipment malfunction or other problem, such time shall be at the expense of CONTRACTOR, with no change in Contract Price.
- B. "Days" specified shall consist of 8-hour days on-site, excluding travel time.
- C. CONTRACTOR shall designate and provide one person to be responsible for scheduling, coordinating, and expediting the specified services. Scheduling the services shall be done in cooperation with, and with the prior approval of ENGINEER and OWNER. Such schedule shall be arranged with the appropriate subcontractors, manufacturers, and suppliers with sufficient time to allow their compliance with the service requirements.
- D. CONTRACTOR shall manage equipment checkout such that checkout has been completed and deficiencies addressed prior to demonstration and training. Scheduling training prior to checkout may result in cancellation when checkout cannot be completed prior to training.

1.03 EQUIPMENT AND SYSTEM INSTALLATION

- A. Competent and experienced technical personnel shall represent the manufacturers of all equipment and systems for as many days as may be necessary to provide proper installation and to resolve assembly or installation problems at the site that are attributable to, or associated with, the equipment furnished. This requirement applies to manufacturers for all equipment furnished, whether or not specifically set forth in the Specifications.
- B. Where a Certificate of Proper Installation is called for in this Specification Section, the manufacturer's representative shall provide the attached Certificate of Proper Installation stating that the equipment or system has been installed in accordance with the

manufacturer's instructions and has been inspected by a manufacturer's authorized representative, that it has been serviced with the proper initial lubricants, that applicable safety equipment has been properly installed, that the proper electrical and mechanical connections have been made, and that any other manufacturer requirements have been met. This certification shall be provided to ENGINEER and OWNER prior to the start-up. This certificate is in addition to the manufacturer's standard startup reports, checklists, and other pertinent information.

- C. Functional (or run) testing is required for all equipment and systems. The manufacturer's representative shall supervise the functional test, which shall include checking for proper rotation, alignment, speed, excessive vibration, and noisy operation. The Manufacturer's Certificate of Proper Installation shall state that proper adjustments have been made and that the equipment or system is ready for start-up.
- D. Manufacturer shall demonstrate, using laser alignment equipment, if appropriate, that the installed equipment has been aligned properly. Final acceptance of equipment will not be granted until manufacturer has demonstrated to ENGINEER that acceptable alignment to tolerances have been achieved. For pumps with motors 7.5 hp and larger, the acceptable shaft alignment tolerances shall be as recommended in the pump manufacturer's written instructions and shall include parallel offset and angular gap measurements.

1.04 STARTING EQUIPMENT AND SYSTEMS

- A. Where field testing and start-up services are called for in the Specifications, or when technical assistance is necessary as a result of any malfunction of the equipment or system furnished, the manufacturer's representative shall provide such services.
- B. Manufacturer's representative shall also conduct and/or assist with performance testing, as required by the Specifications. These services shall continue until such times as the applicable equipment or system has been successfully tested for performance and has been accepted by OWNER for full-time operation.
- C. Coordinate schedule for start-up of various equipment and systems. Coordination includes, but is not limited to, communication with subcontractors, suppliers, OWNER, and ENGINEER. CONTRACTOR shall confirm that all necessary work is complete and that the equipment and systems can be operated in conjunction with all associated processes.
- D. Notify ENGINEER and OWNER a minimum of 7 days prior to start-up of each item using the attached Equipment Startup and O&M Training Scheduling form. CONTRACTOR shall submit form to ENGINEER.
- E. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions that may cause damage.
- F. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- G. Verify wiring and support components for equipment are complete and tested.

- H. Execute start-up under supervision of applicable manufacturer's representative and CONTRACTOR's personnel in accordance with manufacturers' instructions.
- I. Require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up and to supervise placing equipment or system in operation. Authorized representative shall provide approval for starting of systems in writing where specified.
- J. Equipment manufacturer shall provide a written report covering checkout, testing, inspections, and start-up and shall identify any deficiencies noted. Report shall be submitted to ENGINEER. CONTRACTOR shall be responsible for correcting all deficiencies noted in report. In addition, CONTRACTOR shall submit a fully executed Certificate of Proper Installation form if required in Paragraph 3.01 of this section.

1.05 DEMONSTRATION, INSTRUCTIONS, AND OPERATOR TRAINING

- A. For all mechanical equipment and systems and where called for in the Specifications, provide a qualified technical representative to provide detailed instructions to OWNER's personnel for operation and maintenance of equipment and associated instrumentation. Training services shall include pre-start-up classroom instruction and start-up on-site instruction, as stated in the Specifications.
- B. Refer to the Specifications for additional training requirements.
- C. CONTRACTOR shall coordinate the pre-start-up training periods with OWNER's operating personnel and manufacturers' representatives.
 - 1. Schedule training dates and times with OWNER, that are acceptable to the OWNER, using equipment, startup, and O&M training form. Normal hours available for training are between 7:30 A.M. to 3 P.M., Monday through Friday, except for holidays.
 - 2. Submit outline and presentation to ENGINEER at least 7 days in advance of training.
 - 3. Provide name, contact information, and brief synopsis of qualifications of the trainer.
 - 4. If materials above are not provided at least 7 days in advance, training may be canceled.
 - 5. Failure of supplier's or manufacturer's representative to appear for scheduled training, failure to notify OWNER 24 hours in advance of need to cancel scheduled training or failure to arrive within 30 minutes of start of scheduled training shall result in reimbursement to OWNER for time lost by OWNER's personnel in waiting for arrival of manufacturer's representative. Except in case of failure to arrive on time, time will not exceed 1 hour for each employee scheduled to receive training. Failure to arrive on time will be reimbursed by actual time late, up to 1 hour, after 1 hour, training will be rescheduled. CONTRACTOR shall reimburse OWNER via a change order.
 - 6. During the training, instructor will dedicate its time solely to training and not start-up services.
 - 7. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with OWNER's personnel in detail to explain all aspects of operation and maintenance.

8. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment.
 9. Prepare and insert additional data in operation and maintenance manuals when need for additional data becomes apparent during instruction.
 10. OWNER may videorecord the training for future internal use. Provide to OWNER paper and electronic copies of any media used as part of training.
 11. Provide training handouts for each of OWNER's personnel present.
- D. CONTRACTOR shall provide attached Certificate of Operator Training cosigned by OWNER and supplier's representative verifying training was accomplished to satisfaction of all parties.
- E. Operation and maintenance manual submitted in accordance with Section 01 33 00-Submittals shall be provided prior to operator training.
- F. For equipment or systems requiring seasonal operation, perform demonstration for dormant season at start of dormant season.
- G. Final payment for various items of equipment will not be made by OWNER until the equipment is operating to OWNER's satisfaction.
- H. Where items of equipment are placed into service at different times or sequence, manufacturer's services for start-up, field testing, and supervision shall be provided for each time or sequence. Training shall be provided prior to or at the time the first similar item of equipment is placed in service.

1.06 START-UP AND TESTING

- A. Prior to acceptance of any portion of the Work, start-up and testing of all equipment and testing of all materials furnished on the Project by CONTRACTOR shall have been conducted in the presence of representatives of CONTRACTOR, OWNER, and ENGINEER and also manufacturer if requested by OWNER or ENGINEER.
- B. CONTRACTOR shall provide whatever temporary installations and conditions are necessary in order to perform start-up and testing operations on all equipment and materials furnished under the Contract. Temporary connections and equipment necessary during start-up and testing operations shall include, but not be limited to, temporary piping and electrical power and control equipment and devices, temporary connection from various parts of the systems and any other labor, materials, fuel, devices, or items that may be required for start-up and testing operations. Temporary conditions shall include filling with water, if necessary, to check equipment and materials.
- C. All temporary installations and conditions shall be removed by CONTRACTOR upon completion of start-up and testing.
- D. Start-Up:
1. Items to be checked on start-up include, but not limited to, the following:
 - a. Field test procedures shall be approved by ENGINEER prior to field testing. Pump Station shall be operational for a minimum of 30 days prior to final acceptance within

which cumulative major component remains active without down time, consisting of the pumps, HVAC system and electrical system. Control system down time shall not exceed 4 hours.

- b. Demonstration of back-up float controls.
 - c. Gas detection calibration kit shall be always stored on site.
 - d. Check pump operation in manual, bump and auto mode.
 - e. Check alarm operation SCADA system and verify at remote location (EMC contractor's facility, District 1, communication center, and IDOT TSC).
 - f. SCADA panel operation.
 - g. Network Equipment Rack operation.
 - h. Level system operation.
 - i. Fire alarm system operation.
 - j. HVAC system operation.
2. CONTRACTOR shall prepare to demonstrate operation and maintenance procedures for all equipment installed.

E. Method of Measurement:

- 1. Progress payments will be accordance with Section 109 of the IDOT Standard Specifications for Road and Bridge Construction.
- 2. Mechanical and electrical equipment specified will be considered 80% complete once substantially complete and corresponding O&M Manuals have been approved by ENGINEER for each corresponding pay item. Substantial completion is defined as the time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. Equipment will not be considered 100% complete for each corresponding pay item until the Final Acceptance by ENGINEER, all incomplete works (punch lists) have been addressed, spare parts have been delivered, Record Drawings have been approved, and all outstanding issues have been completed to the satisfaction of ENGINEER.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 EQUIPMENT SYSTEMS REQUIRING CERTIFICATION OF PROPER INSTALLATION

- A. All space and process related heating, cooling, and ventilation equipment and systems specified in Division 23.
- B. Section 26 36 23-Automatic Transfer Switches.
- C. Gas Detectors and Monitoring Systems in Section 40 94 23-Controls and Instrumentation.

D. All equipment specified in Division 43.

END OF SECTION

Section 01 91 00-6

TS No. _____

EQUIPMENT START-UP AND O&M TRAINING SCHEDULING FORM

PROJECT _____ CLIENT _____

CONTRACT _____

CONTRACTOR _____ Date: _____

The following equipment is scheduled for start-up on _____

EQUIPMENT NAME: _____ SPECIFICATION SECTION: _____

MANUFACTURER: _____ MINIMUM HOURS OF TRAINING: _____

DATE O&M MANUALS SUBMITTED: _____

Specification Section 01 91 00 requires that start-up and operation and training be conducted by a qualified manufacturer's representative prior to placing equipment in operation. Review Specification Sections 01 33 00 and 01 45 00 and the individual equipment sections for start-up and training requirements. OWNER may find it necessary to propose alternate dates for training based on conflicts with other training and staff availability. The Operation and Maintenance Manuals must be submitted prior to training.

After the equipment or system has been properly installed and is functioning correctly, submit a written report in accordance with Specification Section 01 45 00.

Submit the completed form to ENGINEER and OWNER at least 7 days prior to start-up and training.

Proposed Training Date: _____ Time of Training: _____

Factory-trained representative giving training:

Name(s): _____

Company: _____

Address: _____

Phone: _____

Fax: _____

E-mail: _____

Section 01 91 00-7

CERTIFICATE OF PROPER INSTALLATION

Project_____

Equipment_____

Specification Section_____

Contract_____

I hereby certify the equipment supplier/manufacturer has inspected this equipment and that it has been properly installed, adjusted, and calibrated. I further certify this equipment may now be operated for test purposes and/or normal use.

MANUFACTURER'S REPRESENTATIVE

Signature_____Date_____

Name (print)_____

Title_____

Representing_____

CONTRACTOR

Signature_____Date_____

Name (print)_____

Title_____

This form shall be completed and submitted to ENGINEER prior to OWNER training.

CERTIFICATE OF OPERATOR TRAINING

Project_____

Equipment_____

Specification Section_____

Contract_____

I hereby certify the equipment supplier/manufacturer has instructed OWNER's personnel in the start-up operation and maintenance of this equipment as required in the Specifications.

MANUFACTURER'S REPRESENTATIVE

Signature_____Date_____

Name (print)_____

Title_____

Representing_____

CONTRACTOR

Signature_____Date_____

Name (print)_____

Title_____

OWNER

I hereby state that my operating personnel received instruction for start-up, operation, and maintenance of this equipment.

Signature_____Date_____

Name (print)_____

Title_____

END SECTION

Section 01 91 00-9

SECTION 03 11 00
CONCRETE FORMWORK

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Forms for cast-in-place concrete.
 - 2. Form accessories.
 - 3. Openings for other work.
 - 4. Form stripping.
- B. Unless otherwise indicated, concrete material and work shall be in conformance with the requirements of the IDOT Standard Specifications for Road and Bridge Construction, 2022 version, a publication of the Illinois Department of Transportation.
- C. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ACI 117—Tolerances for Concrete Construction.
- B. ACI 301—Structural Concrete for Buildings.
- C. ACI 318—Building Code Requirements for Reinforced Concrete.
- D. ACI 347—Recommended Practice for Concrete Formwork.
- E. PS1—Construction and Industrial Plywood.

1.03 DESIGN

- A. All formwork shall comply with ACI 347 and ACI 301.
- B. CONTRACTOR shall assume the responsibility for the complete design and construction of the formwork.

1.04 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01 33 00—Submittals for form ties, form coatings, form liners (if any), and any other form accessories.
- B. Submit geometry of forms for circular structures.

PART 2—PRODUCTS

2.01 FORMS

- A. Forms shall conform to the requirements of Section 503-Concrete Structures of the latest IDOT Standard Specifications for Road and Bridge Construction.
- B. Forms shall be of wood, plywood, steel, fiberboard lined, or other approved materials which will produce concrete which meets the specified requirements. The type, size, quality, and shape of all materials of which the forms are made are subject to the review of ENGINEER.
- C. Caution shall be exercised in the use of wood or composition forms or form liner to be certain that no chemical reaction will take place which causes a damaging effect on the concrete surface.

2.02 FORM TIES—NONREMOVABLE

- A. Internal wall ties shall contain positive stops at the required wall thickness. The exterior clamp portions of the tie shall be adjustable in length. Ties shall have cones on the water side of water-containing structures. Ties shall also have cones on the exterior side of all structures which have PVC water-stopped construction joints. Ties shall provide a positive disconnection on both ends 1 to 1 1/2 inches inside the finished face of the concrete.
- B. All wall ties used in the placement of structures which have PVC water-stopped construction joints shall contain integral waterstops. All such ties shall be crimped or deformed in such a manner that the bond between concrete and tie cannot be broken in removal of the outer units. This portion of the tie shall not be removed prior to 24 hours after completion of the concrete placement.
- C. The use of wood spacers and wire ties will not be approved.

2.03 FORM TIES—REMOVABLE

- A. Taper ties which are designed to be removed entirely from the wall may be used with forms designed for this tie type and spacing.
- B. Tie holes shall be plugged with either a neoprene plug or an EPDM rubber plug.
- C. Taper tie holes above the normal operating water surface shall be patched with mortar mix as specified in Section 03 30 00—Cast-In-Place Concrete for patching tie holes.

2.04 FORM COATINGS

- A. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

2.05 CHAMFER STRIPS

- A. Provide 3/4-inch by 3/4-inch wood or plastic chamfer strips at all exposed corners, except as noted.

2.06 KEYWAYS

- A. Keyways shall be formed with wood inserts.

PART 3-EXECUTION

3.01 CONSTRUCTION

- A. Forms shall conform to the shape, line, grade, and dimensions as shown on the drawings. They shall be mortar-tight and sufficiently rigid to prevent displacement or sagging between supports and shall support the loads and pressures without deflection from the prescribed lines. They shall be properly braced or tied together so as to maintain position and shape. Spacing of ties shall be recommended by the tie manufacturer.
- B. Formwork and finished concrete construction shall meet the tolerances specified in ACI 117.
- C. When forms are placed for successive concrete placement, thoroughly clean concrete surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.
- D. At the request of ENGINEER, temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and observation immediately before depositing concrete.
- E. Provide inserts and provide openings in concrete form work to accommodate work of other trades. Verify size and location of openings, recesses, and chases with the trade requiring such items. Securely support items to be built into forms.
- F. Provide top forms for inclined surfaces where the slope is too steep to place and vibrate concrete.
- G. Bevel wood inserts for forming keyways (except in expansion joints where inserts shall have square edges), reglets, recesses, and the like to allow for ease of removal. Inserts shall be securely held in place prior to concrete placement. Unless otherwise shown, chamfer strips shall be placed in the angles of the forms to provide 3/4-inch bevels at exterior edges and corners of all exposed concrete.
- H. The forms shall be oiled with a field-applied commercial form oil or a factory-applied nonabsorptive liner. Oil shall not stain or impede the wetting of surfaces to be cured with water or curing compounds. The forms shall be coated prior to placing reinforcing steel. Oil on reinforcement will not be permitted.

- I. All form surfaces shall be thoroughly cleaned, patched, and repaired before reusing and are subject to review of ENGINEER.

3.02 FORM REMOVAL

- A. Supporting forms and shoring shall not be removed until the member has acquired sufficient strength to support its own weight and the construction live loads on it.
- B. All form removal shall be accomplished in such a manner that will prevent injury to the concrete.
- C. Forms shall not be removed before the expiration of the minimum times as stated below or until the concrete has attained its minimum 28-day design strength as confirmed by concrete cylinder tests, unless specifically authorized by ENGINEER.
 - 1. Wall and vertical faces: 24 hours.
 - 2. Beams and elevated slabs: 14 days.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes providing complete, in-place, all steel and fibers required for reinforcement of cast-in-place concrete as shown on the Drawings.
- B. Unless otherwise indicated, concrete material and work shall be in conformance with the requirements of the IDOT Standard Specifications for Road and Bridge Construction (Standard Specifications), 2022 version, a publication of the Illinois Department of Transportation.
- C. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. Applicable standards listed in this section include, but are not necessarily limited to the following:
 - 1. ACI 315—Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - 2. ACI 318—Building Code Requirements for Reinforced Concrete.
 - 3. ASTM A615—Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 4. ASTM A996—Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcing.
 - 5. CRSI—Manual of Standard Practice.

1.03 SUBMITTALS

- A. Comply with pertinent provisions of Section 01 33 00—Submittals.
- B. Provide complete shop drawings of all material to be furnished and installed under this section:
 - 1. Before fabrication of the reinforcement is begun, CONTRACTOR shall obtain the approval of ENGINEER on reinforcing bar lists and placing drawings.
 - 2. These drawings and lists shall show in detail the number, size, length, bending, and arrangement of the reinforcing. Reinforcing supports shall also be located on the shop drawings.
 - 3. Shop drawings shall be in accordance with ACI 315.

1.04 PRODUCT HANDLING

- A. Delivery:
 - 1. Deliver reinforcement to the job site bundled, tagged, and marked.

2. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.
- B. Storage: Store reinforcement at the job site on blocks and in a manner to prevent damage and accumulation of dirt and excessive rust.

PART 2-PRODUCTS

2.01 MATERIALS

- A. Reinforcing bars shall comply with ASTM A615 or A996 Type R, Grade 60. Reinforcing bars required to be welded shall be ASTM A706 low alloy. Epoxy coated bars shall conform to the requirement of AASHTO M284. Materials shall meet the requirements of Section 508 and Section 1006 of the IDOT Standard Specifications for Road and Bridge Construction.
- B. Steel wire and welded wire fabric shall comply with ASTM A1064. Fabric shall be provided in flat sheets. Rolled fabric shall not be used.
- C. Reinforcement supports including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place shall be:
1. Coated wire bar-type supports complying with CRSI recommendations, unless otherwise indicated.
 2. For slabs on grade, supports with sand plates, or horizontal runners where base material will not support chair legs.
 3. For exposed-to-view concrete surfaces or where the concrete surface will be exposed to weather or moisture, where legs of supports are in contact with forms, supports with either coated or plastic protected legs.
 4. When supports bear directly on the ground and it is not practical to use steel bar supports, precast concrete blocks may be used to support only the bottom lift of reinforcement. The precast blocks must be solid, be of an equal or higher strength than the concrete being placed, must provide adequate support to the reinforcement, and be of proper height to provide specified reinforcing cover. The use of face bricks, hollow concrete blocks, rocks, wood blocks, or other unapproved objects will not be permitted.
- D. Fibrous Reinforcing:
1. Reinforcement shall be 100% virgin polypropylene fibrillated, multi-length graded fiber containing no reprocessed olefin materials and specifically manufactured for use as concrete secondary reinforcement.
 2. Physical Characteristics:
 - a. Specific Gravity: 0.91.
 - b. Fiber Length: Multidesign gradation.
- E. Mechanical Splices and Threaded Couplers: Mechanical splices and couplers shall be capable of developing at least 125% of the yield strength of the reinforcing bar.

2.02 FABRICATION

- A. General:
 - 1. Fabricate reinforcing bars to conform to required shapes and dimensions with fabrication tolerances which comply with CRSI Manual.
 - 2. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
 - 3. Unless otherwise shown on the Drawings, all end hook dimensions shall conform with "ACI Standard Hooks."
- B. Reinforcement with any of the following defects shall be deemed unacceptable and will not be permitted in the work:
 - 1. Bar lengths, depths, and bends exceeding specified fabrication tolerances.
 - 2. Bend or kinks not indicated on Drawings or final shop drawings.
 - 3. Bar with reduced cross section because of excessive rusting or other cause.

PART 3-EXECUTION

3.01 INSPECTION

- A. Examine the substrate, formwork, and the conditions under which concrete reinforcement is to be placed.
- B. Correct conditions detrimental to the proper and timely completion of the work.
- C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. General:
 - 1. Comply with the specified standards for details and methods of placing reinforcement and supports.
 - 2. Clean reinforcement to remove loose rust, mill scale, earth, and other materials which reduce or destroy bond with concrete.
- B. Placing Reinforcement:
 - 1. Placement reinforcement shall comply with Article 420.07 of the IDOT Standard Specifications for Road and Bridge Construction.
 - 2. All reinforcing shall be placed in accordance with Contract Drawings and with shop drawings stamped and approved by ENGINEER.
 - 3. Position, support, and secure reinforcing against displacement by formwork, construction, or concrete placement operations.
 - 4. Support reinforcing by plastic or coated metal chairs, runners, bolsters, spacers, and hangers as needed.
 - 5. Unless otherwise shown on the Drawings, the reinforcement is to be so detailed and placed as to allow the following concrete protection:
 - a. Three inches of cover where the concrete is placed directly against ground.

- b. Two inches of cover where the concrete is placed in forms but is to be exposed to weather, liquid, or the ground.
 - c. One-inch cover in slabs and walls not exposed to weather, liquid, or the ground.
 - d. One and one-half-inch cover in beams, girders, and columns not exposed to weather, liquid, or the ground. This cover applies to beam stirrups and column ties where applicable.
6. Reinforcement shall be positioned within $\pm 3/8$ inch for members with depth to tension reinforcing from compression face less than or equal to 8 inches. Tolerance shall be $\pm 1/2$ inch for members with depth to tension reinforcing from compression face greater than 8 inches. Tolerance on dimension between adjacent bars in slab and wall reinforcing mats shall be 1 inch. Secure against displacement by anchoring at the supports and bar intersections with wire or clips.
 7. Bars shall be securely tied at all intersections except where spacing is less than 1 foot in each direction when alternate intersections shall be tied. To avoid interference with embedded items, bar spacing may be varied slightly if acceptable to ENGINEER. Tack welding of reinforcing will not be permitted.
 8. Set coated wire ties so that twisted ends are directed away from exposed concrete surfaces.
 9. If reinforcing must be cut because of openings or embedded items in the concrete, additional reinforcing must be provided adjacent to the opening at least equal in cross sectional area to that reinforcing which was cut, and it shall extend a minimum of 36 bars diameters beyond the opening on each side or as shown on the Drawings. At sumps or depressions in slabs, bars shall be bent and/or extended under sumps or depressions.
 10. Wall reinforcing mats shall be secured in a vertical plane by providing clearance from forms with bar supports and by using Z-shaped bars at ± 4 feet on center wired between two mats of steel, spacing and staying both of them. Nails shall not be driven into the forms to support reinforcement and neither shall wire for this purpose come in contact with the forms. Alternate top transverse bars in slab shall be supported by individual bar chairs at approximately 3-foot 0-inch centers. Bottom longitudinal bars shall be supported by continuous bar chairs at approximately 4-foot 0-inch centers.
 11. If carrier bars are to be used, CONTRACTOR shall provide reinforcing bars for this purpose in addition to the reinforcing called for by the Drawings and Specifications.
 12. Any damaged epoxy coating on reinforcing shall be repaired per Section 508.4 of Standard Specifications.
- C. Reinforcement Supports:
1. Strength and number of supports shall be sufficient to carry reinforcement.
 2. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support.
 3. Do not use supports as bases for runways for concrete-conveying equipment and similar construction loads.
- D. Splices:
1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying.
 2. Lap splices in reinforcing shall be provided as shown on the Drawings. Where lap splice lengths are not shown on the Drawings, provide Class B, Category 1 lap splices in accordance with ACI 318.

3. Adjacent splices of tangential bars in circular slabs and horizontal bars in circular walls shall be staggered a minimum of one full lap splice length or 3 feet, whichever is greater, unless otherwise shown. Stagger dimension shall be measured from center to center of lap splices.
 4. Mechanical splices and threaded dowel bar inserts may be used where approved by ENGINEER.
- E. Embedded Items:
1. Allow other trades to install embedded items as necessary.
 2. Particularly after bottom layer of reinforcing is placed in slabs, allow electrical contractors to install conduit scheduled for encasement in slabs prior to placing upper layer of reinforcing.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. All cast-in-place concrete for Pump Station 49, except as noted otherwise.
 - 2. PVC waterstops, expansion joint fillers, bonding agents, patching mortars, curing compounds, nonshrink grout, floor sealer, and other related items and accessories.
- B. Unless otherwise indicated, concrete material and work shall be in conformance with the requirements of the IDOT Standard Specifications for Road and Bridge Construction (Standard Specifications), 2022 version, a publication of the Illinois Department of Transportation.
- C. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. Section 1020-Portland Cement Concrete—IDOT Standard Specifications for Roads and Bridge Construction.
- B. ACI 211.1—Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- C. ACI 301—Specifications for Structural Concrete.
- D. ACI 304R—Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- E. ACI 305R—Guide to Hot Weather Concreting.
- F. ACI 306R—Guide to Cold Weather Concreting.
- G. ACI 308—Specification for Curing Concrete.
- H. ACI 309—Guide for Consolidation of Concrete.
- I. ACI 318—Building Code Requirements for Structural Concrete and Commentary.
- J. ASTM C31—Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- K. ASTM C33—Standard Specification for Concrete Aggregates.
- L. ASTM C39—Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

- M. ASTM C40—Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.
- N. ASTM C88—Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
- O. ASTM C94—Standard Specification for Ready-Mixed Concrete.
- P. ASTM C143—Standard Test Method for Slump of Hydraulic-Cement Concrete.
- Q. ASTM C150—Standard Specification for Portland Cement.
- R. ASTM C156—Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.
- S. ASTM C172—Standard Practice for Sampling Freshly Mixed Concrete.
- T. ASTM C231—Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- U. ASTM C260—Standard Specification for Air-Entraining Admixtures for Concrete.
- V. ASTM C309—Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- W. ASTM C494—Standard Specification for Chemical Admixtures for Concrete.
- X. ASTM C595—Standard Specification for Blended Hydraulic Cements.
- Y. ASTM C618—Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
- Z. ASTM C652—Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
- AA. ASTM D994—Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- BB. ASTM D1752—Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.03 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01 33 00—Submittals.
- B. Submit the following information:
 - 1. Gradation of fine and coarse aggregate—ASTM C33.
 - 2. Specific gravity and dry rodded density of each aggregate.
 - 3. Test of deleterious substances in fine and coarse aggregate—ASTM C33.
 - 4. Design mix of each individual concrete mix to be used to be approved by ENGINEER.

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5. Previous test results or trial batch results with 7- and 28-day compressive strengths for each concrete mix proposed.
 6. Certified mill test results for cement identifying brand, type, and chemistry of cement to be used.
 7. Brand, type, principal ingredient, and amount of each admixture to be used.
- C. It is important that the above data be submitted to ENGINEER well in advance of anticipated concreting operations to avoid any delay in construction.

1.04 QUALITY ASSURANCE

- A. Under provisions of the IDOT Standard Specifications for Road and Bridge Construction.

PART 2-PRODUCTS

2.01 CEMENT

- A. Cement products shall meet Section 1001 of Standard Specifications.

2.02 AGGREGATE

- A. All aggregates shall meet Sections 1003 and 1004 of the Standard Specifications. Coarse aggregates shall be type CA-5, CA-11, and CA-16 based in mix type.

2.03 WATER

- A. Water shall meet Section 1002 of Standard Specifications.

2.04 ADMIXTURES

- A. Concrete admixtures shall meet Section 1021 of Standard Specifications.

2.05 PROPORTIONING

- A. Concrete mix designs shall meet Section 1020 of the Standard Specifications. All concrete shall be Class SI with 14 day compressive strength of 3,500 psi (4,000 psi at 28 days), unless noted otherwise. Coarse aggregate for concrete shall be CA-5 and CA-11, except for Fill/Slope Concrete, which shall be CA-16.

2.06 WATERSTOPS

- A. PVC waterstops shall be as manufactured by Greenstreak, Inc., W.R. Meadows, Durajoint. Provide serrated center bulb-type, nontapered 3/8 inch minimum thickness waterstops manufactured from virgin polyvinyl chloride with no reclaimed/scrapped material or pigment whatsoever conforming to Corps of Engineers CRD-C-572. The waterstop shall have an integral fastening system consisting of hogrings or grommets. Provide 4-inch and 6-inch waterstops as shown in the Drawings.

2.07 JOINT FILLER

- A. Expansion joints shall have standard 1/2-inch-thick cork expansion joint filler, W. R. Meadows, meeting ASTM D1752–Type II. Exceptions to this are expansion joints in exterior concrete walks and between concrete walks and other structures which shall be asphalt expansion joint filler, 1/2-inch-thick, meeting ASTM D994.

2.08 BONDING AGENT

- A. Bonding agent for bonding new concrete to existing concrete at construction joints and for bonding concrete overlays to existing concrete shall be a liquid latex product meeting ASTM C1059, Type II.

2.09 PATCHING ADDITIVE

- A. Acceptable manufacturers include MasterEmaco® A 660 by Master Builders Solutions, Sonocrete by Sonneborn Contech Co.

2.10 NONSHRINK GROUT

- A. Acceptable manufacturers include Dayton Superior, Master Builders Solutions. Grout shall be nonshrink, nonmetallic and shall achieve a strength of 7,500 psi in 28 days.

2.11 CURE–SEAL HARDENER

- A. Provide penetrating sealer for interior building floors. See finish schedule for locations to be used.

PART 3–EXECUTION

3.01 MIXING

- A. Ready-mixed concrete shall be batched, mixed, and delivered in accordance with ASTM C94 and ACI 304R. In general, concrete shall be mixed 50 revolutions at plant, 20 upon arrival at site, and 20 each time water is added; maximum of 110 revolutions at mixing speed. Concrete shall be delivered and discharged within 1 1/2 hours or before the drum has revolved 300 times after introduction of water to the cement and aggregates or the cement to the aggregates. Truck mixers shall be equipped with drum revolution counters. In no event shall concrete which has taken its initial set be allowed to be used. Retempering of concrete is not permitted.
- B. A representative of ENGINEER may be at the batching plant periodically to observe the batching and mixing.
- C. No water shall be added on the job unless required by CONTRACTOR and with the knowledge of ENGINEER; the amount of water, if added, shall be recorded on all copies of the delivery tickets. If water is added, CONTRACTOR shall verify that the required water-cement ratio is not exceeded.

- D. Concrete shall have a temperature not less than 60°F nor more than 80°F as delivered to the jobsite.
- E. With each load of concrete, CONTRACTOR shall obtain delivery tickets and shall make these tickets available for review by ENGINEER. Delivery tickets shall provide the following information:
 - 1. Date.
 - 2. Name of ready-mix concrete plant, job location, and CONTRACTOR.
 - 3. Type of cement and admixtures, if any.
 - 4. Specified cement content in sacks per cubic yard of concrete.
 - 5. Amount of concrete in load, in cubic yards.
 - 6. Water-cement ratio.
 - 7. Water added at job, if any.
 - 8. Truck number and time dispatched.
 - 9. Number of mixing drum revolutions.
- F. For job-mixed concrete, all concrete materials shall be mixed in a machine batch mixer for at least 1 1/2 minutes after all ingredients are in the mixer and shall continue until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. The mixer shall not be loaded beyond the capacity given by the manufacturer and shall be rotated at the speed recommended by the manufacturer. The mixer is to be provided with positive timing device that will positively prevent discharging the mixture until the specified mixing time has elapsed.

3.02 JOINTS

- A. CONTRACTOR shall place all joints as shown on the Drawings or specified herein. If acceptable to ENGINEER, CONTRACTOR may, at its own expense, place construction joints in addition to and at places other than those shown on the Drawings. Unless otherwise shown, all joints shall be straight, truly vertical or horizontal, and proper methods shall be employed to obtain this result.
- B. Where construction joints are not shown on the Drawings or specified elsewhere, CONTRACTOR shall provide construction joints in walls as follows:
 - 1. Vertical construction joints at 60 feet on center maximum but not more than 15 feet from corners or intersections.
 - 2. Horizontal construction joints at 18 feet on center maximum for walls 12 inches or more in thickness.
 - 3. Horizontal construction joints of 8 feet on center maximum for walls 10 inches or less in thickness.
- C. Immediately after completion of the first pour at a joint, the concrete surface, reinforcement, and waterstop projecting beyond the joint shall be thoroughly cleaned and laitance removed. The waterstops shall not be disturbed after the concrete in the first pour at a joint has set. Concrete around waterstops shall be thoroughly compacted by hand spading and vibrating. Immediately before the second pour, all extraneous matter shall be removed from the joint, the waterstop and steel cleaned, and the surface thoroughly wetted.
- D. Concrete at all joints shall have been in place at least 48 hours before abutting concrete is placed. At least two hours must elapse after depositing concrete in columns or walls before depositing in beams, girders, or slab supported thereon. Beams, girders, brackets, column

capital, and haunches shall be considered as part of the floor system and shall be placed integrally therewith.

3.03 WATERSTOPS

- A. Unless noted otherwise, PVC waterstops shall be provided at all expansion joints and at construction joints in floors and walls of structures exposed to ground or liquid on one side and occupied by personnel or nonsubmerged equipment on the other side.
- B. PVC waterstops shall be made continuous by splicing. Waterstops shall be spliced using a corner, tee, or cross splice, as applicable, at intersections. Waterstops shall be mitered to maintain the continuity of the ribs and center bulb. Splices shall be made using a hot metal plate or an electric splicer and full butt weld. Direct flame will not be allowed. Sample field-splices shall be submitted to ENGINEER for review prior to construction.
- C. PVC waterstops placed in all joints shall be securely held in place by an acceptable method or as shown on the Drawings. PVC waterstops shall be installed and secured prior to concrete placement. PVC waterstops shall not be inserted into wet concrete. No nails will be permitted through the waterstop. Great care shall be taken when concrete is placed so that the waterstop remains erect and is not bent over.
- D. PVC waterstop shall be provided at all construction joints in liquid holding tanks and channels that are not adjacent to areas occupied by personnel and at joints between new and existing concrete. Waterstop shall be placed as shown on drawing details, if any, and in accordance with the manufacturer's recommendations. Where not shown on the Drawings, waterstops shall be approximately centered in walls and slabs.
- E. At CONTRACTOR'S option, PVC waterstop can be used in lieu of waterstop where hydrophilic waterstop is shown or called for.
- F. If PVC waterstop intersect at joints, waterstop shall be installed per manufacturer recommendations and details. Detail shall be submitted to ENGINEER for review.

3.04 BONDING TO EXISTING CONCRETE

- A. When placing new concrete adjacent to existing concrete, the existing concrete shall be thoroughly roughened, cleaned, and saturated with water 24 hours before pouring new concrete. Existing concrete is defined as concrete more than six months old. At time of new pour, remove any standing water and apply bonding agent. Bonding agent shall be applied in accordance with manufacturer's recommendations.

3.05 EMBEDDED ITEMS IN CONCRETE

- A. All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.
- B. All contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.

- C. Embedded items shall be positioned accurately and supported against displacement. Reinforcing bars shall clear embedded items a minimum of 2 inches.

3.06 PLACING CONCRETE

- A. Before placing concrete, all equipment, forms, ground, reinforcements, and other surfaces with which the concrete will come in contact are to be thoroughly cleaned of all debris, ice, and water. Ground shall be wetted prior to placement of concrete on it.
- B. After reinforcement is placed and before concrete is placed over it, ENGINEER shall be allowed sufficient time to observe the reinforcing.
- C. Unless otherwise authorized by ENGINEER, all concrete shall be placed in the presence of ENGINEER.
- D. Concrete shall be conveyed from the mixer to the place of final deposit as rapidly as practicable by methods that will prevent the segregation or loss of materials. Chuting for conveying purposes must be accomplished in such a manner as to prevent segregation or loss of materials. Receiving hoppers shall be installed at the chute discharge and at no point in its travel from the mixer to place of final deposit shall the concrete pass through a free vertical drop of more than 3 feet. Elephant trunks or tremies shall be used in all wall pours to prevent coating of forms and reinforcing bars.
- E. Care shall be taken to avoid an excess of water on the concrete surface. Excess water shall be drained or otherwise removed from the surface. Dry cement or a mixture of cement and sand shall not be sprinkled directly on the surface to absorb water.
- F. Concrete in wall and beam pours shall be deposited in approximately horizontal layers not to exceed 18 inches in thickness. Each layer shall be well worked into the preceding layer while both layers are still soft.
- G. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation from rehandling or flowing. The maximum allowable lateral movement of the concrete after being deposited is 3 feet. Once concreting is started, it shall be carried on as a continuous operation until the placing of the section or panel is completed.
- H. All concrete shall be placed with the aid of mechanical vibrating equipment in accordance with ACI 309. In congested areas, vibration shall be supplemented by hand spading adjacent to the forms. Vibration should secure the desired results within 5 to 15 seconds at intervals of 18 inches apart maximum. The vibrator shall penetrate the preceding layer of concrete. Vibrators shall have a frequency of not less than 10,000 impulses per minute when in operation submerged in concrete.
- I. A sufficient number of spare vibrators shall be kept in ready reserve to provide adequate vibration in case of breakdown of those in use.
- J. In placing concrete in beams where it is intended to be continuous and monolithic with the slab above, a delay to provide for settlement of the deep concrete shall be scheduled before placing the upper concrete in the slab. The length of delay shall be as long as possible and still permit the revibration of the deep concrete.

- K. Concrete is not to be placed under water. A suitable means shall be provided for lowering the water level below surfaces upon which concrete is to be placed. This may require excavating approximately 12 inches below the bottom of the concrete surface and refilling with gravel and compacting. The groundwater shall not be allowed to rise to the bottom of the concrete until 24 hours after the concrete pour has been completed. Water shall not be allowed to fall upon or run across the concrete during this period.
- L. No extra payment will be allowed for dewatering, undercutting, and gravel fill.
- M. Temperature control for concrete placement shall comply with the provisions of Section 1020 of the Standard Specifications.

3.07 MOIST CURING

- A. All concrete shall be maintained in a moist condition for at least 7 days after being deposited except that for high-early strength concrete, a 3-day period will be sufficient. Moist curing shall be accomplished by one of the following methods:
 - 1. Wood forms left in place and kept wet at all times. If wood forms are not going to be kept wet or if metal forms are used, they shall be removed as soon as practicable and other methods of moist curing shall be started without delay.
 - 2. Use of a curing compound conforming to ASTM C309, Type I as approved by ENGINEER. Curing compound shall be applied at a uniform rate as indicated by the manufacturer sufficient to comply with the requirements of the test water retention of ASTM C156. Curing compound applied to vertical concrete surfaces after forms are removed shall be specially adapted to provide required coverage on the vertical surface. On nonformed surfaces, the curing compound shall be applied immediately after the disappearance of the water sheen after finishing of the concrete. Curing compound shall not be used on concrete surfaces that are to be painted, receive ceramic tile or resilient flooring, or be waterproofed. Care shall be taken not to get curing compound on construction joints, reinforcing steel, and other surfaces against which new concrete will be poured.
 - 3. Use of plastic film. Plastic film shall have a minimum thickness of 4 mils. It shall be placed over the wet surface of the fresh concrete as soon as possible without marring the surface and shall be weighted so that it remains in contact with all exposed surfaces of the concrete. All joints and edges shall be lapped and weighted. Any tears in the film shall be immediately repaired.
 - 4. Application of wet coverings weighing 9 ounces per square yard such as burlap, cotton mats, or other moisture-retaining fabrics. The covering system shall include two layers and shall be kept continuously moist so that a film of water remains on the concrete surface throughout the curing period.
 - 5. Use of an approved waterproof curing paper. Edges of adjacent sheets shall be overlapped several inches and tightly sealed.
 - 6. Ponding of water or continuous sprinkling of water is permitted. Sprinkling at intervals will not be permitted.
 - 7. Construction joints shall be moist cured by one of the methods listed above except by Method "2."
- B. The use of moist earth, sand, hay, or another method that may discolor hardened concrete will not be permitted.

3.08 HOT WEATHER CONCRETING

- A. When the atmospheric temperature exceeds 80°F during concrete placement, this section and ACI 305 shall apply in addition to all other sections of the specifications.
- B. The temperature of the delivered concrete shall not exceed 85°F.
- C. Care shall be exercised to keep mixing time and elapsed time between mixing and placement at a minimum. Ready-mix trucks shall be dispatched so as to avoid delay in concrete placement, and the work shall be organized to use the concrete promptly after arrival at the jobsite.
- D. The subgrade, forms, and reinforcing shall be sprinkled with cool water just prior to placement of concrete. Prior to placing concrete, there shall be no standing water or puddles on the subgrade.
- E. If approved by ENGINEER, an admixture for retarding the setting of the concrete may be used.
- F. Exposed concrete surfaces shall be carefully protected from drying. Continuous water curing is preferred. Curing compounds shall be white pigmented.

3.09 COLD WEATHER CONCRETING

- A. Conditions of this section shall apply, in addition to all other sections of the specifications, when placing concrete in cold weather. Cold weather is defined as a period when, for more than three successive days, the average daily temperature drops below 40°F. When temperatures above 50°F occur during more than half of any 24-hour period, the period will no longer be regarded as cold weather. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. Cold weather concreting shall conform to all requirements of ACI 306.1, except as modified by the requirements of these specifications.
- B. Detailed procedures for the production, placement, protection, curing, and temperature monitoring of concrete during cold weather shall be submitted to ENGINEER. Cold weather concreting shall not begin until these procedures have been reviewed for conformance with ACI 306.1.
- C. All concrete materials, forms, ground, mixing equipment, and other surfaces with which the concrete is to come in contact shall be free from frost, and the temperature of contact surfaces shall be 35°F or above. Ground upon which concrete is to be placed shall not be frozen at any depth.
- D. The mixing water and aggregates shall be heated and when entering the mixer shall have temperatures not exceeding 175°F and 80°F, respectively. Concrete temperature as mixed shall not exceed 80°F and shall typically be between 55°F and 70°F. Concrete, when placed in the forms, shall have a temperature of not less than 50°F.
- E. Freshly placed concrete shall be protected by adequate covering, insulating, or housing and heating. If heating is used, ambient temperature inside the housing shall be maintained at a minimum of 70°F for 3 days or 50°F for 5 days. The maximum ambient temperature during

curing shall not exceed 80°F. If insulating methods are used, recommendations contained in ACI 306R shall be followed. Surface temperature shall be maintained at 50°F for 7 days. After the curing period, the temperature of the concrete shall be reduced uniformly at a rate not to exceed 40°F per 24 hours until outside air temperature is reached. Heating of enclosure shall continue if it is anticipated that the outside air temperature will drop more than 20°F in the next 24 hours. The concrete temperature shall be obtained by attaching a thermometer provided by CONTRACTOR to the concrete surface. Concrete shall be kept moist.

- F. If heating is used, the housing shall be constructed weathertight and shall be constructed in a manner that will provide uniform air circulation and air temperatures over the complete concrete area that is being cured. Special attention shall be given to the edges and ends of a concrete pour with the housing extending at least 5 feet beyond any concrete surface being protected. The housing shall be in place and heat applied within 2 hours after concrete placement.
- G. Heating may be by steam or hot air. Heaters shall be vented to outside of the housing. Open burning salamanders will not be permitted. Heating devices shall not be placed so close to the concrete as to cause rapid drying or discoloration from smoke.
- H. If heating is used, CONTRACTOR shall provide sufficient 24-hour inspection of the heaters to provide compliance with the above-specified temperature requirements during the curing period. CONTRACTOR shall provide maximum-minimum thermometers for ENGINEER's use.
- I. The use of calcium chloride, salts, or other chemical admixtures for the prevention of freezing is prohibited.
- J. Salts or other deleterious materials shall not be used on temporary or permanent structures above concrete surfaces that are being placed, finished, or cured.

3.10 FINISHING

- A. Flat Work:
 - 1. Floated Finish: Place, consolidate, strike off, and level concrete eliminating high spots and low spots. Do not work concrete further until it is ready for floating. Begin floating with a hand float, a bladed power float equipped with float shoes, or a powered disk float when the bleed water sheen has disappeared and the surface has stiffened sufficiently to permit the operation. Immediately refloat the slab to a uniform texture.
 - 2. Light Troweled Finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks.
 - 3. Hard Troweled Finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.
 - 4. Tolerance for concrete floors shall be 1/4 inch within 10 feet in any direction. Straight edge shall be furnished by CONTRACTOR.
 - 5. Broom or Belt Finish: Immediately after concrete has received a floated finish, give the concrete surface a coarse transverse scored texture by drawing a broom or burlap belt across the surface.
 - 6. The above finishes shall be used in the following locations:
 - a. Float Finish: Surface to receive roofing, waterproofing, or sand bed terrazzo.

- b. Light Troweled Finish: Submerged tank slabs.
- c. Hard Troweled Finish: Building floors.
- d. Broom or Belt Finish: Exterior slabs, sidewalks, tops of walls, and tank slabs to receive grout topping.

B. Formed Surfaces:

1. Within 2 days after removing forms and prior to application of a curing compound, all concrete surfaces shall be observed and any poor joints, voids, stone pockets, or other defective areas shall be patched at once before the concrete is thoroughly dry. Defective areas shall be chipped away to remove all loose and partially bonded aggregate. The area shall be thoroughly wetted and filled with as dry as practical mortar mix placed to slightly overfill the recess. Mortar shall include a bonding agent. After partial set has taken place, the excess mortar shall be removed flush with the surface on the concrete using a wood float. All patching shall be cured, protected, and covered as specified for concrete. All cracks, leaks, or moist spots that appear shall be repaired. No extra compensation will be allowed CONTRACTOR for such work.
2. The exterior or removal portion of nonremovable ties shall be removed with the use of a special tool designed for this purpose. Cutting or chipping of concrete to permit removal of exterior portion will not be permitted.
3. For nonremovable ties, tie rod holes left by the removal of the exterior portion of the tie and cone shall be thoroughly wetted and filled by ramming with as dry as practical mortar mix in such a manner such that it completely fills the hole. Mortar shall include a bonding agent. All patching shall be cured, protected, and covered as specified for concrete. The holes are to be filled immediately after removal of the exterior portion of the tie.
4. Holes left by removable ties shall be filled by installing a neoprene plug near the center of the wall. The balance of the hole shall be filled with mortar as specified above to within 1 inch of the face of the wall. The remainder of the hole shall be filled with a waterproofing compound.
5. All finished or formed surfaces shall conform accurately to the shape, alignment, grades, and sections as shown or prescribed by ENGINEER. All surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness. All sharp angles, where required, shall be rounded or beveled. Any formed surface to be painted shall be free of any material that will be detrimental to the paint. The surface of the concrete shall be given one of the following finishes immediately after form stripping:
 - a. Finish A shall be referred to as a sack finish. Surfaces shall be free of contaminants prior to sacking. After wetting the surface, a grout shall be rubbed in using a rubber float or burlap. After the grout hardens sufficiently, it shall be scraped from the surface with the edge of a steel trowel without disturbing the grout in the air holes. After further drying, the surface shall be rubbed with burlap to remove all surface grout. The entire surface shall be finished to secure a continuous, hard, dust-free uniform texture surface free from pinholes and other minor imperfections. Finish A will be required for all unpainted surfaces (See Section 09 91 00—Painting for painted surfaces), interior surfaces of equipment rooms, operation areas, and permanently exposed vertical surfaces. Where steel-faced forms are used to form walls, the portion of wall to receive the sack finish shall first be roughened by brush blasting or other acceptable method to achieve a texture similar to 40 to 60 grit sandpaper.
 - b. Finish B shall be the same as Finish A, except that the final burlap rubbing may be omitted, providing the steel trowel scraping removes the loose buildup from the surface. Finish B shall be provided for waterproof- and moistureproof-coated surfaces.

- c. Finish C shall be referred to as a finish that has surface imperfections less than 3/8 inch in any dimension. Surface imperfections greater than 3/8 inch shall be repaired or removed and the affected areas neatly patched. Finish C or smoother shall be provided for interior surfaces of wet wells, tanks, and channels from 1 foot below minimum water surfaces and down and otherwise unfinished interior surfaces.
 - d. Finish D shall be the finish for surfaces that may be left as they come from the forms, except that tie holes shall be plugged and defects greater than 1/2 inch in any dimension shall be repaired. Finish D shall be provided for surfaces to be buried or covered by other construction such as masonry veneer.
- C. All precautions shall be taken to protect the concrete from stains or abrasions, and any such damage shall be removed or repaired under this Contract.

3.11 LOADING OF CONCRETE STRUCTURES

- A. No concrete structure or portion thereof shall be loaded with its design load until the concrete has obtained its specified 28-day compressive strength. This shall include but not be limited to vertical live load, equipment loading, water loading, groundwater loading, and backfill load. Concrete strength at time of loading shall be determined by testing field-cured concrete cylinders.
- B. Extreme care shall be taken so that construction loads do not exceed design loading of the structure.

3.12 WATER TEST

- A. All liquid-retaining structures shall be water-tested by CONTRACTOR before being faced with masonry or backfilled. The structure shall be filled with water, kept full for at least 24 hours, leaks or moist areas marked, and the structure or surrounding area drained. Repairs shall be made from the face of the concrete that is subjected to water pressure. Method of repair shall be reviewed by ENGINEER.
- B. Testing of the structure shall not take place until the last concrete placed in the structure has developed 28-day design strength as determined by testing field-cured concrete cylinders.
- C. After repair, the structure shall again be tested as above. Testing and repair shall continue until all leaks or moist spots have disappeared. Unless otherwise stated, water for testing shall be supplied by CONTRACTOR.

3.13 NONSHRINK GROUT

- A. Nonshrink, nonmetallic grout shall be used for filling recesses and pockets left for equipment installation and for setting of base plates. The material used shall be approved by ENGINEER. Store, mix, and place the nonshrinking compound as recommended by the manufacturer. The minimum compressive strength shall be 5,000 psi at age 7 days and 7,500 psi at age 28 days.

3.14 TESTING AND SAMPLING

- A. The following tests of fresh concrete shall be performed by CONTRACTOR. CONTRACTOR shall prepare, protect, transport, and have tested all cylinders at its expense.
1. Sampling of concrete for slump tests, air tests, temperature tests, and for making concrete test cylinders shall be performed in accordance with ASTM C172.
 2. Cylinders:
 - a. Three test cylinders shall be made for each pour less than 25 cubic yards, four test cylinders shall be made for each pour between 25 and 100 cubic yards, and eight test cylinders shall be made for each pour in excess of 100 cubic yards. Each concrete mix shall be represented by at least four cylinders for the entire job. Concrete for cylinders shall be collected near the middle of the load and/or as requested by ENGINEER.
 - b. Cylinders shall be made and tested in accordance with ASTM C31 and ASTM C39, respectively. The cylinders must be kept moist and at temperatures between 60°F and 80°F and shall remain undisturbed and stored in a location free from vibration. In hot weather, the cylinders shall be covered with wet burlap and stored in a shaded area. It is CONTRACTOR's responsibility to provide a suitable protected location for storing cylinders on the jobsite.
 - c. After 24 hours, the cylinders shall be transferred to an independent testing laboratory acceptable to OWNER. The cylinders shall be packed in sawdust or other cushioning material for transit to avoid any bumping or jarring of the cylinders.
 - d. Cylinders shall be broken at 7 and 28 days or as requested by ENGINEER. Test results shall be transmitted immediately and directly to ENGINEER and OWNER. Test data shall include date and location of pour and concrete mix used.
 3. Slump Test: CONTRACTOR shall make one slump test near the beginning of all pours with two tests being made for all pours in excess of 25 yards or as requested by ENGINEER. Slump tests shall conform to ASTM C143.
 4. Air Test:
 - a. When air-entrained concrete is used, the air content shall be checked by CONTRACTOR near the beginning of all pours with at least two checks being made for all pours in excess of 25 cubic yards, or as requested by ENGINEER.
 - b. The air contents shall be checked using the pressure method in accordance with ASTM C231. The pocket-sized alcohol air indicator shall not be used unless it is first used in conjunction with the pressure method test.
- B. All costs of additional testing and sampling of fresh or hardened concrete needed because of suspected or actual violation of the specifications shall be borne by CONTRACTOR.

3.15 RECORDS

- A. A record is to be kept of all concrete work by ENGINEER. The record shall include the date, location of pour, concrete mix, slump, air content, test cylinder identification, concrete temperature, and ambient air temperature. In addition, for cold weather concreting the record shall include the daily maximum-minimum thermometer readings of all thermometers during the entire curing period for all concrete pours. The Project Representative will keep this record, and CONTRACTOR shall assist in obtaining needed information.

3.16 CONCRETE REMOVAL AND PATCHING

- A. All areas disturbed as a result of concrete removal or repair shall be patched as specified in Bonding to Existing Concrete.

3.17 CURING AND SEALING INTERIOR BUILDING FLOORS

- A. Install cure-seal hardener product in accordance with manufacturer's instructions. Apply only to those floors noted to be sealed in the finish schedule.
- B. Where product will be used for moist curing, sealing and hardening, apply to new concrete as soon as the concrete is firm enough to walk on after troweling. Where product will be used for sealing and hardening only, surface must be free of dust, dirt, laitance, curing compounds, and any material that would inhibit the penetration of the product. In some instances, the floor may need to be stripped and neutralized before application.
- C. Spray on at rate of 200 square feet per gallon.
- D. Keep surfaces wet with cure-seal hardener for minimum soak-in period of 30 minutes, without allowing drying out or becoming slippery. In hot weather, slipperiness may appear before the 30-minute time period has elapsed. If that occurs, apply more cure-seal hardener as required to keep entire surface in a nonslippery state for the first 15 minutes. For the remaining 15 minutes, mist the surface as needed with water to keep the material in a nonslippery state.
- E. After this period, when treated surface becomes slippery, lightly mist with water until slipperiness disappears.
- F. Wait for surface to become slippery again and then flush entire surface with water removing all residue of cure-seal hardener.
- G. Squeegee surface completely dry, flushing any remaining slippery areas until no residue remains.
- H. Wet vacuum or scrubbing machines may be used to remove residue, provided manufacturer's instructions are followed.
- I. Protect installed floors until chemical reaction process is complete; at least 3 months.
- J. Clean up spills immediately and spot-treat stains with good degreaser or oil emulsifier.
- K. Protection and cleaning of floors are the responsibility of CONTRACTOR until final completion. Replace concrete that becomes stained because of improper precautions or lack of cleaning.

END OF SECTION

SECTION 03 41 13

PRECAST CONCRETE HOLLOW CORE PLANKS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Precast concrete hollow core planks.
 - 2. Connection plates and hangers.
 - 3. Grouting plank joint keys.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ACI 318-Building Code Requirements for Reinforced Concrete.
- B. ASTM C150-Portland Cement.
- C. AWS D1.1-Structural Welding Code.
- D. AWS D1.4-Structural Welding Code-Reinforcing Steel.
- E. PCI-Manual For The Design of Hollow Core Slabs.
- F. PCI MNL-116—Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.
- G. PCI MNL-120—Design Handbook—Precast and Prestressed Concrete.
- H. PCI MNL-123—Manual on Design of Connections for Precast Prestressed Concrete.
- I. PCI-Design Handbook-Precast and Prestressed Concrete.
- J. PCI-Tolerances for Precast and Prestressed Concrete.

1.03 DESIGN REQUIREMENTS

- A. Size components to withstand design loads in an unrestrained condition as follows: Roof Assembly: All dead loads plus 20 psf live loads plus concentrated loads shown on the Drawings.
- B. Plank shall be designed in accordance with the PCI-Manual For The Design of Hollow Core Slabs and PCI-Design Handbook.

- C. Plank shall be capable of resisting shear forces as a diaphragm. Diaphragm chords will be the masonry bond beams.

1.04 SUBMITTALS

- A. Professional Engineer: All plank designs shall bear the name and seal of a State of Illinois licensed structural engineer. CONTRACTOR shall be responsible for submitting the required additional copies of plank drawings with original stamp and signature for submittal to the State of Illinois. These materials must be submitted prior to installation.
- B. Shop Drawings: Indicate plank locations, unit identification marks, connection details, edge conditions, bearing requirements, support conditions, dimensions, openings, openings intended to be field cut, and relationship to adjacent materials.
- C. Product Data: Indicate standard component configuration, design loads, deflections, and cambers.

1.05 QUALIFICATIONS

- A. Fabricator: Company specializing in manufacturing the work of this section with 3 years experience. Maintain plant records and quality control program during production of precast planks. Make records available upon request.
- B. Erector: Company specializing in erecting the work of this Section approved by fabricator.
- C. Design precast concrete members in accordance with PCI Manual For The Design of Hollow Core Slabs under direct supervision of a structural engineer experienced in design of this work and licensed in the State of Illinois.
- D. Welder: Qualified within previous 12 months in accordance with AWS D1.1.
- E. Manufacturer: The precast concrete manufacturing plant shall be certified by the Prestressed Concrete Institute (PCI) Plant Certification Program prior to the start of production. Manufacturer shall be certified in category C3. The manufacturer shall, at its expense, meet the following requirements:
- F. The basis of inspection shall be the Prestressed Concrete Institute's "Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products", MNL-116, and the criteria for acceptance shall be the same as the Plant Certification Program.
- G. Testing: In general compliance with applicable provisions of Prestressed Concrete Institute MNL-116, "Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products."

1.06 REGULATORY REQUIREMENTS

- A. Conform to ACI 318 and the 2018 International Building Code (IBC) for design load and on-site construction requirements.

- B. CONTRACTOR shall submit additional copies of shop drawings for submittal to the Building Code Official by ENGINEER.

1.07 PREINSTALLATION CONFERENCE

- A. Convene minimum one week prior to commencing work of this section.
- B. Discuss anchor and weld plate locations, sleeve locations, and cautions regarding cutting or core drilling.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Lifting or handling devices shall be capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.
- B. Mark each member with date of production and final position in structure.

1.09 COORDINATION

- A. Coordinate the work of framing components not post tensioned but directly associated with the work of this section.
- B. Coordinate field cut openings with affected section.
- C. Coordinate location of hanger tabs and devices for mechanical and electrical work.
- D. Coordinate location of anchors to be placed in masonry walls.

PART 2-PRODUCTS

2.01 FABRICATORS

- A. The plank shall be prestressed hollow-core precast concrete plank as fabricated by Wells Concrete, Flexicore Company, Mid-States Concrete Inc., or County Precast.

2.02 MATERIALS

- A. Materials shall comply with provisions of ACI 318.
- B. Cement grout for grouting joints shall be one part Portland Cement per ASTM C150, three parts sand and water.

2.03 ACCESSORIES

- A. Connecting and supporting devices shall be 304 stainless steel unless noted otherwise.
- B. Bearing pads shall be high-density plastic, 1/8 inch thick.

- C. Caulk as approved by plank manufacturer.

2.04 FABRICATION

- A. Conform to AWS D1.4., PCI MNL-116, and PCI MNL-120, and PCI MNL-123.
- B. Embed anchors, inserts, plates, angles, and other items at locations indicated.
- C. Cut exposed ends flush.

2.05 FINISHES

- A. Plank to be painted shall be field abrasive blasted and painted as specified in Section 09 91 00–Painting.

2.06 FABRICATION TOLERANCES

- A. Conform to PCI-Tolerances for Precast and Prestressed Concrete.

PART 3–EXECUTION

3.01 EXAMINATION

- A. Verify that site conditions and supporting structure are ready to receive work and field measurements are as indicated on shop drawings.

3.02 PREPARATION

- A. Prepare support devices for the erection procedure and temporary bracing.

3.03 ERECTION

- A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.
- B. Align and maintain uniform horizontal and end joints as erection progresses.
- C. Maintain temporary bracing in place until final connection is made. Protect members from staining.
- D. Install bearing pads at bearing ends of planks as indicated.
- E. Adjust differential camber between precast members to tolerance before final attachment and grouting.
- F. Adjust differential elevation between precast members to tolerance before final attachment.

- G. Grout plank joints, trowel smooth. Any grout that may have seeped through to the ceiling below shall be removed before it hardens. Grout shall also be placed between masonry and underside of roof plank in spaces created by roof plank camber over all exterior walls and bearing walls. On nonbearing interior walls, a void over 1/2 inch shall be filled with 1/2-inch expansion material and grout the remainder. This grout shall be applied following roofing. It is the intent that a space of 1/4 inch to 1/2 inch be left for caulking as required in Section 07 90 00—Caulking and Sealants.
- H. Underside of joints between planks that remain exposed shall be caulked as required in Section 07 90 00—Caulking and Sealants.
- I. Where open cores at end of planks are to remain exposed to view. The cores shall be grouted full for a minimum 6-inch depth to provide finished end of plank.
- J. Secure units in place. Perform welding, where shown, in accordance with AWS D1.1.

3.04 ERECTION TOLERANCES

- A. Erect members level and plumb within allowable tolerances. Conform to PCI MNL-116.

3.05 CUTTING OPENINGS

- A. Cooperation shall be extended to all trades in permitting the insertion of anchors, hangers, vents, electrical outlets, etc. Holes needed for such devices shall be cut in the field by the various trades. Cuts shall be made with a masonry saw or core drill. The various trades shall be present during installation of the roof deck. All openings not dimensioned or shown on the Drawings shall be located by the trades requiring the openings. All openings larger than 8 inches in any dimension shall be made by the roof slab supplier, and where necessary, hangers shall be furnished by the supplier. All spalling shall be repaired by the roof plank supplier prior to caulking. It is essential that plank which will remain exposed from below have a neat finished surface. Particular care shall be given to appearance of holes and openings.

END OF SECTION

SECTION 04 05 13

MORTAR AND MASONRY GROUT

PART 1—GENERAL

1.01 SUMMARY

- A. The work includes mortar and grout for masonry.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. 2018 International Building Code.
- B. ASTM C91—Masonry Cement.
- C. ASTM C144—Aggregate for Masonry Mortar.
- D. ASTM C150—Portland Cement.
- E. ASTM C207—Hydrated Lime for Masonry Purposes.
- F. ASTM C404—Aggregates for Masonry Grout.
- G. ASTM C476—Grout for Masonry

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. Submit information on Portland cement, integral waterproofing compound, and hydrated lime for mortar. Include design mix with proportions of materials being used. Submit gradation on aggregates.
- C. Submit design mix for grout including gradation of aggregates.
- D. Manufacturer's certificate: Certify that products meet or exceed specified requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. All cement shall be stored in a dry, weatherproof, properly ventilated structure which will protect it from dampness and freezing.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. See Section 04 20 00—Unit Masonry System, for cold weather requirements.

PART 2—PRODUCTS

2.01 MORTAR

- A. Provide Portland cement-lime mortar or masonry cement mortar with proportion restrictions as stated in the 2018 International Building Code. Provide integral waterproofing compound in mortar for all exterior masonry. Provide Type N mortar for exterior non-load bearing brick. Provide Type S mortar for all other masonry.
- B. Portland cement shall conform to ASTM C150, Type I or III.
- C. Hydrated lime shall conform to ASTM C207, Type S.
- D. Masonry cement shall conform to ASTM C91.
- E. Provide integral waterproofing compound.
- F. Mortar aggregate for ordinary tile, brick, stone, and block shall consist of clean, sharp sand, conforming to ASTM C144. The sand shall be graded within the following limits:

Sieve Number	Percent by Weight Passing
4	100
8	95 to 100
16	70 to 100
30	40 to 75
50	10 to 35
100	2 to 15
200	---

- G. Sand from any one source shall not vary over the extreme limits shown above. For unusually thin joints, such as occur with a unit having cut or ground edges, the aggregate used shall conform to these specifications except that 95% shall pass a No. 16 sieve.
- H. Water used in mixing water shall be clean and free of injurious materials.
- I. Mortar shall be thoroughly mixed until of uniform color and consistency. Only sufficient mortar to meet the immediate requirements of the work shall be mixed at one time. No mortar shall be retempered after it has begun to set, and no partially set mortar shall be used. No antifreeze material shall be used in the mortar to lower the freezing point.

2.02 GROUT

- A. Grout shall conform to ASTM C476—Mortar and Grout for Reinforced Masonry.
- B. Aggregates shall conform to ASTM C404—Aggregates for Masonry Grout.
- C. Grout shall have a minimum 28-day compressive strength of 2,500 psi with the following proportions:
 - 1. Fine Grout: 1 Portland Cement: 0 to 1/10 lime: 2 1/2 to 3 fine aggregate.
 - 2. Coarse Grout: 1 Portland Cement: 0 to 1/10 lime: 2 1/2 to 3 fine aggregate: 1 to 2 coarse aggregate.
- D. Fine grout shall be used in spaces with least horizontal dimension greater than 3/4 inch and less than 2 1/2 inches. Coarse grout shall be used in all spaces with least dimensions 2 1/2 inches or greater.

PART 3—EXECUTION

3.01 INSTALLATION

- A. Brace masonry for wet grout pressure.
- B. Work grout into masonry cores and cavities.
- C. Where joints occur in grout, they shall be made 2 inches below the block joint so that a key is provided.
- D. Grout full masonry walls from top of floor to underside of all lintels at openings for a distance of 16 inches adjacent to each side of opening, unless shown otherwise on the Drawings.

END OF SECTION

SECTION 04 20 00

UNIT MASONRY SYSTEM

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Concrete block.
 - 2. Brick.
 - 3. Glass block.
 - 4. Glazed concrete masonry units.
 - 5. Reinforcement, anchorage, control joints, and accessories.
 - 6. Cold weather requirements.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 BASIS OF PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for PUMP STATION GENERAL WORK which shall be payment in full for the work described herein.

1.03 REFERENCES

- A. 2018 International Building Code.
- B. ASTM C67—Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- C. ASTM C90—Standard Specification for Loadbearing Concrete Masonry Units.
- D. ASTM C216—Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
- E. ASTM C744—Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
- F. UL—Fire Resistance Directory.

1.04 QUALITY ASSURANCE

- A. Variation from the plumb in the lines and surfaces of columns and walls shall not exceed 1/4 inch in 10 feet, 3/8 inch in a story height or 20 feet maximum or 1/2 inch in 40 feet or more. Variation from plumb for external corners, expansion joints, and other conspicuous lines shall not exceed 1/4 inch in any story or 20 feet maximum or 1/2 inch in 40 feet or more.

- B. Variation from the level of the grades indicated on the drawing for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines shall not exceed 1/4 inch in any bay or 20 feet or 1/2 inch in 40 feet or more.
- C. Variation of the linear building line from an established position in plan and related portion of columns, walls, and partitions shall not exceed 1/2 inch in any bay or 20 feet maximum or 3/4 inch in 40 feet or more.
- D. Variation in cross-sectional dimensions of columns and thickness of walls shall not exceed minus 1/4 inch or plus 1/2 inch from the dimensions indicated on the drawings.

1.05 MOCKUP

- A. Provide a 4-foot by 4-foot mockup panel of masonry, including anchor accessories and flashings, before any masonry work begins. Location will be indicated by OWNER. Mockup panel shall be approved by OWNER and used as a sample of the quality of work to be expected on the job. Mockup panel may not remain as part of the work. Obtain ENGINEER's/Architect's acceptance of materials, workmanship, and visual qualities before proceeding with work.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Masonry units, when delivered to the site, shall be thoroughly cured and shall be dry. When stored on the site, they shall not be in contact with the ground, shall be kept clean and covered.

1.07 COLD WEATHER REQUIREMENTS

- A. All masonry units delivered to use in freezing weather shall be fully protected by a weathertight covering to prevent accumulation of ice on the units. Loose board covering will not be permitted.
- B. Cold Weather Protection:
 - 1. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
 - 2. Remove all masonry determined to be frozen or damaged by freezing conditions.
 - 3. Perform the following construction procedure while the work is progressing. When air temperature is from 40°F (4°C) to 32°F (0°C), heat sand or mixing water to produce mortar temperature between 40°F (4°C) and 120°F (49°C):
 - a. When air temperature is from 32°F (0°C) to 25°F (-4°C), heat sand or water to produce mortar temperature between 40°F (4°C) and 120°F (49°C); maintain temperature of mortar on boards above freezing.
 - b. When air temperature is from 25°F (-4°C) to 20°F (-7°C), heat sand and mixing water to produce mortar temperatures between 40°F (4°C) and 120°F (49°C); maintain temperature of mortar on boards above freezing; use salamanders or other heat sources on both sides of walls under construction; use wind breaks when wind is in excess of 15 mph.

- c. When air temperature is from 20°F (-7°C) and below, heat sand and mixing water to produce mortar temperatures between 40°F (4°C) and 120°F (49°C); provide enclosures and auxiliary heat to maintain air temperature above 32°F (0°C); do not lay units which have a surface temperature of 20°F (-7°C).
- 4. Perform the following protections for completed masonry and masonry not being worked on:
 - a. When the mean daily air temperature is from 40°F (4°C) to 32°F (0°C), protect masonry from rain or snow for at least 24 hours by covering with weather-restrictive membrane.
 - b. When the mean daily air temperature is from 32°F (0°C) to 25°F (-4°C), completely cover masonry with weather-restrictive membrane for at least 24 hours.
 - c. When the mean daily air temperature is from 25°F (-4°C) to 20°F (-7°C), completely cover masonry with insulating blankets or similar protection for at least 24 hours.
 - d. When mean daily temperature is 20°F (-7°C) and below, maintain masonry temperature above 32°F (0°C) for 24 hours using enclosures, blankets, and supplementary heat.

PART 2-PRODUCTS

2.01 CONCRETE BLOCK

- A. Concrete block shall be load bearing and shall conform to the requirements of ASTM C90 and the 2018 International Building Code. Bond shall be running bond. Concrete block shall be the two-cell type and shall be made with normal weight aggregate. Concrete block where noted to be fire rated shall be UL Listed for the hour rating as listed.
- B. Unless otherwise indicated, interior concrete block at window sills and lintels, pilasters, and the top course of walls at roof lines shall be constructed of solid concrete block, lintel block filled with grout, or the cores of the block filled with grout. Interior block at window sills shall be solid concrete block unless otherwise noted. Bullnose block shall be used at all door, window, and wall corners that remain exposed.
- C. All interior concrete block walls shall extend to the underside of roof deck or floor above unless noted otherwise.
- D. Provide sash units with integral dovetail slots at masonry control joints.

2.02 BRICK

- A. Face brick shall be ASTM C216, latest edition, Grade SW, Type FBS, made from clay, shale, fine clay, or mixture thereof. All brick shall be free from cracks, laminations, and other defects that may interfere with proper laying of brick or impair the strength or permanence of the structure.
- B. A certificate of conformance as to grade and type shall be supplied by the manufacturer.

- C. CONTRACTOR shall submit brick samples to ENGINEER for selection. The bricks to be used shall be of modular size (7 5/8 by 2 1/4 by 3 5/8) and running bond.
- D. Provide all brick masonry to complete work.

2.03 DECORATIVE CONCRETE BLOCK

- A. Glazed Concrete Masonry Units:
 - 1. Glazed concrete masonry units shall be used where indicated on the Finish Schedule.
 - 2. All glazed concrete masonry units shall be made with lightweight aggregate and shall be autoclaved units conforming to ASTM C90 as applicable. The glazed surface shall have a smooth satin-gloss finish and externally heat-polymerized cast-on facing conforming to ASTM C744, Federal Specification SS-C-621b, and ASTM C67, Paragraph 8 (50 cycles of Freezing and Thawing).
 - 3. Glazed masonry units shall be used with colors selected by OWNER from manufacturer's standard.
 - 4. The glazed facing shall be free from chips, cracks, crazes, or any other imperfections that would detract from the overall appearance of the wall when viewed from a distance of 5 feet at right angles to the wall.
 - 5. All units shall include water repellent block admixture.

2.04 GLASS BLOCK

- A. Glass block shall be 7 5/8 inches by 7 5/8 inches by 3 inches solid, transparent block with smooth faces and clear, colorless glass with factory applied coating on edge surfaces.
- B. Panel Reinforcing: Two parallel 9 gauge wires either 1 5/8 inch or 2 inch on center with electrically butt-welded crosswires spaced at regular intervals, hot dipped galvanized after welding or Type 304 stainless steel.
- C. Panel Anchors: 20 gauge perforated steel strips 24 inches long by 1 3/4 inches wide, hot dipped galvanized after perforation or 22 gauge by 16 inches long by 1 3/4 inches wide of Type 304 stainless steel.
- D. Expansion Strips: Made of polyethylene foam with a thickness of 3/8 inch.
- E. Asphalt Emulsion: A water-based asphalt emulsion.
- F. All mortar and bearing surfaces of the block shall be precoated or prepared to provide adhesion between mortar and glass.

2.05 REINFORCEMENT AND ANCHORAGE

- A. For concrete block walls, masonry wall reinforcement shall be 220 Ladder-Mesh manufactured by Hohmann & Barnard, Inc., Ladder Wire, manufactured by Wire-Bond, or Ladder-Type by Heckman Building Products.

- B. For cavity walls, masonry wall reinforcement shall be 265 Ladder Adjustable or manufactured by Hohmann & Barnard, Inc., Ladder Adjustable Tab by Wire-Bond, or Ladder-Pintel Eye by Heckman Building Products.
- C. Wall reinforcement and ties shall be hot-dipped galvanized having a minimum 1.50 ounce/square foot zinc coating in accordance with ASTM A153 Class B2.
- D. Side rods shall be 9 gauge wire, and cross rods and tabs shall be 9 gauge wire. Maximum spacing of tabs shall be 24 inches.
- E. Prefabricated corner and tee sections shall be used to form continuous reinforcement around corners and for anchoring abutting walls and partitions.
- F. Reinforcing Bar Positioners: Where vertical reinforcing bars are required, provide bar positioners.

2.06 ACCESSORIES

- A. Cellular or honeycomb cell vents, 2 1/2 inches high, shall be provided at weep holes. Cell vents shall be UV-resistant polypropylene.
- B. Vertical expansion control joints shall be located as shown on the drawings. Control joints shall be constructed with a factory-extruded section of rubber and shall extend for the entire height of the wall. Care shall be taken so that the gap is free of mortar or debris. Control joint shall be caulked on exposed faces with caulk of a color to match mortar.
- C. See Section 05 50 00—Metal Fabrications for masonry veneer support system at lintels.
- D. See Section 07 26 00—Vapor and Air Barrier for air barrier on masonry walls.
- E. See Section 07 62 00—Flashing and Sheet Metal for masonry flashing specifications.

PART 3—EXECUTION

3.01 MASONRY WORKMANSHIP

- A. All masonry shall be laid plumb and true to lines. Brick shall be laid with complete full mortar joints. Mortar beds shall be spread smooth or only slightly furrowed. The ends of brick shall be buttered with sufficient mortar to fill the end joint.
- B. All masonry shall be laid in running bond, unless specified otherwise.
- C. Avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after being set in position. Where an adjustment must be made after the mortar has started to harden, the mortar shall be removed and replaced with fresh mortar.
- D. In building cavity walls, the cavity shall be kept clean by slightly beveling the mortar bed to incline toward the cavity or by placing wood strips with attached wire pulls on the metal ties.

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The strips shall be withdrawn and cleaned before placing the next row of metal ties. Any mortar fins that protrude into the cavity space as the wall is built shall be troweled flat onto the inner face of the wythe.

- E. Where cutting of exposed masonry is necessary, the cuts shall be made with a motor-driven masonry saw or by other methods that provide cuts that are straight and true.
- F. Glazed concrete masonry units shall be cut using either an abrasive or diamond blade and cut units shall be cut neatly and located for best appearance.
- G. Where flashing is to be laid on or against masonry, the surface of the masonry shall be smooth and free from projections that might puncture the flashing material. Through-wall flashing shall be placed on a bed of mortar, and mortar shall be placed above the flashing.
- H. Weep holes spaced 32 inches on center 2 1/2 inches high shall be provided in the first course immediately above all flashing. Weep holes shall be kept free of mortar droppings.
- I. Outside joints around the perimeter of exterior door and window frames or other wall openings shall be not less than 1/4 inch nor more than 3/8 inch wide and shall be cleaned out to a uniform depth of at least 3/4 inch ready for placement of caulk.
- J. All walls shall be adequately braced until they are completed and anchored to the roof construction.
- K. All brick having initial rates of absorption in excess of 0.25 ounce per square inch per minute shall be wetted sufficiently so that the rate of absorption when laid does not exceed this amount. Wetting of units shall be such so that each unit is nearly saturated, surface dry when laid. During freezing weather, units that require wetting shall be sprinkled with warm water just before laying.

3.02 MORTAR JOINTS

- A. All joints shall be laid plumb to lines. Unless specified otherwise, mortar beds shall be full 3/8 inch thick and shall be spread smooth or only slightly furrowed. Vertical joints shall be shoved not over 3/8 inch thick, unless otherwise shown. All joints shall be completely filled.
- B. Interior and exterior joints shall be tooled concave. All joints shall be tooled to uniform depth and shall be straight and true. Mortar joints shall be cut flush with masonry where rigid thermal insulation will be applied to interior masonry surfaces.

3.03 REINFORCEMENT AND ANCHORAGE

- A. Reinforcement shall be installed in the first and second bed joint 8 inches apart immediately above lintels and below sills at openings. Elsewhere, spacing shall be at 16-inch vertical intervals or as shown on the drawings. Extend reinforcement in the second joint above and below openings 2 feet beyond the jambs. All other reinforcing shall be continuous.

- B. Side rods shall be lapped 6 inches minimum at splices. Reinforcement units shall be of widths required for wall thicknesses as shown. Reinforcement shall be placed to allow for a 5/8-inch mortar cover on the exterior face of walls and 1/2-inch mortar cover on interior faces.
- C. Vertical reinforcing bars shall be installed using prefabricated bar positioners. Provide one positioner at the top of the first course of block and one additional positioner at a maximum spacing of 200 bar diameters.

3.04 BUILT-IN WORK

- A. As work progresses, install all built-in work (such as window and door frames, anchor bolts, plates, and lintels) to be provided by other sections.
- B. Install built-in items plumb and level.
- C. Bed anchors of metal door frames in adjacent mortar joints. Grout all steel door frames full with mortar except those called for to be "removable."
- D. Do not use built-in organic materials subject to deterioration.
- E. Steel members embedded in exterior masonry shall be "battered" with not less than 1/2 inch of setting mortar on all surfaces.

3.05 JOINING OF WORK

- A. Where fresh masonry joins masonry that is partially set or totally set, the exposed surface of the set masonry shall be cleaned and lightly wetted so as to obtain the best possible bond with the new work. All loose brick and mortar shall be removed. If it becomes necessary to "stop-off" a horizontal run of masonry, this shall be done only by racking back brick in each course, and if grout is used, stopping grout 4 inches back of the rack. Toothing will not be permitted.

3.06 PROTECTION OF WORK

- A. During erection, all walls shall be kept dry by covering at the end of each day or shutdown period with a canvas or waterproof covering. Partially completed walls not being worked on shall be similarly protected at all times. All covering shall overhang at least 2 feet on each side of the wall and shall be securely anchored.

3.07 MASONRY CONTROL JOINTS

- A. Provide vertical masonry control joints as detailed on the drawings.
- B. Where control joint locations are not shown on the drawings, they shall be provided as follows:
 - 1. Brick veneer:
 - a. Distance from wall corner (maximum): at or near corners.
 - b. Spacing between joints (maximum): 25 feet for panels without openings; 20 feet for panels with openings.

- c. Additional locations: at changes in wall height.
- 2. Block backup walls and single-wythe block walls:
 - a. Distance from wall corner or intersection (maximum): 12 feet or 0.75 times wall height, whichever is less.
 - b. Spacing between joints: 25 feet or 1.5 times wall height, whichever is less.
 - c. Additional locations: at changes in wall height, at steps on top of foundation walls, and at junctions between shallow and deeper.
- C. Where possible, joints shall be located at one or both edges of door, window, and louver openings and at changes in wall height.

3.08 CLEANING NEW WORK

- A. Masonry faces to remain exposed shall be wiped with a damp cloth as the work progresses and thoroughly cleaned and pointed upon completion. If stiff brushes and water will not suffice, the surface shall be thoroughly wetted with plain water and then scrubbed with a 5% or 10% solution of hydrochloric acid. Alternatively, a commercial cleaner may be used. Immediately after, the surface shall be washed to remove all traces of acid. All surfaces not being cleaned shall be protected from the acid. All mortar shall be removed from surfaces other than masonry.
- B. Glazed masonry walls shall be cleaned with a detergent masonry cleaner containing no muriatic acid strictly following the cleaner manufacturer's instructions, including thorough rinsing.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Shop-fabricated carbon steel, stainless steel, including lintels, and bar screen.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM A36—Carbon Structural Steel.
- B. ASTM A53—Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A123—Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- D. ASTM A143—Practice for Safeguarding Against Embrittlement of Hot-Dipped Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- E. ASTM A153—Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- F. ASTM A240—Standard Specification for Chromium and Chromium Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- G. ASTM A276—Stainless Steel Bars and Shapes.
- H. ASTM A307—Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
- I. ASTM A384—Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
- J. ASTM A385—Practice for Providing High-Quality Zinc Coatings (Hot-Dip).
- K. ASTM A500—Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- L. ASTM A780—Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- M. ASTM A992—Structural Steel Shapes.

- N. ASTM A1008—Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- O. ASTM A1011—Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
- P. AWS A2.0—Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- Q. AWS A5.4—Stainless Steel Electrodes for Shielded Metal Arc Welding.
- R. AWS D1.1—Structural Welding Code—Steel.
- S. AWS D1.6—Structural Welding Code—Stainless Steel.
- T. ASTM F593—Standard Specifications for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- U. ASTM F594—Standard Specification for Stainless Steel Nuts.

1.03 DESIGN REQUIREMENTS

- A. All fabrications shall meet applicable code requirements including OSHA.

1.04 SUBMITTALS FOR REVIEW

- A. Comply with pertinent provisions of Section 01 33 00—Submittals.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, sections, elevations, and details where applicable.
- C. Mill Test Reports: Submit indicating structural strength and composition.
- D. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.05 QUALITY ASSURANCE

- A. Fabricate steel members in accordance with AISC Code of Standard Practice.
- B. Welders Certificates: Certify welders employed on the work, verifying AWS qualification within the previous 12 months.

1.06 QUALIFICATIONS

- A. Qualify welding processes and welding operators in accordance with AWS *Standard Qualifications Procedures*.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to job site properly marked to identify the structure for which it is intended and at such intervals to allow uninterrupted progress of the work. Marking shall correspond to markings indicated on the shop drawings.
- B. Store all members off the ground using pallets, platforms, or other supports.
- C. Do not store materials on the structure in a manner that might cause distortion or damage to the members of the supporting structures.
- D. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to OWNER.

PART 2-PRODUCTS

2.01 MATERIALS-CARBON STEEL

- A. Steel Sections:
 - 1. ASTM A36 (channels, angles, plates).
 - 2. ASTM A992 (wide flange sections).
 - 3. Pipe: ASTM A53, Grade B.
 - 4. Tubes: ASTM A500, Grade B.
 - 5. Silicon content of steel members to be hot-dipped galvanized shall be in the range of 0 to 0.04%. Submit mill test reports confirming compliance.
- B. Sheet Steel: ASTM A1011.
- C. Plain Washers: Round carbon steel complying with FS FF-W-92.
- D. Bolts, Threaded Rods, and Nuts: ASTM A307 Grade A, or galvanized to ASTM A153 for galvanized components for exterior use and where built into exterior walls.
- E. Lock Washers: Helical spring-type carbon steel complying with FS FF-W-84.
- F. Welding Electrodes: Comply with AWS D1.1. E70XX electrodes for carbon steel. For ASTM A992 steel and any other steel with 50 ksi or greater yield strength, use only E7018 or other E70XX electrodes specifically permitted by AWS D1.1.
- G. Select fasteners for the type, grade, and class required.

2.02 MATERIALS-STAINLESS STEEL

- A. Unless otherwise noted, all stainless steel bars and shapes shall meet the requirements of ASTM A276 and shall be Type 316L.
- B. Unless otherwise noted, all stainless steel bolts shall meet the requirements of ASTM F593 and shall be Type 316L.

- C. Unless otherwise noted, all stainless steel nuts shall meet the requirements of ASTM F594 and shall be Type 316L.
- D. If components are not available in Type 316L, other 300 Series type shall be used as approved by ENGINEER.
- E. Welding Electrodes:
 - 1. Comply with AWS D1.6.
 - 2. Use ER316L electrodes for 316L stainless steel.
 - 3. Use ER308L electrodes for 304L stainless steel.

2.03 ACCESSORIES

- A. Masonry Veneer Support System:
 - 1. For exterior masonry cavity wall construction, provide prefabricated, hot-dip galvanized steel masonry veneer support system to support brick or split face block veneer from concrete masonry backup wall.
 - 2. System shall be Hohmann and Barnard TBS Thermal Brick Support System, Fero Fast Thermal Bracket system, or Halfen Brickwork Support System.
 - 3. When shelf angle size is not indicated on the drawings, shelf angle design shall be provided by manufacturer. Manufacturer's design shall bear the seal of a professional engineer licensed in the state the project is located in.
 - 4. Fasten veneer support system to masonry backup wall using manufacturer standard adjustable brackets and 304 stainless steel masonry anchors. Fastener type and sizing shall be provided by the manufacturer. Manufacturer's fastener design shall bear the seal of a professional engineer licensed in the state the project is located in.
 - 5. Submit product details, shop drawings including overall layout, shelf angle sizes, bracket locations, and connections details, and design calculations bearing the seal of a professional or structural engineer, as appropriate, and licensed in the state the project is located in.

2.04 FABRICATION

- A. Fabrication and Assembly:
 - 1. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on the approved shop drawings.
 - 2. Properly mark and match-mark materials for field assembly and for identification as to structure and site for which intended.
 - 3. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 - 4. Where finishing is required, complete the assembly, including welding of units, before start of finishing operation.
 - 5. Provide finish surfaces of members exposed in the final structure free of markings, burrs, and other defects.
- B. Connections:
 - 1. Bolts and washers of all types and sizes shall be provided for completion of all field erection.

2. Comply with AWS Code for procedures, appearance, and quality of welds used in correcting welded work.
 3. Assemble and weld built-up sections to produce true alignment of axes without warp.
 4. Welding shall be done by the shielded arc process.
 5. All welds shall be chipped, ground smooth, and primed immediately after fabrication.
- C. Workmanship:
1. Use materials of size and thickness shown or, if not shown, of size and thickness to produce strength and durability in the finished product.
 2. Work to dimensions shown or accepted on the shop drawings using proven details of fabrication and support.
 3. Form exposed work true to line and level, with accurate angles and surfaces, and with straight sharp edges.
 4. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing works.
 5. Cap all open ends of pipe and structural tubing.
 6. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush; match and blend with adjoining surfaces.
 7. Provide for anchorage of the type shown. Coordinate with supporting structures. Fabricate and space the anchoring devices to provide adequate support for intended use.
 8. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive hardware and similar items.

2.05 FINISHES

- A. Carbon steel surfaces shall be prepared by abrasive blasting to SSPC-SP10 as specified in Section 09 91 00–Painting.
- B. Do not prime surfaces where galvanizing or field welding is required.
- C. Immediately after surface preparation, prime paint carbon steel items with one coat in accordance with manufacturer's instructions and Section 09 91 00–Painting.
- D. Structural Steel Members: Galvanize after fabrication to the requirements in this section and ASTM A123.
- E. Surfaces that will be inaccessible after assembly or erection shall be finish painted prior to assembly or erection.
- F. Galvanizing:
1. All items, except piping designated to be galvanized, shall be hot-dipped galvanized in accordance with ASTM Specification A123 and A153. Piping shall be hot-dipped galvanized in accordance with ASTM A53. Furnish a Certificate of Compliance stating that the galvanizing complies with ASTM Specifications and Standards and all other applicable requirements specified herein.
 2. Fabrication of items to be galvanized shall be in accordance with ASTM A143, A384, and A385. Structural steel shall be fabricated generally in accordance with Class 1

guidelines as shown in *Recommended Details for Galvanized Structures* as published by the American Hot Dip Galvanizer's Association, Inc.

3. Galvanized items shall be handled, transported, and stored to prevent damage or staining to the coating. Maintain adequate ventilation and continuous drainage.
4. Silicon content for steel to be hot-dipped galvanized shall be in the range of 0 to 0.04%.
5. Steel work shall be precleaned utilizing a caustic bath, acid pickle and flux, or shall be blast cleaned and fluxed. In either case, all surface contaminants and coatings shall be removed.
6. All welding shall be performed in accordance with the American Welding Society publication D19.0-72, *Welding Zinc Coated Steel*. All uncoated weld areas shall be touched up.

PART 3-EXECUTION

3.01 EXAMINATION

- A. Correct conditions detrimental to the proper and timely completion of the work.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Furnish setting drawings, diagrams, templates, instructions, and directions for installation of anchorages such as concrete inserts, anchor bolts, and miscellaneous items having integral anchors which are to be embedded in concrete construction.
- B. Coordinate delivery of such items to project.
- C. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

- A. Setting Precast Anchorages:
 1. Clean bearing surfaces free from bond-reducing materials, and roughen to improve bond to surfaces. Clean the bottom surface of bearing plates.
 2. After the bearing members have been positioned and plumbed, tighten and anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 3. Pack grout solidly between bearing surfaces and plates so that no voids remain.
- B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction including threaded fasteners for concrete inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- C. Cutting, Fitting, and Placement:
 1. Perform cutting, drilling, and fitting for installation of miscellaneous metal fabrications.

2. Set work accurately in location, alignment, and elevation and make plumb, level, true, and free from rack measured from established lines and levels.
3. Fit exposed connections accurately together to form tight hairline joints.
4. Weld connections that are not to be left as exposed joints, grind joints smooth, and touchup shop paint coat or galvanizing repair.

3.04 FIELD WELDING

- A. Comply with AWS Code for procedures of manual shielded metal arc welding (steel, stainless steel) and gas metal arc welding (aluminum), appearance and quality of weld made, and methods in correcting welding work.

3.05 TOUCH-UP PAINTING

- A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting in accordance with Section 09 91 00—Painting.

3.06 GALVANIZING REPAIR

- A. Areas damaged by welding, flame-cutting, or during handling, transport, or erection shall be repaired by one of the following methods whenever damage exceeds 3/16 inch in width.
 1. Cold Galvanizing Compound:
 - a. Surfaces to be reconditioned with zinc-rich paint shall be clean, dry, and free of oil, grease, and corrosion products.
 - b. Areas to be repaired shall be power disc-sanded to bright metal. So that a smooth reconditioned coating can be effected, surface preparation shall extend into the undamaged galvanized coating.
 - c. Touch-up paint shall be an organic cold-galvanized compound having a minimum of 94% zinc dust in the dry film.
 - d. The paint shall be spray- or brush-applied in multiple coats until a dry film thickness of 8 mils minimum has been achieved. A finish coat of aluminum paint shall be applied to provide a color blend with the surrounding galvanizing.
 - e. Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.
 2. Zinc-Based Solder:
 - a. Surfaces to be reconditioned with zinc-based solder shall be clean, dry, and free of oil, grease, and corrosion products.
 - b. Areas to be repaired shall be wire-brushed.
 - c. Heat shall be applied slowly and broadly close to but not directly onto the area to be repaired. The zinc-based solder rod shall be rubbed onto the heated metal until the rod begins to melt. A flexible blade or wire brush shall be used to spread the melt over the area to be covered. The zinc-based solder shall be applied in a minimum thickness of 2 mils.
 - d. Coating thickness shall be verified by measurements with a magnetic or electromagnetic gauge.

3.07 SCHEDULE

- A. The following schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.
- B. Lintels: Galvanized and field finish paint in accordance with Division 09 for exterior wall lintels. Lintels approved by ENGINEER shall be placed over all masonry openings, even though not shown on the Drawings. See lintel schedule on the Drawings.
- C. Manual Bar Screen: 316 stainless steel.
- D. Monorail Beam: primed steel, field finish painted.

END OF SECTION

SECTION 05 56 00

ANCHOR BOLTS AND POST-INSTALLED ANCHORS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Anchor bolts, expansion bolts, adhesive anchors, and screw anchors.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM A36/A36M—Standard Specification for Carbon Structural Steel.
- B. ASTM F1554—Anchor Bolts, Steel, 36, 55, and 105-ksi yield strength.
- C. ICC-ES International Code Council—Evaluation Service.
- D. AC 193—Acceptance Criteria for Mechanical Anchors in Concrete Elements.
- E. AC 308—Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete.
- F. ACI 355.2—Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary.
- G. ACI 355.4—Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary.

PART 2—PRODUCTS

2.01 GENERAL

- A. Unless indicated otherwise on the drawings or specified, use the following bolt material for the various installation situations:
 - 1. Stainless Steel: For all submerged locations, below final grade, and in contact with aluminum appurtenances and other items not to be painted. Also for anchoring equipment, unless otherwise specified.
 - 2. Steel: In other locations in contact with items to be painted or encased in concrete.

2.02 ANCHOR BOLTS

- A. Anchor bolts complete with washers and nuts shall be fabricated as shown or as specified by the equipment manufacturer and unless otherwise indicated shall be hot-dip galvanized carbon steel or 316 stainless steel. Anchor bolts shall, as a minimum, conform to the requirements of ASTM F1554-Grade 36.

- B. Stainless steel anchor bolts shall be used in all submerged locations, below final grade, and in contact with aluminum and other items not to be painted. Galvanized anchor bolts shall be used elsewhere.

2.03 EXPANSION BOLTS

- A. Expansion bolts shall be KWIK Bolt TZ by Hilti, Inc., Power-Stud+ SD2, SD4, or SD6 by DeWalt, Strong-Bolt or Strong-Bolt 2 by Simpson Strong-Tie Anchor Systems.
- B. All expansion bolts shall comply with the 2018 International Building Code, AC 193, and ACI 355.2. They shall be ICC-ES approved for use in cracked and uncracked concrete.
- C. Expansion bolts will not be permitted as substitutes for embedded anchor bolts except with the prior written acceptance of ENGINEER or where otherwise specifically called for.

2.04 ADHESIVE ANCHORS

- A. Adhesive anchors shall be HIT HY 200 by Hilti, Inc., Red Head C6+ or Red Head A7+ by ITW, Pure 110+ or AC200+ by DeWalt, Set-XP by Simpson Strong-Tie Anchor Systems.
- B. All adhesive anchors shall comply with the 2018 International Building Code, AC 308, and ACI 355.4. They shall be ICC-ES approved for use in cracked and uncracked concrete.

2.05 SCREW ANCHORS

- A. Screw anchors shall be KWIK HUS-EZ by Hilti, Inc., Screw-Bolt by DeWalt, Titen-HD by Simpson Strong-Tie Anchor Systems.
- B. All screw anchors shall comply with the 2018 International Building Code. They shall be ICC-ES approved for use in cracked and uncracked concrete.

PART 3-EXECUTION

3.01 ANCHOR BOLTS

- A. Anchor bolts for structural members shall be located as shown and specified.
- B. Anchor bolts for mechanical equipment shall have embedment length, edge distances, and spacing as required by the equipment manufacturer.
- C. All dirt or foreign materials shall be removed prior to embedding into concrete. After anchor bolts have been embedded, their threads shall be protected by grease and by installing the nuts or by other means until the time of installation of the equipment or metal work.

3.02 EXPANSION BOLTS

- A. Unless otherwise noted on the drawings, expansion bolt edge distance and spacing shall be in accordance with manufacturer's printed installation instructions.

- B. Bolt embedment shall at least equal 6-bolt diameters.
- C. Installation procedures shall be in accordance with the manufacturer's printed installation instructions.
- D. Where location of bolts is adjustable, reinforcing steel shall be located prior to drilling holes and bolts shall be located to clear reinforcing steel.

3.03 ADHESIVE ANCHORS

- A. At locations shown on the drawings, reinforcing bars or threaded rod shall be provided in existing concrete by drilling holes, injecting epoxy adhesive, and inserting the reinforcing bar.
- B. All existing surfaces to receive adhesive anchors, including the entire area in contact with the new concrete, shall be cleaned and roughened to amplitude of 1/4 inch.
- C. Installation procedures shall be in accordance with the manufacturer's printed installation instructions.
- D. Where location of anchors is adjustable, reinforcing steel shall be located prior to drilling holes and anchors shall be located to clear reinforcing steel.
- E. CONTRACTOR shall arrange an anchor manufacturer's representative to provide on-site installation training for installation of their adhesive anchor system products. Submit documentation that all CONTRACTOR's personnel or subcontractors who install adhesive anchors have been trained prior to the announcement of anchor installation.
- F. Adhesive anchors in horizontal and upwardly inclined orientations to resist sustained tension loads are subject to the following requirements:
 - 1. They shall be installed by personnel certified by an applicable certification program. Certification shall include written and performance tests in accordance with the ACI/CRSI Adhesive Anchor Installer Certification program, or equivalent, as approved by ENGINEER.
 - 2. They require continuous special inspection during installation. CONTRACTOR shall notify ENGINEER and SPECIAL INSPECTOR of the schedule for these anchor installations to permit coordination of inspections.

3.04 SCREW ANCHORS

- A. Unless otherwise noted on the drawings, screw anchor edge distance and spacing shall be in accordance with manufacturer's recommendations.
- B. Anchor embedment shall at least equal 6-bolt diameters.
- C. Installation procedures shall be in accordance with the manufacturer's printed installation instructions.

- D. Where location of anchors is adjustable, reinforcing steel shall be located prior to drilling holes and anchors shall be located to clear reinforcing steel.

END OF SECTION

SECTION 06 11 00

WOOD FRAMING AND SHEATHING

PART 1—GENERAL

1.01 SUMMARY

- A. Work included:
 - 1. Roof sheathing.
 - 2. Miscellaneous framing and sheathing.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ALSC—American Lumber Standards Committee.
- B. APA—American Plywood Association.
- C. AWWA—American Wood Preservers Association.
- D. NFPA—National Forest Products Association.
- E. NLGA—National Lumber Grades Authority.
- F. SPIB—Southern Pine Inspection Bureau.
- G. WCLIB—West Coast Lumber Inspection Bureau.
- H. WWPA—Western Wood Products Association.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Protect lumber and other building materials and keep under cover both in transit and at the job site. Protect from dampness. Stack framing lumber and plywood to provide proper air circulation. Locate stacks on well-drained areas. Support 6 inches above grade and protect with waterproof cover.

PART 2—PRODUCTS

2.01 MATERIALS

- A. Lumber shall be kiln-dried with moisture content not to exceed 19% at time of installation and grade marked according to the National Lumber Manufacturer's Association.

- B. All studs shall be 2 inches by 4 inches nominal or 2 inches by 6 inches nominal as shown on the drawings and shall be No. 2 Douglas Fir, No. 2 Southern Pine, or better.
- C. Plywood roof sheathing shall be grade C-D (CDX), Exposure 1, or better, graded in accordance with the American Plywood Association.
- D. Wood sills, plates, blocking, etc., to be same grade as studs.

PART 3-EXECUTION

3.01 FRAMING

- A. General: All rough framing lumber and all other wood framing, studs blocking, and furring shall be accurately set to required lines and levels, closely fitted, shimmed, and rigidly secured in place.
- B. Place all wood studs in sizes as shown and spaced at 16 inches o.c., unless noted otherwise. Erect studs on single bottom and single top plate at nonbearing walls, double studs at all openings, triple studs at corners. Install blocking between studs as required. Bolt plates and blocking to concrete at 32-inch centers, unless noted otherwise. Space framing to receive electrical piping or ductwork without cutting joist. Verify all duct and piping runs prior to framing to eliminate conflict. Stud walls shall extend a minimum of 8 inches above the ceiling line. Stud walls shall be adequately braced off of other stud walls and/or masonry walls.
- C. Construct load bearing, framing, and curb members full length without splices.

3.02 PLYWOOD SHEATHING

- A. Plywood sheathing shall be nailed at 6 inches on center at edges and 12 inches on center at intermediate supports with 10d common nails.
- B. Secure roof sheathing perpendicular to framing members with ends staggered and sheet ends over firm bearing. Use sheathing clips between sheets between roof framing members, or provide solid edge blocking between sheets.

3.03 CONNECTIONS

- A. All framing connections and nailing shall be in accordance with the details shown and/or the 2018 International Building Code minimum requirements, whichever is more restrictive.
- B. Framing connectors shall be Simpson Strong Tie, or Mitek. Connector numbers shown on details are Simpson. Submit engineering data on any substitutes.
- C. Connectors shall be installed in accordance with manufacturer's requirements.

END OF SECTION

SECTION 06 11 10

WOOD BLOCKING AND CURBING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Roof curbs and cants.
 - 2. Wood blocking.
 - 3. Wood furring and grounds.
 - 4. Preservative treatment of wood.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ALSC—American Lumber Standards Committee.
- B. AWWA—American Wood Preservers Association.
- C. NFPA—National Forest Products Association.
- D. NLGA—National Lumber Grades Authority.
- E. SPIB—Southern Pine Inspection Bureau.
- F. WCLIB—West Coast Lumber Inspection Bureau.
- G. WWPA—Western Wood Products Association.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00—Submittals.
- B. Certification of type of wood and wood treatment to be used.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be thoroughly sealed and protected from weather during transport and at the jobsite. Protect from dampness.

PART 2-PRODUCTS

2.01 MATERIALS

- A. Lumber for roof curbs, cants, blocking, furring, and grounds shall be "standard" grade Douglas Fir, No. 2 Southern Pine, or better, graded in accordance with the WWSA, WCLIB, NLGA, or SPIB grading rules as applicable. Lumber shall bear the grading agency's stamp.
- B. Wood shall be kiln-dried with moisture content not to exceed 19% at time of installation.
- C. All lumber furnished under this section shall be pressure-treated with a chromated copper arsenate (CCA) waterborne preservative to a minimum retention of 0.40 pounds per cubic foot. Acceptable products include Hoover Treated Wood Products CCA, or Wood Preserving Co. Osmose CCA. Cuts shall be treated in the field with a brush-on waterborne preservative compatible with the pressure treatment.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Provide and install wood curbs, cants, blocking, furring, and grounds of proper size and shape where shown on the drawings and where required to secure other work or equipment in place.
- B. Members shall be installed true to lines, level, plumb, and secure.
- C. Connections and nailing shall be in accordance with the details shown and/or the 2018 International Building Code minimum requirements, whichever is more restrictive.
- D. Apply brush-on wood preservative treatment to cuts in accordance with manufacturer's recommendations.

END OF SECTION

SECTION 06 17 53

PLATE CONNECTED WOOD TRUSSES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. All materials, equipment, and labor necessary for the prefabrication, delivery, and permanent setting of wood trusses on buildings.
 - 2. Bridging.
 - 3. Temporary and permanent bracing.
 - 4. Related hardware.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ALSC—American Lumber Standards Committee.
- B. APA—American Plywood Association.
- C. ASTM A653—Sheet Steel, Zinc-Coated (Galvanized) by the Hot Dip Process, (Structural Physical) Quality.
- D. AWWA—American Wood Preservers Association.
- E. NFPA—National Forest Products Association.
- F. SPIB—Southern Pine Inspection Bureau.
- G. TPI—Truss Plate Institute.
- H. WWPA—Western Wood Products Association.

1.03 DESIGN REQUIREMENTS

- A. The basic design loads shall be in accordance with the 2018 International Building Code.
- B. Dead Loads and Collateral Loads: Trusses shall be designed for a Top Chord dead load of 10 psf.
- C. Live Loads:
 - 1. Roof live loads shall be computed in accordance with the 2018 International Building Code using a ground snow load of 25 psf, a snow load importance factor of 1.1, and

snow exposure and thermal factors as per Code. Minimum roof live load shall be 20 psf. Snow load and minimum roof live load shall be applied to the top chord.

2. Design for unbalanced snow loads in accordance with the building code.
 3. Design for sliding and drifted snow loads as shown on the drawings.
 4. Roof live loads shall be applied to the horizontal projection of the roof.
- D. Wind Loads: Wind loads shall be computed in accordance with the 2018 International Building Code using a 3-second gust wind speed of 114 mph, exposure category C, and an importance factor of 1.0.
- E. Concentrated Loads: Design for any concentrated loads shown on the drawings.
- F. Combination of Loads: The combining of loads for design purposes shall be as prescribed with the 2018 International Building Code.

1.04 SUBMITTALS

- A. Submittals shall be as in Section 01 33 00–Submittals.
- B. Professional Engineer: All truss designs shall bear the name and seal of a State of Illinois licensed structural engineer. CONTRACTOR shall be responsible for submitting the required additional copies of truss drawings with original stamp and signature for submittal to the Illinois Department of Transportation District. These materials must be submitted prior to installation.
- C. Truss designs shall include the following information: Pitch, span, dimensions, and spacing of trusses; truss bearing sizes and locations; design loading of truss and allowable stress increase; axial forces in each truss member; nominal sizes and location of connector plates at all joints; size, species, and stress of grade of lumber for all truss members; camber; permanent lateral bracing as required by design to reduce buckling length of individual truss members; and handling and erection recommendations. Where sheathing is not attached directly to truss bottom chords, provide bottom chord bracing and bridging as required by design to resist wind uplift loads.

1.05 QUALITY ASSURANCE

- A. The design and fabrication criteria of all wood trusses shall meet the following:
1. “National Design Specifications for Stress-Grade Lumber and its Fastenings,” by National Forest Products Association (latest revision).
 2. “Timber Construction Standards,” by American Institute of Timber Construction (latest revision).
 3. “Design Specifications for Light Metal Plate Connected Wood Trusses,” by Truss Plate Institute (latest revision).
 4. 2018 International Building Code.
- B. Fabricator Manufacturer: Minimum three years experience in successful fabrication of trusses comparable to type indicated for this project.

- C. Design Trusses under direct supervision of a professional engineer experienced in design of this work and licensed in the State of Illinois.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Fabricated trusses and subcomponents shall be so handled and stored that they are not subject to damage.
- B. If the trusses are to be stockpiled prior to erection, sufficient bearing points and/or bracing shall be provided to prevent excessive lateral bending or tipping over.

PART 2—PRODUCTS

2.01 MATERIALS

- A. Lumber:
 - 1. All lumber used for truss members shall be Spruce-Pine-Fir, Douglas Fir, Southern Pine, Hem-Fir, or Western Larch and shall conform to lumber for trusses and shall have a minimum nonrepetitive fiber bending strength of 1,050 psi. If design calls for use of a lumber with greater strength, then that lumber shall be used for the associated members.
 - 2. At the time of delivery, the moisture content of all lumber shall not exceed 19% kiln-dried.
 - 3. All lumber shall conform to the species and shall be fully recognized nominal sizes shown on the drawings or truss engineering design.
 - 4. All members shall be cut from lumber which bear the proper grade-mark stamps of a licensed lumber inspection agency.
- B. Connectors:
 - 1. All truss connector plates shall be manufactured from ASTM A653, Grade A, prime commercial quality galvanized sheet steel of no less than 20-gauge thickness which has a minimum yield of 33,000 psi and a minimum ultimate tensile strength of 45,000 psi.
 - 2. The corrosion-resistant coating shall be ASTM A924—Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements, Coating Designation C90 or G60, ASTM A879—Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface, Coating Class C, or such treatment as will give equivalent corrosion protection.
 - 3. The connectors shall have a series of nail-like projections which are designed to separate the fibers of the wood into which they are pressed in accordance with accepted nailing practices.
 - 4. Where field-assembly of truss subcomponents is necessary, the connections shall be in accordance with the details shown on the truss design drawings, approved by a Professional Engineer.

2.02 FABRICATION

- A. All trusses and other roof structural components shall be fabricated in a properly equipped manufacturing facility of a permanent nature. They shall be manufactured by experienced

workmen using precision cutting and truss fabricating equipment under the direct supervision of a qualified foreman. All trusses shall be fabricated under strict rules of inspection and quality control as the local code may require and be open to the observation of ENGINEER or its representative at all times.

- B. All truss members shall be accurately cut to length, angle, and be true to line to provide tight joints for finished truss.
- C. All truss members and connector plates shall be properly placed in special jigs and the members tightly clamped in place remaining in that position until the connector plates have been pressed into the lumber simultaneously on both sides of the joints.
- D. Camber shall be built into the trusses, as noted on the engineering truss designs, by properly positioning the members in the fabricating jig. No camber will be allowed on the bottom chord.

PART 3-EXECUTION

3.01 ERECTION

- A. Install trusses in accordance with manufacturer's instructions and TPI BWT (latest revision).
- B. Framing anchors and/or truss hangers shall be provided by CONTRACTOR, as required, or detailed to withstand all loads, both dead and live, as well as wind and transfer loads to bearing.
- C. Field erection of the trusses, including items such as handling, safety precautions, and temporary bracing to prevent toppling or the domino effect on the trusses during erection, and any other safeguards or procedures consistent with good workmanship and good building erection practices, shall be employed.
- D. During the entire construction period, all contractors shall provide means for adequate distribution of concentrated loads so that the carrying capacity of any one truss and/or other component is not exceeded.
- E. Proper erection bracing shall be installed to hold the trusses true and plumb and in safe condition until permanent truss bracing and bridging can be solidly nailed in place to form a structurally sound roof framing system. All erection and permanent bracing shall be installed and all components permanently fastened before the application of any loads. Provide all permanent bracing necessary for truss stability. Where sheathing is not attached directly to truss bottom chord and where required by design, provide bottom chord bracing and bridging as required to resist wind uplift loads.
- F. Frame openings between trusses with lumber in accordance with Section 06 11 00-Wood Framing and Sheathing.

END OF SECTION

Section 06 17 53-4

SECTION 06 60 00

FIBERGLASS FABRICATIONS

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes fiberglass structural shapes (angles, channels, I-beams, tubes, bars, plates, etc.), fiberglass ladders, stairs, and handrail.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 QUALIFICATIONS

- A. Manufacturer of fiberglass structural shapes, ladders, and handrail shall have a minimum of 5 years of verifiable experience in the manufacture and fabrication of pultruded fiberglass structural shapes and fabrications.

1.03 DESIGN CRITERIA

- A. The design criteria of the FRP stairs and landings, including connections, shall be in accordance with governing building codes and accepted standards in the FRP composites industry. FRP supplier shall design all FRP stairs and platforms as shown on drawings.
- B. Stair Treads: Stair treads shall be designed for a uniform load of 100 psf per ASCE 7 or a concentrated load of 300 pounds on an area of 4 square inches located in the center of the tread, whichever produces greater stress and deflect less than 0.25 inch. The two loads do not act concurrently.
- C. Structural support members for stairs and landings shall not deflect more than $L/360$ of span for structural members unless specifically stated otherwise in drawings and/or as listed herein. Connections shall be designed to transfer the design loads.

1.04 SUBMITTALS

- A. Shop drawings of all fabrications shall be submitted to ENGINEER for approval in accordance with the requirements of Section 01 33 00—Submittals
- B. Manufacturer's catalog data showing: Materials of construction, dimensions, spacings, and construction of grating, handrails and stairs.
- C. Detail shop drawings showing: Dimensions, sectional assembly, location and identification mark, size and type of supporting frames required, and design calculations.

PART 2-PRODUCTS

2.01 FIBERGLASS STRUCTURAL SHAPES

- A. Fiberglass structural shapes shall be manufactured by the pultrusion process using the following materials:
 - 1. Isophthalic polyester resin with flame-retardant additive.
 - 2. Glass fiber reinforcing consisting of both continuous strand mat and continuous strand longitudinal fiber (roving).
 - 3. Surfacing veil of polyester nonwoven fabric.
 - 4. UV inhibitor.
- B. Acceptable product lines include the following:
 - 1. Extren Series 525 by Strongwell Extren.
 - 2. Pultex Series 1525 by Creative Composites Group, Inc.
 - 3. Dynaform ISOFR system by Fibergrate Composite Structures, Inc.

2.02 FASTENERS/ADHESIVES

- A. Unless noted otherwise, all bolts, nuts, and washers shall be Type 316L stainless steel in accordance with ASTM F593 and ASTM F594. Fiberglass bolts, nuts, and washers shall be Dynaform as manufactured by Fibergrate Composite Structures, Inc., FibreBolt as manufactured by Strongwell, or Creative Composites Group, Inc.
- B. Adhesive resin used for joining sections and for sealing cut edges shall be approved for use by the manufacturer.

2.03 FIBERGLASS LADDERS

- A. Fiberglass ladders shall be designed in accordance with OSHA requirements. All ladder components shall be fabricated to support a rung load of 350 pounds with a safety factor of 1.5.
- B. Ladder shall be a prefabricated system with safety yellow pigment and produced by Fibergrate Composite Structures, Inc., Strongwell, or Creative Composites Group, Inc.
- C. Ladders that are located outdoors shall be factory coated with a UV-resistant coating.
- D. New Safety Climb Equipment:
 - 1. Safety climb Equipment: Provide a safety climb device on the ladders. Fall protection system components shall be supplied by the same company. System supplied shall conform to OSHA standards.
 - 2. The top bracket of the safety climb equipment shall extend above the platforms at the tops of the ladders. The top of the usable cable shall be at the top of the ladder above the platform. DBI/SALA LAD-SAF stainless steel Flexible Cable Ladder System.
 - 3. Provide telescoping extension at ladders with floor door access.

2.04 FIBERGLASS RAILING

- A. The fiberglass railing system shall be fabricated into finished sections by fabricating and joining together the pultruded square tube using molded internal connecting plugs and spiral grooved pultruded rod epoxy bonded and joined together as shown on the drawings.
- B. Kickplate shall be 4 inches by 1/2-inch by 0.125-inch-thick pultruded fiberglass shape and shall be attached to the railing posts with nylon drive rivets. Rails and posts shall be 2-inch by 2-inch by 0.156-inch square tube manufactured by pultrusion process.
- C. The FRP railing system shall be designed to meet the configuration and loading requirements of OSHA with a minimum factor of safety on loading of 2.0. Railing shall be capable of withstanding a load of 200 pounds applied at any point noncurrently, vertically, downward, or horizontally.
- D. Railing system shall be a prefabricated system with safety yellow pigment and produced by Fibergrate Composite Structures, Inc., Strongwell, or Creative Composites.
- E. All shop fabricated cuts are to be coated with a polyester resin to provide maximum corrosion resistance. Field cuts are to be similarly coated by CONTRACTOR in accordance with the manufacturer's instructions.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Installation/erection of components shall be in accordance with the design drawings and shop drawings.
- B. All cut edges shall be sealed with a resin recommended by the manufacturer.
- C. Install Safety Climb Equipment:
 - 1. After all other work is completed, install the new safety climb equipment to all ladders.
 - 2. Safety climb equipment on the shaft ladders shall extend above the platforms.
 - 3. Safety climb equipment shall be inspected and the installation shall be approved by a representative of the manufacturer.

END OF SECTION

SECTION 06 61 10
FIBERGLASS GRATING

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes fiberglass grating and stair treads.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 DESIGN REQUIREMENTS

- A. Grating shall be designed to safely support a uniform load of 100 psf with a maximum deflection of 1/4 inch.

PART 2—PRODUCTS

2.01 GRATING

- A. Fiberglass grating and stair treads shall be manufactured by the wet layup (molded) using the following materials:
 - 1. Isophthalic polyester resin with flame-retardant additive. Resin content shall be a minimum of 60% and fiberglass a maximum of 40% by weight.
 - 2. UV inhibitor.
- B. Acceptable products include the following: Rectangular bar style.
 - 1. Duragrate Series by Strongwell.
 - 2. Chemgrate and Fibergrate by Fibergrate Composite Structures, Inc.
 - 3. Creative Composites Group, Inc.
- C. Grating shall be of depth required to meet design requirements.
- D. Rectangular bar-style grating bars shall be tapered to promote self-cleaning.
- E. Angular silica particles shall be integrally embedded in the top surface of the grating to create an antislip surface. The tips of the bearing bars and cross bars shall be in the same plane to maximize the antislip top surface area.
- F. Individual grating sections shall be of a size to permit ease of handling, with a maximum length not in excess of 8 feet.
- G. Provide 316 stainless steel hold-down clips for all grating.

- H. Where possible, provide a 12-inch wide section of grating over each stop gate and over each valve operating nut.
- I. Provide 1/4-inch thick toeboards extending 4 inches above top of grating adhered to edge of grating a tall slide gates in grated areas. Refer to Section 06 60 00–Fiberglass Fabrications.

2.02 STAIR TREADS

- A. Stair treads shall be of a one-piece molded construction and shall have a 1 1/2-inch by 6-inch rectangular mesh pattern providing unidirectional strength in the tread span direction. Stair treads shall be reinforced with continuous rovings in each direction. The top layer of reinforcement shall be no more than 1/8 inch below the top surface of the tread so as to provide maximum stiffness and prevent resin chipping of unreinforced surfaces. Percentage of glass (by weight) shall not exceed 35 percent so as to achieve maximum corrosion resistance, and as required to maintain the structural requirements of Contract. After molding, no dry glass fibers shall be visible on any surface of bearing bars or cross bars. All bars shall be smooth and uniform with no evidence of fiber orientation irregularities, interlaminar voids, porosity, resin rich or resin starved areas.
- B. Non-slip surfacing: stair treads shall be manufactured with a concave, meniscus profile on the top of each bar providing maximum slip resistance. For additional safety, and to meet OSHA requirements, stair treads shall be manufactured with a 1 1/2-inch solid, molded nosing. Nosing shall be gritted with an angular quartz grit, integrally molded into the top surface of the nosing area only.

2.03 GRATING SUPPORT ANGLES

- A. Grating support angles shall be provided as detailed on the drawings and in accordance with Section 06 60 00–Fiberglass Fabrications. Support angles shall be provided under all edges of grating. Support angles shall be mitered at corners.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Install grating in accordance with design drawings, shop drawing, and grating manufacturer's written instructions.
- B. Field cut or sanded surfaces shall be coated with resin furnished by the manufacturer and applied in accordance with manufacturer's instructions.
- C. Provide a 1/8-inch to 1/4-inch gap between adjacent grating panels.

END OF SECTION

SECTION 07 14 00

FLUID-APPLIED WATERPROOFING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Fluid-applied elastomeric waterproofing membrane for belowgrade walls. Fluid-applied waterproofing membrane is required on the earth side of concrete walls that are below grade, have earth on one side, and are common with rooms, tunnels, or galleries to be occupied by equipment, piping, or personnel. Membrane is not required for walls that are poured directly against an excavated surface.
- B. Fluid-applied elastomeric waterproofing membrane for belowgrade structures.
- C. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. NRCA (National Roofing Contractors Association)—Waterproofing Manual.

1.03 SUBMITTALS

- A. Submit two samples of coating system applied to 1/4-inch plywood or similar rigid base.
- B. Submit list of at least five projects of similar nature by waterproofing applicator that have been installed within the last 5 years, identified with project name, location, and date.
- C. Submit letter from membrane manufacturer stating that applicator is an approved or certified applicator of its product.
- D. Submit copies of warranty.

1.04 QUALIFICATIONS OF APPLICATOR

- A. Membrane applicator shall be approved by the manufacturer and shall have a minimum of 5 years experience in application of fluid-applied waterproofing coatings.

1.05 ENVIRONMENTAL CONDITIONS

- A. No waterproofing work shall be performed at ambient temperatures below 40°F.
- B. No waterproofing work shall be performed during inclement weather or when such weather is imminent.

1.06 WARRANTY

- A. Provide installer's 2-year total system warranty of watertightness covering cost (labor and materials) to repair any leaks in the waterproofing membrane, including cost to remove backfill material or other materials concealing the membrane, if required.
- B. Provide manufacturer's standard 5-year product warranty.

PART 2-PRODUCTS

2.01 MEMBRANE

- A. Membrane shall be a one-part, moisture curing, high solids, VOC-compliant, modified polyurethane waterproofing membrane that can be applied to damp and green concrete.

2.02 ACCESSORIES

- A. Cleaners and conditioners, primers, sealants, backer rod, flashing and flashing reinforcements, and other accessories related to the membrane application shall be provided as required by the membrane manufacturer.
- B. Provide 1/8-inch-thick protection board.

PART 3-EXECUTION

3.01 SURFACE PREPARATION

- A. Surface preparation shall be in accordance with the membrane manufacturer's recommendations.
- B. Verify that curing methods used for concrete are compatible with the membrane system.
- C. Concrete surfaces shall be free of laitance, loosely adhering materials, oil, curing compounds, and all other contaminants prior to membrane application. Prepare all concrete surfaces by sandblasting followed by vacuum cleaning or by acid etching.

3.02 PRODUCT APPLICATION

- A. Preparatory work (priming and flashing) must be fully cured in accordance with manufacturer's recommendations prior to coating application.
- B. Apply coating in accordance with manufacturer's recommendations using approved squeegee, trowel, or spray equipment to produce a 60 mil wet film thickness. This is in addition to the primer and flashing coats. Extend coating over all previously flashed and primed areas.

- C. The membrane shall be cured as recommended by the manufacturer prior to water testing, backfilling, or allowing foot traffic on surfaces.
- D. Horizontal surfaces shall be flooded to a depth of 2 inches maintained over a 12-hour period. Any leaks evident after this period shall be repaired and the leaky areas retested until leaks are stopped.
- E. Apply protection board to all surfaces prior to backfilling.

END OF SECTION

SECTION 07 21 12
BOARD INSULATION

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes board insulation for cavity wall construction and for perimeter foundation walls.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

PART 2—PRODUCTS

2.01 CAVITY WALL INSULATION

- A. Cavity wall insulation shall be 3-inch-thick polyisocyanurate foam board with foil facing on both sides. Aged thermal resistance (R-value) at 72°F shall be a minimum of 19.0.
- B. Adhesive for adhering insulation to backup wall shall be as recommended by the insulation manufacturer.

2.02 FOUNDATION INSULATION

- A. Foundation insulation shall be 2-inch-thick extruded polystyrene closed cell rigid foam board with continuous skins on both sides. Aged thermal resistance (R-value) at 75°F shall be a minimum of 10.0.

PART 3—EXECUTION

3.01 INSTALLATION—CAVITY WALLS

- A. Insulation shall be installed horizontally within the cavity space between masonry wythes.
- B. Take care during installation so that all insulation boards are butted and installed between ties and fit flush against inner wythe or backup wall.
- C. Cut insulation neatly to fit around obstructions across the cavity such as vents, louvers, pipes, and conduits.
- D. Secure insulation in place against backup wall with mastic adhesive and observe label directions.

3.02 INSTALLATION—FOUNDATION WALLS

- A. Rigid insulation shall be laid dry against the foundation walls as backfill is placed. Insulation shall be located at all below-grade walls of buildings and structures containing areas that may be occupied by personnel. See architectural drawings for locations and extent of insulation.

END OF SECTION

SECTION 07 21 13

BATT INSULATION

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes batt insulation for attic spaces and insulation vent system between roof trusses as called for on the drawings.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM C665—Specification for Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

PART 2—PRODUCTS

2.01 ROOF INSULATION

- A. Batt insulation placed on top of precast plank in attic spaces shall be unfaced fiberglass batt 12 inches thick conforming to ASTM C665, Type 1, and providing a minimum R-value of 38. Two layers of 6-inch batt placed perpendicular to each other may be used in place of one layer of 12-inch batt.
- B. All batt insulation in attic spaces shall be unfaced or foil-reinforced kraft-faced meeting the 2018 International Building Code or governing local building code requirements.
- C. Acceptable manufacturers include the following:
 - 1. Owens Corning.
 - 2. Manville.
 - 3. Certainteed.

2.02 INSULATION VENTS

- A. Insulation vents shall be 2 inches high by 14 inches wide by 48 inches long, tear-resistant high-impact plastic.

PART 3-EXECUTION

3.01 INSTALLATION-ROOF INSULATION

- A. Prior to installing insulation, vapor barrier shall be in place (See Section 07 26 00-Vapor and Air Barrier).
- B. Insulation shall be loose laid on the precast plank over the vapor barrier. If two layers of insulation are used to make up the required thickness, upper layer shall be installed perpendicular to the lower layer.

3.02 INSULATION VENTS

- A. Insulation vents shall be installed between roof trusses at the truss bearing ends providing an unobstructed air channel from the soffit into the attic.

END OF SECTION

SECTION 07 26 00

VAPOR AND AIR BARRIER

PART 1-GENERAL

1.01 SUMMARY

- A. Work includes:
 - 1. Vapor barrier in exterior construction and on top of precast roof plank.
 - 2. Air barrier in masonry double wythe walls on concrete block backup wall.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

PART 2-PRODUCTS

2.01 MATERIALS

- A. Vapor barrier for precast plank construction: Vapor barrier shall consist of 6 mil ASTM D4397, Class B polyethylene sheeting with less than 0.3 perm water vapor permeance in accordance with ASTM E96
- B. Permeable air barrier for masonry cavity wall construction shall be fluid applied membrane, ExoAir 230 by Tremco, Air-Shield LM by W.R. Meadows, or Sikagard 535 by Sika Corporation. Apply to outside face of inner wythe of concrete block prior to installation of rigid insulation. Apply in strict accordance with manufacturer's instructions. Air barrier shall be included in all new cavity wall construction on the project.

PART 3-EXECUTION

3.01 INSTALLATION ON TOP OF PRECAST ROOF PLANK

- A. Provide continuous vapor barrier on top of precast plank.
- B. Provide one layer of sheeting over area of building.
- C. Lap all joints a minimum of 12 inches and tape all joints.

3.02 INSTALLATION OF AIR BARRIER

- A. Install air barrier on outside face of inner wythe of concrete block in cavity wall construction.
- B. Install air barrier per manufacturer's recommendations and approved details.

END OF SECTION

Section 07 26 00-1

SECTION 07 31 13

FIBERGLASS SHINGLE ROOFING

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes granular-surfaced fiberglass shingle roofing, including shingles, underlayment, eave protection membrane, shingle-over ridge vents, sheet flashing, drip edging, and related accessories.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM D226—Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- B. ASTM D3018—Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.
- C. ASTM D3462—Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
- D. ASTM D4586—Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- E. UL 580—Tests for Wind Uplift Resistance of Roof Assemblies.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with the provisions of Section 01 33 00—Submittals.
- B. Submit two copies of shingle warranty for review.
- C. Submit shingle color samples for selection by OWNER.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply felts or shingles in cold weather. Storage of bundles in heated area several days prior to use can permit shingling where unheated shingles would crack.

1.05 WARRANTY—SHINGLES

- A. Provide 30-year material warranty covering cost to replace defective shingles, exclusive of labor, in the event of manufacturing defect(s) in the shingles. In addition, provide a 5-year material/labor warranty covering cost to repair or replace defective shingles, including cost

of roof tear-off and excluding costs of flashing and metal work, up to the full replacement cost of the shingles.

- B. Material warranty shall be 30-year limited warranty. Material and labor warranty shall be 5-year Sure Start Protection warranty.

PART 2-PRODUCTS

2.01 FIBERGLASS SHINGLES

- A. Fiberglass shingles shall be 12 inches by 36 inches two-piece laminated, three-tab, 245 pounds per square, self-sealing, UL Class A, wind-resistant, fiberglass shingles surfaced with mineral granules, and conforming to ASTM D3018 and ASTM D3462.
- B. Color shall be as selected by OWNER.

2.02 UNDERLAYMENT AND EAVE PROTECTION MEMBRANE

- A. Underlayment for all areas, except along eaves, shall be No. 15 unperforated asphalt saturated felt conforming to ASTM D226.
- B. Eave (ice dam) protection shall be a sheet membrane of rubberized asphalt bonded to sheet polyethylene, 40 mils minimum total thickness, with strippable release paper.

2.03 ACCESSORIES

- A. Nails shall be annular-barbed or ring-barbed galvanized roofing nails with minimum 3/8-inch-diameter head and sufficient length to penetrate through the plywood sheathing.
- B. Plastic cement shall be asphalt type with mineral fiber components conforming to ASTM D4856. It shall be free of asbestos and toxic solvents and shall be capable of setting within 24 hours at temperatures of 75°F and 50% RH.
- C. Lap cement shall be fibrated cutback asphalt type recommended for use in underlayment and shall be free of asbestos and toxic solvents.
- D. Continuous shingle-over ridge vents shall be constructed of plastic and shall be formed with vent openings that do not permit direct water or weather entry or insect/bird entry. Vents shall provide minimum 12.2 square inches of net-free ventilation per linear foot.

2.04 FLASHING

- A. Sheet flashing shall be minimum 0.03-inch-thick aluminum, mill finish, conforming to ASTM B209.
- B. Exposed edges of flanges shall be hemmed a minimum 1/4 inch on the underside. Underside shall be coated with acid and alkali-resistant bituminous paint.

- C. Drip cap edging shall be aluminum style "D".
- D. Provide aluminum pipe boots for roof pipe penetrations.

PART 3-EXECUTION

3.01 EXAMINATION

- A. CONTRACTOR shall examine all roof decks on which roofing is to be applied and shall notify ENGINEER in writing prior to starting work of any defects which CONTRACTOR may consider detrimental to the proper installation of their materials. Roof deck shall be smooth, dry, free from dirt and foreign material before starting roofing.
- B. Verify that roofing penetrations are in place and properly flashed and that roof openings are correctly formed.

3.02 INSTALLATION-EAVE (ICE DAM) PROTECTION

- A. Place eave edge and gable edge metal flashings tight with fascia boards. Weather lap joints 2 inches and seal with plastic cement. Secure flange with galvanized nails spaced 8 inches o.c.
- B. Apply eave protection membrane in accordance with manufacturer's instructions. Extend eave protection membrane minimum 4 feet upslope beyond interior face of exterior wall.

3.03 INSTALLATION-PROTECTIVE UNDERLAYMENT

- A. Place one ply of underlayment over areas not protected by eave protection. Install underlayment perpendicular to slope of roof. Underlayment shall be weather-lapped a minimum 4 inches over eave protection membrane, and weather-lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place.
- B. If the roof slope is 4 in 12 or flatter, place a second ply of underlayment over first layer with ends and edges weather-lapped minimum 4 inches. Stagger end laps of each consecutive layer. Nail in place.
- C. Weather-lap and seal water-tight with plastic cement items projecting through or mounted on roof.

3.04 INSTALLATION-VALLEY PROTECTION

- A. Place one layer of sheet metal flashings, minimum 24 inches wide, centered over open valleys and crimped to guide water. Weather-lap joints minimum 2 inches. Nail in place minimum 8 inches o.c. and 1 inch from edges.

3.05 INSTALLATION-METAL FLASHING AND ACCESSORIES

- A. Weather-lap joints minimum 2 inches and seal weather-tight with plastic cement.

- B. Secure in place with nails at 8 inches o.c. Conceal fastenings.
- C. Flash and seal work weather-tight projecting through or mounted on roofing with plastic cement.

3.06 INSTALLATION—FIBERGLASS SHINGLES

- A. Place shingles in straight coursing pattern with 4-inch weather exposure on slopes of 4-in-12 or flatter and 5-inch weather exposure on slopes 5-in-12 and steeper.
- B. Project first course of shingles 3/4 inch beyond fascia boards.
- C. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
- D. Cap hips and ridges with individual shingles maintaining 5-inch weather exposure. Place to avoid exposed nails.
- E. After installation, place one daub of plastic cement, 1-inch diameter, under each individual shingle tab exposed to weather to prevent lifting.
- F. Coordinate installation of roof-mounted components of work projecting through roof with weather-tight placement of counter flashings.
- G. Complete installation to provide weathertight service.

END OF SECTION

SECTION 07 62 00

FLASHING AND SHEET METAL

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes masonry wall flashing, custom-fabricated sheet metal flashing and counter flashing at: Eave, gable, and ridge lines; roof hatches; roof-mounted equipment; vent stacks; and other locations.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM A653—Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM A924—General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
- C. ASTM B32—Solder Metal.
- D. ASTM B209—Aluminum and Alloy Sheet and Plate.
- E. ASTM D4586—Asphalt Roof Cement, Asbestos-Free.
- F. SMACNA—Architectural Sheet Metal Manual.

1.03 SUBMITTALS

- A. See Section 01 33 00—Submittals for general submittal requirements.
- B. Shop drawings: Submit fabrication details, jointing details, fastening methods, and termination details.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA standard details and requirements.

1.05 QUALIFICATIONS

- A. Fabricator and installer shall be a company specializing in sheet metal fabrication work with a minimum of 5 years of verifiable experience in that field.

1.06 WARRANTY

- A. Fluoropolymer coating shall be provided with a 20-year guarantee against cracking, chipping, peeling, and fading.

PART 2-PRODUCTS

2.01 MATERIALS

- A. Masonry wall flashing and flashing around windows, doors, and other openings shall be 32 mil of self-adhesive rubberized asphalt integrally bonded to 8 mil of cross-laminated, high-density polyethylene film to provide a minimum 40 mil thick membrane. Provide primer or surface conditioner as recommended by manufacturer.
- B. Aluminum Sheet: 0.032 inch thick meeting ASTM B209.
- C. Fasteners: Same material and finish as flashing sheet. Stainless steel fasteners may be used with any flashing material. Provide soft neoprene washers with fasteners.
- D. Protective Backing Paint: Bituminous type.
- E. Sealant: See Section 07 90 00—Caulking and Sealants.
- F. Bedding Compound: Rubber asphalt or butyl type.
- G. Plastic Cement: ASTM D4586, Type I or II.
- H. Reglets: Aluminum or PVC, surface-mounted or recessed, or as shown on the drawings.
- I. Solder: ASTM B32. Soldering is not permitted on aluminum or stainless steel sheet.

2.02 FABRICATION

- A. All flashing and fascia shall be formed to the configurations shown on the drawings and/or the applicable manufacturer's details, or in accordance with SMACNA standard details where not shown on the drawings, or in manufacturers details. Form sections true to shape, accurate in size, square, and free from buckles, kinks, or other defects.
- B. All exposed edges shall be folded or returned on themselves at least 1/2 inch. Corners shall be mitered and seamed.
- C. Form pieces in the longest possible lengths. Form material with flat lock seams.
- D. All sections shall be provided with slip joints at 8 feet on center.
- E. Cleats shall be fabricated of the same materials as the flashing sheets and shall be interlockable with the sheets.

- F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form a drip.
- G. Fabricate corners from one piece with minimum 18-inch-long legs. Seam or solder for rigidity and seal with sealant.

2.03 FINISH

- A. Back paint all sheet metal with asphaltum paint where sheet metal surfaces come in contact with masonry or steel.
- B. Flashing and fascia shall be painted where exposed to view from the ground. Aluminum shall be coated with a fluoropolymer coating system.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Through-wall flashing shall be installed 1/2 inch back of the outside face of the wall, carried through the outside wythe, turned up in the collar, and adhered to back-up wall as shown on the drawings. At no time should any portion of the flashing be allowed to hang or drape beyond the width of the wall. All laps shall be sealed and shall not be less than 3 inches in width. Flashing around openings shall extend at least 3 inches beyond each side of opening.
- B. Fit flashing tight in place. Make corners square, surfaces true and straight in planes, and line accurate to profiles. Seal metal joints watertight.
- C. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted by ENGINEER.
- D. Insert flashings into reglets where shown on the drawings. Seal flashings into reglets with sealant.
- E. Counter flashing shall be provided at all vertical masonry and/or concrete walls which extend above the roof line. The counter flashing shall be installed in a reglet unless otherwise shown. Surface-mounted reglets shall be used where noted.
- F. CONTRACTOR shall provide copper sleeves for hot pipes penetrating the roof as approved by the roofing manufacturer. The annular space between the sleeve and the pipe shall be packed with insulation capable of withstanding the maximum temperature of the pipe. CONTRACTOR to provide a galvanized steel rain collar welded to the hot pipe.

END OF SECTION

SECTION 07 71 00

MANUFACTURED ROOF SPECIALTIES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Metal fascia and soffit.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. SMACNA—Architectural Sheet Metal Manual.

1.03 SUBMITTALS

- A. Submittals shall comply with requirements of Section 01 33 00—Submittals.
- B. Submit sample panels for selection of fluoropolymer finish colors.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA standard details.

1.05 WARRANTY

- A. Fluoropolymer coating shall be provided with a 20-year guarantee against cracking, chipping, peeling, and fading.

PART 2—PRODUCTS

2.01 FASCIA

- A. Metal fascia system shall be constructed of 0.05-inch aluminum and shall include all necessary angles, clips, corners, and other accessories of the same material as the finish panels.
- B. Acceptable products include the following: Fascia System by Fabral, Peterson Aluminum Corporation, or MBCF.

2.02 SOFFIT

- A. Metal soffit system shall be constructed of 0.032-inch-thick aluminum sheet and shall include all necessary channels, angles, clips, flashing, fasteners, and other accessories of the same

material as the soffit panels. Soffit panels shall be fully vented to allow for ventilation and shall have stiffener grooves spaced at 6 inches on center.

- B. Acceptable products include the following: Fabral, PAC 750 by Peterson Aluminum Corporation, or MBCF.

2.03 FINISHES

- A. Finish on all products shall be a 1.0 mil DFT two-coat factory-applied 70% fluoropolymer coating over an epoxy prime coat. Colors shall be selected by OWNER. All exposed fasteners shall be provided with the same finish as the sheet metal products.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install components in accordance with the drawings and the manufacturer's instructions.
- B. Installation details shall be such as to allow for thermal expansion and contraction of the components and to provide for a complete weatherproof installation.

END OF SECTION

SECTION 07 71 23

GUTTERS AND DOWNSPOUTS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Aluminum gutters and downspouts.
 - 2. Precast concrete splash pads.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM B209—Aluminum and Aluminum Alloy Sheet and Plate.
- B. SMACNA—Architectural Sheet Metal Manual.

1.03 DESIGN REQUIREMENTS

- A. Conform to SMACNA manual for sizing components for a 10-year storm event.

1.04 REGULATORY REQUIREMENTS

- A. Conform to the 2018 International Building Code or governing local building code for size and method of rainwater discharge.

PART 2—PRODUCTS

2.01 GUTTERS AND DOWNSPOUTS

- A. Gutters and downspouts shall be constructed of 0.032-inch-thick aluminum sheet conforming to ASTM B209 and shall be made from the same manufacturer as the fascia and soffit system.

2.02 ACCESSORIES

- A. Anchorage devices shall meet SMACNA or manufacturer's requirements.
- B. Gutter supports shall be straps and fasteners at maximum 3 feet 0 inch on center.
- C. Downspout supports shall be brackets of the appropriate size and spacing.
- D. Fasteners shall be aluminum or stainless steel.

2.03 SPLASH PADS

- A. Splash pads shall be precast concrete of the appropriate size with minimum 28-day compressive strength of 3,000 psi and minimum 5% air entrainment.

2.04 FABRICATION

- A. Form gutters and downspouts to SMACNA requirements.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion of defects detrimental to appearance or performance. Allow for expansion by providing expansion joints as required.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.05 FINISHES

- A. Finish on gutters and downspouts shall match finish on fascia system. All components, including fasteners and supports, shall be prefinished to match gutters and downspouts.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install gutters, downspouts, and accessories with manufacturer's instructions.
- B. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
- C. Install gutters level.
- D. Seal metal joints watertight.
- E. Set splash pads under downspouts.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Silicone firestopping foam for sealing annular spaces around ductwork penetrations through fire-rated assemblies.
 - 2. Silicone firestopping sealant for sealing annular spaces around piping and conduit penetrations through fire-rated assemblies and to seal gaps at intersections of walls and floors/ceilings.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM International (ASTM):
 - 1. E814, Standard Method of Fire Tests of Through Penetration Fire Stops.
 - 2. E1966, Standard Test Method for Fire Resistive Joint Systems.
 - 3. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 4. E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 5. E2174, Standard Practice for On-Site Inspection of Installed Fire Stops.
 - 6. E2393, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
 - 7. E2837, Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall.
- B. International Firestop Council (IFC).
 - 1. Recommended IFC Guidelines for Evaluating Firestop Systems in engineering Judgments (EJs), referred to herein as IFC Recommended Guidelines.
- C. National Fire Protection Association (NFPA).
 - 1. 101, Life Safety Code.
 - 2. 220, Standard on Types of Building Construction.
 - 3. 221, Standard for High Challenge Fire Walls, Fire Walls, and Fire Barriers.
 - 4. 251, Standard Methods of Tests of Fire Resistance of Building Construction Materials.
 - 5. 255, Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Underwriters Laboratories, Inc. (UL):
 - 1. 1479, Fire Tests of Through Penetration Fire Stops.
 - 2. 2079, Standard for Tests for Fire Resistance of Building Joint Systems.
 - 3. 263, Fire Tests of Building Construction and Materials.
 - 4. 723, Surface Burning Characteristics of Building Materials.

- E. Building Code—International Code Council (ICC):
 - 1. International Building Code and associated standards, 2018 Edition including all amendments, referred to herein as Building Code.
 - 2. International Fire Code and associated standards, 2018 Edition including all amendments, referred to herein as the Fire Code.

1.03 REGULATORY REQUIREMENTS

- A. Firestopping materials and installation shall conform to the 2018 International Building Code requirements, including fire-resistance ratings and surface-burning characteristics.
- B. Provide certificate of compliance from local building inspector indicating approval of firestopping materials and installation.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. A small amount of hydrogen gas is released as the firestopping foam cures. Use forced-air ventilation when installing if areas of installation have less than 2 cubic feet of free air for each pound of liquid mixture being formed.

1.05 SUBMITTALS

- A. Shop Drawings: See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

PART 2—PRODUCTS

2.01 FIRESTOPPING FOAM

- A. Firestopping foam for duct penetrations through fire-rated assemblies shall be a foamed-in-place silicone elastomer produced from two liquid components.
- B. Acceptable products include the following: Fire Barrier Rated Foam, FIP 1 Step by 3M Corporation, Tremco Sealants, and Recturseal.

2.02 FIRESTOPPING SEALANT

- A. Firestopping sealant for piping and conduit penetrations through fire-rated assemblies shall be a single-component silicone elastomer.
- B. Acceptable products include the following: Fire Barrier Silicone Sealant 2000 by 3M Corporation, Tremco Sealants, and Rectorseal.

2.03 DAMMING MATERIAL

- A. Damming material shall be fire-resistant mineral fiber (if left in place) or other combustible material (if removed), as directed by the appropriate fire-tested designs.

2.04 PRIMER AND WRAP STRIP

- A. Primer for firestopping sealant shall be 3M Corporation, Tremco Sealants, and Rectorseal.
- B. Wrap strip for firestopping sealant shall be 3M Fire Barrier FS-195 Wrap/Strip, Tremco Sealants, and Rectorseal.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Firestopping foam and sealant shall be applied according to manufacturer's written instructions and shall achieve a fire rating equal to rating of construction which is penetrated. Substrate shall be free of all combustible materials (except damming material for later removal), loose impediment, oil, and other free liquids.
- B. Install damming material to establish the thickness and hold the firestopping foam/sealant in place. Follow the manufacturer's installation instructions. All gaps or cracks left after damming materials are in place must be sealed.
- C. Firestopping Foam: Immediately after mixing, dispense liquid foam into the penetration opening in accordance with manufacturer's installation instructions. Do not overfill penetration openings with liquid foam. Foam expands approximately three times its original volume during cure. Follow manufacturer's guidelines. If the opening is not filled when the cured foam has completed its expansion, repeat the installation and cure procedure until the opening is filled to the desired level. Allow 15 minutes between application of each shot.
- D. Firestopping Sealant: Apply primer and wrap strip in accordance with manufacturer's instructions prior to installing sealant. Apply sealant to a minimum depth of 1 1/2 inches and with uniform density and texture.
- E. Remove combustible damming material after foam/sealant has cured. Noncombustible damming material may be left in place.

3.02 QUALITY CONTROL

- A. Firestopping Foam:
 - 1. Perform manufacturer's four-step in-line quality control check at least once daily and upon changing to a new lot of material in order to review performance of both dispensing equipment and foam product prior to installing penetration seals. The four-step quality check includes evaluation for: snap time (cure rate); foam color and uniformity; foam cell structure; and foam density (weight).
 - 2. Check cured penetration seal after 24-hour cure by removing damming materials to examine seal.
 - 3. Cured foam should completely fill penetration. Fill all remaining gaps with freshly mixed foam or firestopping sealant.
 - 4. Recheck after added material has cured 24 hours.
 - 5. Damming materials required to achieve a fire rating must be returned to the penetration.

6. Clean up spills of liquid components with high-flash mineral spirit solvent, following manufacturer's instructions.
 7. If necessary, trim excess cured foam with a sharp knife or blade.
- B. Firestopping Sealant:
1. Check completed work for complete adhesion and seal 48 hours after sealant application.
 2. Clean adjacent surfaces of excess sealant using a compatible solvent in accordance with the manufacturer's instructions.

END OF SECTION

SECTION 07 90 00

CAULKING AND SEALANTS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Caulking and sealants on the project, including primers and backer rod material.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM C920—Elastomeric Joint Sealants.
- B. ASTM C1521, Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joint.
- C. American Concrete Institute (ACI): a. 302.1R, Guide for Concrete Floor and Slab Construction.
- D. Underwriters Laboratories, Inc. (UL).

1.03 SUBMITTALS

- A. Submittals shall comply with provisions of Section 01 33 00—Submittals.
- B. Submit color chart for each sealant used on project. Colors will be selected by ENGINEER.
- C. Submit copies of warranty.

1.04 WARRANTY

- A. Caulked joints shall be weathertight and guaranteed watertight by installer for two years from the earlier of either the date established for Substantial Completion of the project. Deliver original guarantee to OWNER with copies to ENGINEER.

1.05 QUALITY ASSURANCE

- A. Qualifications: Sealant applicator shall have minimum five years of experience using products specified on projects with similar scope.
- B. Mock-Ups: Before sealant work is started, a mock-up of each type of joint shall be sealed where requested by ENGINEER.

1. The approved mock-ups shall show the workmanship, bond, and color of sealant materials as specified or selected for the work and shall be the minimum standard of quality on the entire project.
2. Each sample shall cure for a minimum of seven days at which time the sealant manufacturer's authorized factory representative shall perform adhesion tests on each sample joint.
 - a. Perform adhesion tests per ASTM C1521.
 - b. If mock-up is not acceptable or if adhesion test fails, provide additional mock-up and adhesion testing as required until acceptable to ENGINEER.

PART 2-PRODUCTS

2.01 CAULK-NONSUBMERGED AND SUBMERGED NON-POTABLE APPLICATIONS-GENERAL

- A. Caulk for nonsubmerged and submerged non-potable water contact applications in all locations except floor joints shall be a one-part or two-part polyurethane sealant.
- B. Acceptable products include the following, or equal:
 1. Masterseal NP1 by Master Builders Solutions.
 2. Vulkem 116 by Tremco, Inc. (exterior applications only).
 3. Dymonic 100 by Tremco, Inc.
 4. Sikaflex-2c NS EZ Mix by Sika Products.

2.02 CAULK-NONSUBMERGED AND SUBMERGED NON-POTABLE WATER APPLICATIONS-FLOOR JOINTS

- A. Caulk for floor joints in nonsubmerged and submerged non-potable water contact applications shall be a one-part, self-leveling, polyurethane sealant.
- B. Acceptable products include the following, or equal:
 1. MasterSeal SL1 by Master Builders Solutions.
 2. Vulkem 45 SSL by Tremco, Inc.
 3. Sikaflex-2c SL by Sika Products.

2.03 CAULK-VERTICAL EXPANSION JOINTS

- A. Caulk at vertical expansion joints in nonsubmerged and submerged non-potable water contact applications shall be a one-part or two-part polyurethane sealant.
- B. Caulk shall be capable of $\pm 50\%$ joint movement.

2.04 CAULK-EXPANSION JOINTS-FLOORS

- A. Caulk at floor expansion joints in nonsubmerged and submerged non-potable water contact applications shall be a one-part or two-part polyurethane sealant.
- B. Caulk shall be capable of $\pm 50\%$ joint movement.

2.05 ACCESSORIES

- A. Backer rod shall be flexible, closed-cell polyethylene rod stock sized to be under at least 25% compression when positioned in the joint. In shallow joints and where backer rod is not used, polyethylene bond breaker tape shall be used. It is essential that the caulk bond to the side of the joint but not to the base of the joint.
- B. Primer(s) shall be used where required by the manufacturer for the specific product(s) used and the specific application(s) intended. Specific product(s) shall be as recommended by the manufacturer.
- C. Cleaning fluid shall be methyl ethyl ketone (MEK), methyl isopropyl ketone (MIK), or similar solvent material which will not etch or mar metal finishes and shall be the product of a nationally recognized manufacturer, of type expressly recommended for use with the caulking or sealant compound used.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Seal completely all joints around entire perimeter of all openings in all exterior walls (inside and outside faces), including joints at all exterior doors, windows, louvers, sills, and elsewhere as noted on the drawings and as necessary to seal all open joints in the building in a complete manner. Joints in exterior walls shall be caulked in a completely weathertight manner. Joints between interior walls and concrete ceilings and other interior joints shall be caulked as indicated on the drawings. Caulking not specified in other sections shall be performed under this heading.
- B. All caulking shall be done in accordance with manufacturer's specifications. Allow minimum 28-day curing period for concrete, grout, or mortar prior to caulking unless requested otherwise. Caulking work shall be done before the final coat of paint is applied except at moving joints which shall be finish painted before caulking or caulking shall be protected during painting. All caulking shall occur only when the temperature is above 40°F.
- C. Joints shall be thoroughly cleaned and primed before caulking in accordance with manufacturer's instructions. Unless otherwise shown, joints shall be square in cross section 1/2-inch by 1/2-inch and shall comply with manufacturer's joint width/depth ratio limitations.
- D. Backer rod shall be used in all openings 3/4 inch or more in depth and shall be tightly packed to completely fill the space to 1/2 inch back of face. The 1/2 inch shall then be filled with caulking compound.
- E. Caulking shall be done by hand gun. Compound shall be driven into joint grooves with sufficient pressure to force out all air and fill joint grooves solidly. Caulking where exposed shall be free of wrinkles and shall be uniformly smooth.
- F. At completion of caulking, clean off all excess material from adjoining surfaces and material. Entire installation shall be left in a perfect appearing weathertight condition.

3.02 FIELD QUALITY CONTROL

- A. Field Testing: Testing to conform with the provisions of IDOT Standard Specifications for Road and Bridge Construction.
- B. Adhesion Testing: Perform adhesion tests in accordance with ASTM C1521 per the following criteria:
 - 1. Water bearing structures: One test per every 1000 LF of joint sealed.
 - 2. Exterior precast concrete wall panels: One test per every 2000 LF of joint sealed.
 - 3. Chemical containment areas: One test per every 1000 LF of joint sealed.
 - 4. Building expansion joints: One test per every 500 LF of joint sealed.
 - 5. All other type of joints except butt glazing joints: One test per every 3000 LF of joint sealed.
 - 6. Manufacturer's authorized factory representative shall recommend, in writing, remedial measures for all failing tests.

END OF SECTION

SECTION 08 11 00

STANDARD STAINLESS STEEL DOORS AND FRAMES

PART 1—GENERAL

1.01 SUMMARY

- A. Work included: Thermally-insulated and fire-rated galvanized and stainless steel doors and frames.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ANSI/NAAMM HMMA-866 Guide Specifications for Stainless Steel Hollow Metal Doors and Frames.
- B. UL 10B—Fire Tests of Door Assemblies.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01 33 00—Submittals.
- B. In addition to shop drawings and product data, indicate type of primer paint to be used and verify compatibility with field paint system specified.

1.04 REGULATORY REQUIREMENTS

- A. Fire-Rated Door and Frame Construction: Conform to UL 10B.

PART 2—PRODUCTS

2.01 THERMALLY-INSULATED DOORS

- A. Thermally-insulated doors shall be hollow full flush, 1 3/4-inch-thick, 16 gauge Type 304 stainless steel sheet in accordance with ANSI/SD1-100 with polyurethane core rigid reinforcing full thickness.
- B. Acceptable products include the following:
 - 1. Ceko Imperial.
 - 2. Curries 707 Series.
 - 3. Steelcraft LS Series.

2.02 FIRE-RATED/INTERIOR DOORS

- A. Fire-rated/interior doors shall be hollow full flush, 1 3/4-inch-thick, 16-gauge G90 galvanized steel sheet in accordance with ANSI/SD1-100 with honeycomb or steel stiffened rib core for full thickness of door. Fire doors shall carry Underwriters label on the door.
- B. Acceptable products include the following:
 - 1. Ceco Regent.
 - 2. Curries 747 Series.
 - 3. Steelcraft T. Series.

2.03 FABRICATION-DOORS

- A. Doors shall be fully-sealed, continuously-welded construction with all surface welds, joints, and seams filled and ground smooth.
- B. Tops and bottoms of doors shall be completely closed with 16-gauge channels. Outside edges of doors shall be flush without depressions. No inverted channels will be allowed.
- C. Mortise, reinforce, drill, and tap doors to receive hardware. Reinforcement shall be welded within the stiles and rails. Reinforce top rails to accommodate closers on either side and reinforce bottom for kickplate.
- D. All Underwriters fire doors shall be constructed to meet Underwriters Laboratories specific approval according to current procedure for the indicated class.

2.04 FRAMES

- A. Stainless and galvanized steel door frames shall be made of 14 gauge, cold-rolled, prime-quality stainless or G90 galvanized steel in accordance with ANSI/SD1-100.
- B. Fire-rated frames shall carry Underwriters label on the frame.
- C. Frames shall be removable where shown on the drawings.

2.05 FABRICATION-FRAMES

- A. Fabricate frames as welded unit. Weld joints continuously through full throat width of frames, including rabbets, soffits, and stops; grind, fill, dress, and make smooth, flush, and invisible.
- B. Welded frames shall be provided with two 304 stainless steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and shall not be used to size the frame opening.
- C. Frames shall be 2 inches by 5 3/4 inches. Frames shall have 4-inch head member at 7 feet 0 inch doors in masonry walls.

- D. Fabricate frames with hardware reinforcement plates welded in place.
- E. All Underwriters fire-rated frames shall be constructed to meet Underwriters Laboratories specific approval according to current procedure for the indicated class.
- F. Provide anchors appropriate to wall type.
- G. Provide frames for all stainless steel doors.

2.06 FINISH

- A. Standard Stainless Steel Finish: #2B Mill Finish.
- B. Galvanized steel: Oven cured primer conforming to ANSI A250.10.

PART 3-EXECUTION

3.01 INSTALLATION-FRAMES

- A. Install frames in accordance with ANSI/SD1-100.
- B. Coordinate installation of frames with wall construction for anchor placement.
- C. Coordinate installation of frames with installation of doors, hardware, joint sealers, and field painting.
- D. Set all frames as supplied by manufacturer.
- E. Frames in masonry walls shall be grouted full.

3.02 INSTALLATION-DOORS

- A. Install doors in accordance with ANSI/SD1-100.
- B. Coordinate installation of doors with installation of frames, hardware, glass and glazing, and field painting.
- C. Set all doors as supplied by manufacturer. Hang all doors allowing for expansion and contraction at time of setting.
- D. Set all hardware in accordance with templates as supplied by hardware supplier.
- E. Cover all exposed hardware until completion of painting and finishing.
- F. Examine hardware at completion; test, oil, grease, and adjust for perfect operation.

3.03 SCHEDULE

- A. See Door Schedule on the Drawings.

END OF SECTION

SECTION 08 31 13

ACCESS DOORS AND FRAMES

PART 1—GENERAL

1.01 SUMMARY

- A. Work included: Aluminum floor doors and frame units.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

PART 2—PRODUCTS

2.01 ALUMINUM FLOOR DOORS AND FRAMES

- A. Acceptable products include the following: The Bilco Company, Type J, Nystrom, or Haliday Products, as scheduled.
- B. Type J doors shall be designed for a minimum live load of 300 psf with a maximum deflection of 1/150 of span.
- C. Doors shall be constructed of stiffened 1/4-inch aluminum diamond-pattern plate.
- D. Channel frame for Type J doors shall be 1/4-inch extruded aluminum with bend-down anchor tabs. Depth of frame shall be 6 inches. A continuous EPDM gasket shall be mechanically attached to the frame around the entire perimeter.
- E. Hinges shall be through bolted to the door and frame with tamper-proof Type 316 stainless steel lock bolts.
- F. Provide 1 1/2-inch drain coupling located in corner of channel frame for Type J doors.
- G. Type J doors shall be equipped with required number and size of compression spring operators for door to operate easily and smoothly. Provide heavy-forged cam-action hinges to open door so edge of door does not open into channel. Doors shall have smooth controlled operation and not be affected by temperature.
- H. Provide hold-open arm that automatically locks in open position. Provide snap lock with fixed handle mounted to underside of cover. Provide removable exterior turn/lift handle with spring-loaded ball detent to open cover. All hardware shall be Type 316 stainless steel for corrosive environment.

2.02 FINISH

- A. Aluminum floor doors and frames shall have mill finish. Apply bituminous coating to portions of frames in contact with concrete.

2.03 ACCESSORIES

- A. Provide Bilco Ladder-Up, or equal, at all floor doors with ladder access. Materials and finishes shall be aluminum.
- B. All aluminum floor/door openings shall be fitted with a permanently installed, fall-through prevention grating system that is easily retractable for access to the opening below. Grating system shall be factory installed by access door manufacturer.
- C. Performance Characteristics:
 - 1. Grating panel(s) shall be high visibility safety yellow in color.
 - 2. Grating panel(s) shall lock automatically in the full open position.
 - 3. Grating system shall have a twenty-five year warranty.
 - 4. Grating panel(s) shall have a provision for locking to prevent unauthorized opening.
- D. Grating: Panels shall be aluminum with a powder coat paint finish and designed to meet OSHA 1926.502(c) and 1910.29 requirements for fall protection.
- E. Hold Open Feature: A Type 316 stainless hold open device shall be provided to lock the cover in the fully open 90 degree position.
- F. Hardware: All hardware shall be Type 316 stainless steel.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.
- B. Provide piping from channel frames for Type J floor doors from outlet to base of wall nearest floor drain or through wall to ground for tank structures. Terminate pipe in minimum 1 cubic foot of clear stone if termination is below ground.

3.02 ADJUSTING AND CLEANING

- A. Clean exposed surfaces using methods acceptable to the manufacturer that will not damage finish.
- B. Test units for proper function and adjust until proper operation is achieved.
- C. Repair finishes damaged during installation.

D. Restore finishes so no evidence remains of corrective work.

3.03 SCHEDULE

A. See Door Schedule on the Drawings.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Hardware to fully equip all doors.
 - 2. Thresholds and weatherstripping.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. NFPA 80—Fire Doors and Windows.

1.03 REGULATORY REQUIREMENTS

- A. Hardware shall conform to the 2018 International Building Code for requirements applicable to fire-rated doors and frames. Hardware shall comply with NFPA 80 and shall be properly stamped or labeled for easy identification.
- B. Hardware shall comply with barrier-free requirements.

1.04 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of “Operational and maintenance manuals special provisions.”
- B. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

PART 2—PRODUCTS

2.01 LOCKSETS AND LATCHSETS

- A. Locksets and latchsets shall have 2 3/4-inch backset. Strikes shall be curved lip.
- B. Lockset and latchset numbers listed in Paragraph 3.02 Schedule are Sargent (listed first) followed by Schlage number (listed second in parentheses).
- C. Provide removable core brass 6- or 7-pin cylinders for all locksets and latchsets.

2.02 EXIT DEVICES

- A. Exit devices shall be Sargent 8813 x ETL Series, Adams Rite, or Yale, and shall be equipped with reinforced cross bars and functions as indicated on the hardware sets. The exit device shall be operated by a lockable lever from the exterior side.

2.03 HINGES

- A. Butt hinges shall be Stanley FBB 191, Hager BB 1191, or ASSA Abloy BH 888, full mortise, ball bearing, nonferrous, nonrising, loose pin, and flat bottom tip, unless otherwise specified. Provide three 4 1/2-inch by 4 1/2-inch hinges per door for doors 7 feet or less in height with one additional hinge for each additional 30 inches or fraction thereof, unless otherwise specified. Provide additional hinges or heavyweight hinges for all doors that are over 36 inches wide, unless specified otherwise.

2.04 DOOR CLOSERS

- A. Door closers shall be LCN Series 1460, ASSA Abloy DC, or Norton 160 Series for exterior doors and 1461 for interior doors. Provide aluminum finish on closers. Provide full covers. Door closers for locations noted as (ss) shall have the SRI primer for corrosion resistance. Door closers specified in Paragraph 3.02 are LCN. (H-Hold Open).

2.05 OVERHEAD DOOR HOLDERS

- A. Overhead door holders shall be Glynn Johnson GJ 81H Series, unless otherwise specified. Holders for locations noted as (ss) shall be fabricated with stainless steel components. Numbers specified in Paragraph 3.02 are Glynn Johnson.

2.06 SURFACE BOLTS

- A. Surface bolts shall be 8-inch Ives 1630 series. At doors with (ss) hardware, bolts shall be 8-inch Ives 1640 Series.

2.07 KICKPLATES

- A. Kickplates shall be 6 inches high. Kickplate width shall be 2 inches less than door width.

2.08 DOOR STOPS

- A. Provide wall- or floor-mounted door stops at all interior doors. Stops shall be Glynn Johnson GJFB-13, GJ60C, or GJ60W, or Ives, for locations noted as (ss).

2.09 THRESHOLD AND WEATHERSTRIPPING

- A. All exterior doors shall be weatherstripped with Reese DS75, National Guard Products, Inc. 156, or Reese, weatherstripping. Provide Reese 323C, Pemko 315AN, National Guard Prolocks, sweeps; and Reese S425A, Pemko 171A, National Guard Prolocks, thresholds.

2.10 KEYING

- A. Door keys shall be keyed alike to match existing IDOT keying system. Provide five keys per lock. Doors shall have temporary construction cylinders. Provide permanent cylinders at project completion. Serial numbers shall be stamped or engraved on all keys.

2.11 FINISH

- A. Finish for all hardware, except as noted below, shall be US 26D or US 32D where stainless steel (ss) hardware is specified in Paragraph 2.
- B. Finish for surface bolts shall be US 26D; finish for kickplates shall be 32D.
- C. Where stainless steel (ss) is specified, all hardware, including threshold and weatherstripping, shall be installed with stainless steel fasteners.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Provide finish hardware to fully equip all doors.
- B. Install hardware in accordance with manufacturer's instructions.

3.02 SCHEDULE

- A. Provide the following hardware groups in the amounts indicated on the door schedule or required for a complete and proper installation:

Group 1

Latchset 10U15 (ND10S) (ss)
Door Closer-1460 BF (Regular Arm) (ss)
Hinges and Kickplate (ss)

Group 2

Exit Device-8813 x PRK (ss)
Door Closer-1460 (ss)
(Parallel Arm)
Hinges and Kickplate (ss)

Group 3

Lever-Rigid, each face (ss)
Surface bolts-One top and bottom (ss)
Overhead Door Holder GJ 81 H-HD (ss)
Hinges and Kickplate (ss)

END OF SECTION

Section 08 71 00-3

SECTION 09 91 00

PAINTING

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included: Surface preparation and application of paints and coatings.
- B. Unless otherwise indicated, material and work shall be conformance with the requirements of the Standard Specifications for Road and Bridge Construction, latest version, a publication of the Illinois Department of Transportation.
- C. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ASTM B117—Standard Practice for Operating Salt Spray (Fog) Apparatus.
- B. ASTM D2247—Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity.
- C. ASTM D3363—Standard Test Method for Film Hardness by Pencil Test.
- D. ASTM D4060—Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- E. ASTM D4541—Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
- F. ASTM D4585—Standard Practice for Testing Water Resistance of Coatings Using Controlled Condensation.
- G. Federal Register—Code of Federal Regulations (CFR).
- H. Federal Register—Resource Conservation and Recovery Act (RCRA).
- I. Federal Register—Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
- J. ICRI—International Concrete Repair Institute.
- K. NACE—National Association of Corrosion Engineers.
- L. SSPC—The Society for Protective Coatings—Steel Structures Painting Manual.

1.03 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01 33 00–Submittals.
- B. Shop primer proposed for use shall be submitted with all material and equipment submittals. All shop primers shall be of the same generic type and quality as those specified herein.
- C. Submit manufacturer's Safety Data Sheets (SDS) for each type of paint with each shop drawing submittal. SDS sheets shall be posted at the construction site at all times painting is in progress.
- D. Substitution submittals shall include performance test data, as certified by a qualified testing laboratory, for the ASTM tests specified in Paragraph 2.01.

1.04 QUALITY ASSURANCE

- A. The work under this section shall be done by a firm with not less than 5 years of experience in commercial painting and finishing. Documentation of this experience shall be included together with the product data submitted for approval.
- B. Painting shall conform to applicable Section 1008, PAINT MATERIALS and MIXED PAINTS, of the IDOT Standard Specifications for Road and Bridge Construction.
- C. The products of manufacturers other than those herein named, which are approved equal to the products specified, may be substituted, except that, all paints applied to a surface shall be products of one manufacturer. Data showing equivalent performance of each paint product to be submitted for review at least 30 calendar days before the painting is to begin, and no painting shall proceed until the substituted products have been accepted in writing.
- D. Regulatory Requirements: All paints, surface preparation, and application methods shall conform to federal requirements for allowable exposure to lead and other hazardous substances.
- E. Prepainting Meeting:
 - 1. A prepainting meeting shall be held immediately following the project preconstruction conference. The prepainting meeting is to be held prior to any material and equipment that requires painting is delivered to the site.
 - 2. CONTRACTOR, the paint subcontractor, and the paint manufacturer's representative shall be present to review the specifications and project scope.
 - 3. The paint manufacturer's representative shall review progress at the site as requested by ENGINEER. These are generally expected to be prior to monthly progress meetings.

1.05 FIELD QUALITY CONTROL

- A. Furnish testing apparatus as applicable for observing surface preparation, testing atmospheric conditions and testing coatings, prior to beginning surface preparation. Provide the following apparatus:
 - 1. One set of U.S. Department of Commerce thickness calibration plates, certified by the National Bureau of Standards, to test dry film thickness.

2. One wet-film thickness gauge.
 3. One dry-film thickness gauge, Mikrotest III, 0-40 mils with calibration standard approved by the Bureau of Standards.
 4. One Bacharach Sling Psychrometer, Model 12-7011.
 5. Tinker and Razor Model M-1 Holiday Detector and recommended wetting agent.
 6. One set of SSPC-VIS 1-89 Visual Standards for Abrasive Blast Cleaned Steel.
- B. Provide access via scaffolding or staging for inspection.
- C. Entire surface of coated submerged concrete shall be tested with holiday detector. Mark and repair all pinholes, then retest until no pinholes are found.
- D. CONTRACTOR shall provide documentation to ENGINEER of conditions before and during painting operations for each area and each day's work. Documented conditions shall include the following at a minimum: date, area of work, system used, preparation methods, environmental conditions, quantity and thickness of coating placed, noted conditions, and nonconforming items. ENGINEER can provide sample report form if CONTRACTOR does not have their own.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered to the site in original containers with labels intact and seals unbroken.
- B. Drop cloths shall be used in all areas where painting is done to fully protect other surfaces.
- C. Oily rags and waste must be removed from the building each night or kept in an appropriate metal container.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. CONTRACTOR shall dry-heat, dehumidify, and ventilate to obtain painting conditions recommended by the paint manufacturer during surface preparation, application, and cure.
- B. Relative humidity conditions as specified by the paint manufacturer's data sheet shall be adhered to. This includes times in which supplemental heat is used. Supplemental heat shall be indirect-fired hot air furnaces or electric heat. Open-flame heaters shall not be used.
- C. No unprotected, unheated exterior painting shall be undertaken when damp weather appears probable, nor when the temperature of the substrate is below 55°F, unless approval in writing is received from the paint manufacturer.

1.08 COLOR SELECTIONS

- A. Provide color charts for all coatings being used on the project. After initial selection of colors by OWNER, provide draw down samples of selected colors for OWNER's final approval. For stained wood, provide specified wood species sample with selected color for final approval.

- B. CONTRACTOR shall provide a summary sheet at the completion of the project listing the finish paint products used and the manufacturer's color identification for each item painted. This summary sheet should be submitted to ENGINEER and OWNER for review.

PART 2-PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. All materials required for painting shall be types and quality as manufactured by Tnemec Company, Inc., Sherwin-Williams Company, Carboline, PPG Protective and Marine Coatings, unless noted otherwise in the schedule.
- B. Where thinning is necessary, only the products of the manufacturer furnishing the paint will be allowed. All such thinning shall be done strictly in accordance with the manufacturer's instructions.
- C. Paint and paint products of Tnemec Company and Sherwin-Williams, listed in the following specifications, are set up as standard of quality. Carboline and PPG Protective and Marine Coatings have preapproved equivalent products that shall be used. Other manufacturer's products will be considered as a substitution if CONTRACTOR and paint manufacturer certify that the products offered are recommended for the service intended, are compatible with the shop primers used, are equal in solids content and composition, and are of the same type. Submittal shall include the following performance data as certified by a qualified testing laboratory. ASTM Specifications shall be the latest revision:
 - 1. Abrasion-ASTM D4060, CS-17 Wheel, 1,000 grams load.
 - 2. Adhesion-ASTM D4541.
 - 3. Hardness-ASTM D3363.
 - 4. Humidity-ASTM D2247 and D4585.
 - 5. Salt (Fog) Spray-ASTM B117.

PART 3-EXECUTION

3.01 SURFACE PREPARATION

- A. General:
 - 1. All surfaces to be painted shall be prepared as specified herein and by the manufacturer's published data sheet and label directions. The objective shall be to obtain a uniform, clean, and dry surface.
 - 2. No field painting shall be done before the prepared surfaces are observed by ENGINEER. Surfaces painted without such observation shall be abrasive-blast-cleaned and repainted.
 - 3. Prior to field-blasting, a sample of the blast abrasive shall be provided to ENGINEER for pH testing. Additional samples of subsequent deliveries or batches of blast abrasive shall be provided to ENGINEER for pH testing.
 - 4. For on-site abrasive-blasting, low-dust, low-silica content material shall be used. Coal slag abrasive shall be used on pipe and ferrous materials. Staurolite abrasive shall be used on concrete and concrete block.

5. Quality of surface preparations listed below are considered a minimum. If paint manufacturer requires a better preparation for a particular application, it shall be considered a requirement of this specification.
 6. All concrete surfaces shall be tested for moisture in accordance with ASTM D4263 and, if necessary, F1869. Surfaces shall also be verified that the pH of the cleaned concrete surface to be coated is within the range of 8 to 11.
- B. Ferrous Metal:
1. All ferrous metal to be primed in the shop shall have all rust, dust, and mill scale, as well as all other foreign substances, removed by abrasive blasting. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting.
 2. All ferrous metals not primed in the shop shall be abrasive-blasted in the field prior to application of the primer, pretreatment, or paint.
 3. Abrasive blasting of metals in the shop shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. Abrasive blasting of metals in the field for immersion service shall be in accordance with SSPC-SP 10 Near White Blast Cleaning. Abrasive blasting of metals in the field for nonimmersion service shall be in accordance with SSPC-SP6 Commercial Blast Cleaning.
 4. Solvent cleaning in accordance with SSPC-SP1 shall precede all abrasive-blasting operations.
 5. Ductile iron pipe shall be prepared by abrasive blasting per National Association of Pipe Fabricators NAPF 500-03-04 Abrasive Blast Cleaning.
 6. Prior to finish coating, all primed areas that are damaged shall be cleaned and spot-primed.
- C. Concrete:
1. All concrete surfaces, including precast concrete to be painted, shall be cleaned of all form oil, curing compound, and other foreign matter. Concrete floors containing oil and grease residues shall be cleaned with detergent to remove all residues.
 2. All new concrete and precast concrete walls, floors, and ceilings shall be abrasive-blast cleaned in accordance with SSPC-SP13/NACE No. 6 in order to prepare the surfaces for adherence of the painting systems as specified. Abrasive blasting of concrete shall result in a surface profile in accordance with ICRI No. 03732 at CSP-3 to CSP-5.
 3. Bug holes, pits, voids, and cracks shall be filled as specified in Section 03 30 00—Cast-In-Place Concrete without placing a friable sand-cement surface overall. The dried surface shall be stoned down.
 4. Paint manufacturer shall observe and approve the surface preparation method and the prepared surface prior to painting.
 5. After cleaning, the surface shall be washed and all dust, sand, and loose particles shall be removed by vacuuming. If CONTRACTOR elects to blow the surfaces off with air, it shall be oil-free air, and the methods shall conform to OSHA requirements.
- D. Galvanized: Where galvanized items are not submerged or buried, they shall be cleaned with nonhydrocarbon solvent cleaner (such as Clean N Etch) in accordance with SSPC-SP1 and shall be abrasive-blasted in accordance with SSPC-SP16 Brush-Off Blast Cleaning.
- E. Copper: Where copper piping is not submerged or buried, it shall be solvent-cleaned in accordance with SSPC-SP1 and shall be lightly sanded.

- F. PVC and CPVC: All PVC and CPVC to be painted shall be solvent-cleaned in accordance with SSPC-SP1 and shall be lightly sanded.

3.02 APPLICATION

- A. All materials shall be used as specified by the manufacturer's published data sheets and label directions.
- B. No paint shall be applied on a wet or damp surface and in no case until the preceding coat is dry and hard. Each coat shall be allowed to dry in accordance with manufacturer's data sheets before the next coat is applied.
- C. Drying time shall be construed to mean "under normal conditions." Where conditions are other than normal because of the weather or because painting must be done in confined spaces, other drying times will be necessary.
- D. Additional coats of paint shall not be applied, nor shall units be returned to service until paints are thoroughly dry and cured.
- E. Steel that will be inaccessible in the completed work shall receive the final coat before enclosure.
- F. Paint shall be applied to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, or other surface imperfections will not be acceptable. Tops and bottoms of walls and areas that are "cut-in" by brush prior to rolling shall have a uniform appearance in comparison with adjoining surfaces.
- G. Concrete block walls shall be back-rolled to achieve a pinhole-free surface coat.
- H. Walls and ceiling surfaces shall receive a minimum of one coat of paint before surface-mounted items such as conduits, boxes, piping, etc., are installed on these surfaces.
- I. Crevices and other hard-to-apply areas shall be back-rolled/back-brushed in conjunction with application of the first field coat of primer or intermediate coat. This includes, but is not limited to, between pipe flanges, pipe flange/pipe barrel joints, equipment fittings, and other narrow openings.
- J. No paint shall be applied to new or existing surfaces until joints have been caulked according to Section 07 90 00—Caulking and Sealants requirements, except at moving joints which shall be finish-painted before caulking or caulking shall be protected during painting.
- K. For PVC and CPVC piping, unions and valves shall not be painted.

- L. Graffiti-Resistant Coating for Masonry Installation:
 - 1. Comply with all of manufacturer's recommendations for surface preparation and application.
 - 2. Flood coats are required to provide graffiti-protection.
 - 3. Maintenance: Surfaces that have been properly treated to provide for easy removal of graffiti. Remove graffiti as soon as possible after surface has been defaced. Apply Mark A Way directly to the "tagged" surface and allow it to work for 5 to 8 minutes keeping substrate wet with cleaner. Agitate with a nylon brush and rinse thoroughly with water. A power washer (not to exceed 1,000 psi) may be required to completely remove graffiti. After surface has been cleaned and allowed to dry completely, it will continue to protect against graffiti penetration and permit additional cleaning cycles if necessary. In areas that receive multiple "taggings" and if graffiti removal becomes difficult, a reapplication of coating may be required.

3.03 FIELD QUALITY CONTROL

- A. Examination of work on the site by the manufacturer's representative shall be performed when requested by ENGINEER.

3.04 CLEANING

- A. All stains and marks shall be removed from other surfaces upon completion of the work.

3.05 SCHEDULE

- A. General:
 - 1. At the completion of the project, all painted surfaces which have been damaged shall be repainted or touched-up.
 - 2. See Finish Schedule on the drawings for an additional reference for areas to be painted.
 - 3. The painter shall use some discretion in what should and should not be painted. Do not paint over labels and other information, bronze, machined surfaces, moving parts where painting may impair movement, hot surfaces which may peel, etc. If in doubt whether a part should be painted, ask ENGINEER.
 - 4. Products listed first are Tnemec, second are Sherwin-Williams, and third are Carboline.
- B. New Work:
 - 1. All new work done by all trades shall be painted by CONTRACTOR in accordance with the following schedule and in accordance with paint manufacturer's recommendation. It is the intent of these specifications that all non-galvanized ferrous metal items scheduled for painting be shop-primed. If items are not shop-coated, surfaces shall be prepared and painted in the field as specified. If any items of new construction are not listed, CONTRACTOR shall request paint system from ENGINEER, and the items shall be painted as part of this Contract without additional cost.
 - 2. Interior concrete floors, including equipment bases:
 - a. One prime coat of 201 Epoxoprime, or ArmorSeal 1000 HS Epoxy (reduced), or Carboseal 720, hand broadcast antiskid sand into the wet paint between finish coats in locations as requested by OWNER, and two finish coats of 280 Theme-Glaze, or ArmorSeal 1000 HS Epoxy, or Carboseal 745.
 - b. See Section 03 30 00—Cast-In-Place Concrete for sealed concrete floors.

3. Interior concrete walls:
 - a. One filler coat (1/16-inch minimum thickness) Mortarclad 218, or Duraplate 2300, or Carboguard 510.
 - b. Two coats of Series N69 Hi-Build Epoxoline II, or Macropoxy 646, or Carboguard 890.

Note: Interior face of concrete tank walls and floors channels and pipe trenches are not to be painted.

4. All exposed concrete ceilings (ceilings of water-containing tanks are not considered exposed): Two coats of Series N69 Hi-Build Epoxoline, or Macropoxy 646, or Carboguard 890.
5. Cast or ductile iron; not submerged or buried (including pipes to be insulated):
 - a. One shop coat of N69-1255 Hi-Build Epoxoline, or Macropoxy 646 Beige, or Carboguard 890 as primer;
 - b. Touch-up prime coat prior to finish coating; and apply either:
 - (1) Two coats of N69 Hi-Build Epoxoline II, or Macropoxy 646, or Carboguard 890 for interior surfaces, or
 - (2) One coat of N69 Hi-Build Epoxoline II, or Macropoxy 646, or Carboguard 890 and one coat of 1074 Endura-Shield, or Acrolon 218HS, or Carbothane 134 HG for exterior surfaces.
6. Cast or ductile iron, tar coated; buried: Not painted.
7. Cast or ductile iron, submerged:
 - a. One shop coat Series 20HS or N69-1255 Epoxoline, or Dura-Plate 235 Beige, or Carboguard 890 as primer.
 - b. Touch-up prime coat prior to finish coating and one stripe coat on all edges of N69 Epoxoline, or Dura-Plate 235, or Carboguard 890.
 - c. Two coats of Series N69-Hi-Build Epoxoline II, (one coat) Sher-Glass FF.
8. Steel, machinery, and equipment; not submerged (including pipes to be insulated):
 - a. One shop coat of N69-1255 Hi-Build Epoxoline, or Macropoxy 646 Beige, or Carboguard 890 as primer.
 - b. Touch-up primer prior to finish coat, and either:
 - (1) Two coats of N69 Hi-Build Epoxoline II, or Macropoxy 646, or Carboguard 890 for interior surfaces; or
 - (2) One coat of N69 Hi-Build Epoxoline II, or Macropoxy 646; or Carboguard 890 and one coat of 1074 Endura-Shield, or Acrolon 218HS, or Carbothane 134 HG for exterior surfaces.

FIRST FIELD COAT SHALL BE APPLIED PRIOR TO INSTALLATION TO SURFACES INACCESSIBLE AFTER INSTALLATION.

9. Motors, gear drives, and doors delivered with nonepoxy primers:
 - a. Degrease per SSPC-SP1.
 - b. Lightly hand-sand per SSPC-SP2.
 - c. Apply one coat 135-1255 Chembuild Beige, or Macropoxy 646 Beige, or Carboguard 890.
 - d. Apply two finish coats as follows:
 - (1) Two coats of N69 Hi-Build Epoxoline II, or Macropoxy 646, or Carboguard 890 for interior surfaces, or

- (2) One coat of N69 Hi-Build Epoxoline II, or Macropoxy 646, or Carboguard 890 and one coat of 1074 Endura-Shield, or Acrolon 218HS, or Carbothane 134 HG for exterior surfaces.
 - 10. Steel, machinery, and equipment, submerged:
 - a. One shop coat Series 1 Omnithane (20HS or N69-1255 Epoxoline), or Dura-Plate 235 Beige, or Carboguard 890 as primer.
 - b. Touch-up prime coat prior to finish coating, and one stripe coat on all edges of N69 Hi-Build Epoxoline, or Dura-Plate 235, or Carboguard 890.
 - c. Two coats of N69 Hi-Build Epoxoline, or (one coat) Sher-Glass FF, or Carboguard 890 .
 - 11. Galvanized, copper, brass, CPVC, and PVC; not submerged or buried:
 - a. One coat of N69-1255 Hi-Build Epoxoline II, or Macropoxy 646, or Carboguard 890 and either:
 - b. Two coats of N69 Hi-Build Epoxoline, or Macropoxy 646, or Carboguard 890 for interior surfaces, or
 - c. One coat of N69 Hi-Build Epoxoline, or Macropoxy 646, or Carboguard 890 and one coat of 1074 Endura-Shield, or Acrolon 218HS, or Cabrothane 134 HG for exterior surfaces.
 - 12. Insulation of equipment, pipes, and ductwork:
 - a. Two coats of Series 1029 Endurotone, or DTM Acrylic B66100, or Carbocrylic 3359.
 - b. Colored PVC jacketing shall not be painted.
 - 13. Galvanized, copper, CPVC, and PVC; submerged or buried: Not painted.
 - 14. Aluminum items:
 - a. Exposed areas of structural items such as railings and grating shall not be painted.
 - b. For structural items in contact with concrete, see Division 05.
 - 15. Stainless steel: Not painted.
 - 16. Graffiti-Resistant Coating for Masonry: Exterior masonry work shall be coated with a low VOC clear coating to resist water absorption and provide easy removal of graffiti.
 - a. Provide DurAPell GS Series V626 as manufactured by Tnemec Co Inc., or Anti-Graffiti Coating 1K as manufactured by Sherwin Williams, or Blok-Guard & Graffiti Control VOC 15.
- C. Coverage:
- 1. Dry mil thickness shall conform to those specified. Mil test measurement shall conform to SSPC Steel Structures Painting Manual. Dry Film Thickness (DFT) shall be verified in accordance with SSPC-PA2.
 - 2. The coatings listed will provide the mil thickness given when applied at the coverages listed. Upon the request of ENGINEER, such surfaces shall be checked by the painter with a calibrated mil thickness gauge and any deficiencies found in the film shall be remedied by additional coat(s) at the expense of CONTRACTOR.
 - 3. On masonry, application rates will vary according to surface texture; however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative pinhole-free finish either by decreasing the coverage rate or by applying additional coats of paint.
 - 4. Coverages reflect manufacturer's recommendations using spray application techniques. Where brushing or rolling is specified or performed at the discretion of the painter, one additional coat, minimum, will be required to achieve total DFT as specified and recommended by the manufacturer.

	Sq. Ft.** Coverage	Dry Mil** Thickness Per Coat
Products		
1029 Endurotone, DTM Acrylic B66100	200	
N69 Hi-Build Epoxoline II, Macropoxy 646		
Steel or Impervious Substrate Primer Coat	---	4.0
Steel or Impervious Substrate Intermediate Coat(s)	---	5.0
Steel or Impervious Substrate Finish coat	---	5.0
135-1255 Chembuild, Macropoxy 646	335	4.0
Steel Doors	---	3.0
1074 Endura-Shield II, Acrolon 218HS	---	2.5
201 Epoxoprime, ArmorSeal 1000 HS Epoxy	250	
280 Tneme-Glaze, ArmorSeal 1000 HS Epoxy	250	
Epoxoblock WB 1254, Kem Cati-Coat HS	80	
N69 Hi-Build Epoxoline, Macropoxy 646 (Masonry and Concrete)	250	
Series 1 Omnithane, DuraPlate 235 (Primer)		3.0, 5.0
N69 Hi-Build Epoxoline II (Submerged)		6.0
Sher-Glass FF (Submerged)		12.0

** Roller or brush application requires two or more coats to obtain recommended film thickness. No allowance is made here for overspray, waste in handling, mixing, or application. Final total DFT shall be equal to that specified. Paint submittals shall note where roller or brush application is proposed and the paint manufacturer's recommendations of number of coats to achieve the required thickness shall be noted.

Primer, intermediate and/or final surface colors shall be of contrasting colors to promote coverage.

- D. Color: Unless otherwise indicated, all surfaces without a final finish color shall be painted. In general, colors will be differentiated as follows:
1. Ceiling.
 2. Grade floor.
 3. Lower level floors.
 4. Lower level concrete walls.
 5. Interior metal trim.
 6. Exterior metal trim (excluding louvers, stainless steel coping, and aluminum framing).
 7. Exterior piping and appurtenances (such as sluicgate stands and operators).
 8. Natural or anodized aluminum surfaces shall not be painted. Surfaces and equipment which are provided with a factory final finish shall not be painted.
 9. Stainless steel surfaces shall not be painted unless noted otherwise.
 10. Interior concrete walls of building (including masonry surfaces that are not glazed block surfaces).
 11. Safety items as necessary (bollards, hoist beams/trolley, etc.).

END OF SECTION

Section 09 91 00-10

SECTION 10 00 20

MISCELLANEOUS SPECIALTIES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Bulletin Board.
 - 2. Station Identification Plate.
 - 3. Staff Gauges
 - 4. Shop Desk.
 - 5. First Aid Kit.
 - 6. Fire Extinguishers.
 - 7. Clock.
 - 8. Trash Can.
 - 9. Office Chair.
 - 10. Pump Dolly.
 - 11. Stilling Well.
 - 12. Step Ladder.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

PART 2—PRODUCTS

2.01 BULLETIN BOARD

- A. Furnish and installed one two-panel bulletin board. Bulletin board panels shall be 1/4-inch cork mounted on hardboard. Overall dimensions shall be approximately 40 inches high, 36 inches long, 3 inches deep.

2.02 STATION IDENTIFICATION PLATE

- A. Furnish and secure in position and location, one cast bronze tablet for each such required tablet. The tablet shall be made by a firm specializing in bronze tablet work and shall be of best grade of statuary bronze. Lettering shall be arranged as directed and of a style to be selected. All lettering and designs to be of embossed type, milled and polished. Background shall be pebble finish, left rough. A full-size rubbing shall be submitted for approval before casting.
- B. Lettering shall read as shown on Drawings.

2.03 STAFF GAUGE

- A. Two staff gauges (one in the wet well and one in the discharge chamber), calibrated in feet and tenths of a foot, shall be provided to show depth of water. staff gauge range shall be from 0 feet to 25 feet for wet well and 0 feet to 4 feet for the discharge chamber.
- B. Each gauge shall be porcelain enameled iron rod. The rods shall be professional type, 2 1/2-inch wide minimum, with large bold markings of a height for the full height of the wet well.
- C. Each staff gauge shall be attached and supported using corrosion resistant hardware at locations to avoid conflict with level controls, etc.

2.04 SHOP DESK

- A. A metal shop desk shall be provided. The desk shall have a 43-inch high work surface and shall be approximately 53 inches high by 34.5 inches wide, by 30 inches deep. The unit shall have a rear top shelf riser, a 3.5-inch high drawer on nylon rollers, and a large storage compartment with locking door and adjustable shelf. The unit shall have 14 ga. corner posts and a minimum 20 ga. top and shall have a gray enamel painted finish.

2.05 FIRST AID KIT

- A. Furnish and install two first aid kits with brackets for wall mounting as directed in the pump room and electrical room. The kit shall be an 80 items kit.

2.06 FIRE EXTINGUISHERS

- A. Furnish and install three fire extinguishers as directed. The extinguishers shall be multipurpose Dry Chemical Type with a U.L. rating of 20A; 120B: C, 10-pound capacity in enameled steel containers. The extinguishers shall be installed with wall brackets of size required for type and capacity of extinguisher indicated.

2.07 CLOCK

- A. Furnish and install clock with synchronous motor type, 12-inch face, 120 V, 60 Hz.

2.08 TRASH CAN

- A. Trash can shall be made of polyethylene and the capacity shall be approximately 40- to 50-gallon industrial type with wheels/casters.

2.09 OFFICE CHAIR

- A. Chair shall have fabric upholstery. All chairs shall meet ANSI HFS100. Chair: Black. Black mesh back, polyester seat. Lever height adjustment.

2.10 PUMP DOLLY

- A. Furnish one pump dolly for moving pumps from the ground floor at elevation 817.00 to the well level floor.
- B. Dolly shall be the following design:
 - 1. Dolly shall be 48-inch by 30-inch with 18-inch deck height and 3,000-pound capacity, 12-gauge steel deck, flush edges, double grip T-bar handle, 1-inch axle and roller bearing wheels.
 - 2. Dolly shall easily be mobile when carrying heavy loads.

2.11 STILLING WELL

- A. Stilling well shall be provided as indicated on the Drawings and as specified herein. Stilling well shall be provided for the Float Control Systems specified under Division 26.
- B. Stilling wells for back-up float systems shall be constructed of 3/8-inch fiberglass consisting of 60% polyester resin and 40% glass material with stainless steel barrel slide bolt latch and stainless steel door hinges. Barrel shall stay firmly in place until the handle is lifted from the groove.
- C. All hardware and metal parts shall be all stainless steel.

2.12 STEP LADDER

- A. Provide a 20-foot portable, heavy-duty fiberglass extension ladder that meets OSHA safety standards. Ladder shall have a minimum weight capacity of 250 pounds.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions.

END OF SECTION

SECTION 20 05 53

IDENTIFICATION FOR PLUMBING AND HVAC PIPING AND EQUIPMENT

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included: Perform all work required to furnish and install equipment, valve, pipe, and wire identification with supplementary items necessary for proper installation as specified herein, or shown on the drawings. CONTRACTOR shall identify including, but not limited to, all equipment, valves, piping, ductwork, dampers, pumps, and wires.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00-Submittals.

1.03 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. ASME A13.1-Scheme for the Identification of Piping Systems.
 - 2. Illinois Plumbing Code.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging with labels clearly identifying product name and manufacturer until ready for installation.
- B. Storage: Store materials in clean, dry area indoors until ready for installation.
- C. Handling: Protect materials and finish from damage during handling and installation.

PART 2-PRODUCTS

2.01 MANUFACTURERS

- A. Equipment tags, valve tags, and pipe markers shall be manufactured by Marking Services, Incorporated, Seton Name Plate Company, WH Brady Company, or Graphic Products, Inc.

2.02 EQUIPMENT TAGS

- A. Plastic Labels For Equipment (Indoor Application):
1. Use: All equipment purchased by CONTRACTOR or OWNER and CONTRACTOR installed included in Divisions 22 or 23.
 2. Materials and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick.
 3. Character Color: Black.
 4. Background Color: White.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 1 inch by 3 inches.
 6. Minimum Letter Size: 1/4 inch.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment (Outdoor Application):
1. Use: All equipment purchased by CONTRACTOR or OWNER and CONTRACTOR installed included in Divisions 22 or 23.
 2. Material: Printed graphics protected by a chemical and UV resistant top laminate.
 3. Letter Color: Black.
 4. Background Color: White.
 5. Minimum Label Size: Length and width vary for required label content, but not less than 1 inch by 3 inches.
 6. Minimum Letter Size: 1/4 inch.
 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

2.03 PIPE MARKERS

- A. Manufacturers: Marking Systems, Inc., Seton Name Plate Company, W.H. Brady Company.
- B. Pipe markers shall conform to ANSI A13.1. Arrow markers must have same ANSI background colors as their companion pipe markers or be incorporated into the pipe identification marker.
- C. Pipe markers and arrow markers also shall be provided for all piping systems.
- D. Self-adhesive labels that stick directly to the pipe or insulation jacketing are not acceptable. Provide lettering in accordance with the following table.

PIPE MARK SIZE CHART

Outside Pipe Diameter (Including Covering)	Minimum Length of Label Field Color (Inch)	Minimum Height of Letters (Inch)
3/4 inch to 1 1/4 inch	8	1/2
1 1/2 inch to 2 inch	8	3/4
2 1/2 inch to 6 inch	12	1 1/4

PART 3-EXECUTION

3.01 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state, and local requirements and referenced standards and conform to code and ordinances of authorities having jurisdiction.
- B. Degrease and clean surfaces to receive nameplates.
- C. Install nameplates parallel to equipment lines.
- D. Affix nameplates with stainless steel screws or sticky-back adhesive.

END OF SECTION

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: This section includes information common to two or more technical plumbing specification sections or items that are of a general nature, not conveniently fitting into other technical sections.
- B. Related Sections and Divisions: Applicable provisions of Division 01 govern work under this section.

1.02 SUBMITTALS

- A. See Section 01 33 00—Submittals for shop drawing submittal procedures.
- B. Refer to Section 01 41 00—Regulatory Requirements for American Iron and Steel (AIS) requirements for shop drawing submittals.

PART 2—PRODUCTS

NOT APPLICABLE

PART 3—EXECUTION

3.01 CUTTING AND PATCHING

- A. Refer to Division 01, General Requirements, Cutting and Patching.

3.02 BUILDING ACCESS

- A. Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus. When the building access was not previously arranged and must be provided by this CONTRACTOR, restore any opening to its original condition after the apparatus has been brought into the building.

3.03 EQUIPMENT ACCESS

- A. Install all piping, conduit and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Prime Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Plumbing Contractor and installed by the General Prime Contractor.

Section 22 05 00-1

- B. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.

3.04 COORDINATION

- A. Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.
- B. Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

3.05 SLEEVES AND OPENINGS

- A. Pipe penetrations in new poured concrete horizontal construction requiring F and T rating: Form opening using hole form or core drill opening. Alternatively provide cast in place fire stopping devices/sleeves.
- B. Pipe penetrations in new poured concrete horizontal construction requiring F rating but no T rating: Same as pipe penetrations in new poured concrete construction requiring F and T ratings except that schedule 40 steel sleeves may also be used.
- C. Pipe penetrations in new poured concrete horizontal construction that do not require F or T ratings: Provide schedule 40 steel pipe sleeve, form opening using hole form or core drill opening.
- D. Pipe penetrations in existing concrete floors: Core drill openings.

3.06 SEALING

- A. Non-Rated Partitions: In wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, in accordance with manufacturer's instructions. . The bolt heads for the mechanical seal shall face the inside of the building to facilitate repair or replacement of the seal.

END OF SECTION

SECTION 22 05 23

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Valves of all descriptions except where indicated elsewhere.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within this specification.

1.03 QUALITY ASSURANCE

- A. Quality assurance shall be in accordance with Section 01 45 00—Quality Control.

1.04 SYSTEM DESCRIPTIONS

- A. Performance Requirements:
 - 1. Where valve types (ball, butterfly, etc.) are specified for individual plumbing services (i.e., domestic water, gas, etc.), each valve type shall be of the same manufacturer unless prior written approval is obtained from OWNER.
 - 2. Valves shall be line size unless specifically noted otherwise.

1.05 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.
- B. Schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves shall be used on the project. Temperature ratings specified are for continuous operation.

1.06 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under Section 01 33 00—Submittals.

PART 2-PRODUCTS

2.01 WASTE SYSTEM VALVES (SPD)

- A. Ball Valves (PVC) 3 Inches and Smaller: Hand-operated 150 psi union-type PVC ball valves, Chemtrol TU Series Tru-bloc, Hayward, Walworth. Valves and all components including O-rings shall be compatible with chemicals in piping. PVC valves and union shall not be painted.
- B. Ball Check Valves 3 Inches and Smaller: PVC body, Tru-union ends, suitable for installation in a horizontal or vertical line with flow upward.

PART 3-EXECUTION

3.01 GENERAL

- A. Properly align piping before installation of valves. Install and test valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.
- B. Mount valves in locations which allow access for operation, servicing and replacement.
- C. Install all valves with the stem in the upright or horizontal position. Valves installed with the stems down will not be accepted.
- D. Prior to flushing of piping systems, place all valves in the full-open position.

3.02 SHUT-OFF VALVES

- A. Install shut-off valves at each piece of equipment, at each branch take-off from mains for isolation or repair and elsewhere as indicated.

3.03 BALL CHECK VALVES

- A. Install ball check valves in as indicated. Provide check valves at sanitary sump pump discharges.

END OF SECTION

SECTION 22 05 29

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Hangers and supports for Plumbing Piping and Equipment.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within this specification.

1.03 QUALITY ASSURANCE

- A. Quality assurance shall be in accordance with Section 01 45 00—Quality Control.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.

1.05 OPERATION AND MAINTENANCE DATA

- A. All operations and maintenance data shall comply with the submission and content requirements specified under Section 01 33 00—Submittals.

PART 2—PRODUCTS

2.01 MANUFACTURERS

- A. Anvil, B-Line, Pate, G-Strut, Piping Technology, Roof Products & Systems.

2.02 STRUCTURAL SUPPORTS

- A. Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the Drawings.

2.03 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2-Inch through 2 Inches:
 - 1. Carbon steel, adjustable swivel ring.
 - 2. Carbon steel, adjustable clevis, standard.
- B. Hangers for Pipe Sizes 2 Inches and Larger: Carbon steel, adjustable clevis, standard.
- C. Wall Support:
 - 1. Carbon steel welded bracket with hanger. .
 - 2. Perforated, epoxy painted finish, 16-12 gauge, minimum, steel channels securely anchored to wall structure, with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp or provide manufacturers clamp and cushion assemblies.
- D. Vertical Support: Carbon steel riser clamp for above floor use.

2.04 PIPE HANGER RODS

- A. Steel Hanger Rods:
 - 1. Hanger rod shall be continuously threaded, complete with adjusting and lock nuts.
 - 2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
 - 3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, shall not exceed the limits indicated.

Maximum Load (pounds)	Rod Diameter (inches)
(650°F Maximum Temperature)	
610	3/8
1,130	1/2
1,810	5/8
2,710	3/4
3,770	7/8
4,960	1
8,000	1 1/4

2.05 BEAM CLAMPS

- A. Malleable black iron clamp for attachment to beam flange to 0.62 inch thick with a retaining ring and threaded rod of 3/8-, 1/2-, and 5/8-inch diameter. Furnish with a hardened steel cup point set screw.
- B. Forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1 1/2-inch diameter.

2.06 CONCRETE INSERTS

- A. Poured in Place:
 - 1. Wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8-inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity.
 - 2. Universal type to be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8 inch diameter.
- B. Drilled Fasteners: Carbon steel drop-in type expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

2.07 CONTINUOUS CONCRETE INSERT CHANNELS

- A. Steel inserts with an industry standard pre-galvanized finish, nominally 1 5/8-inch wide by 1 3/8-inch deep by length to suit the application, designed to be nailed to concrete forms and provide a linear slot for attaching other support devices. Installed channels to provide a load rating of 2,000 pounds per foot in concrete. Manufacturer's standard brackets, inserts, and accessories designed to be used with the channel inserts may be used. Select insert length to accommodate all pipe in the area.

2.08 ANCHORS

- A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.09 EQUIPMENT STANDS

- A. Use structural steel members welded to and supported by pipe supports. Clean, prime and coat with three coat rust inhibiting alkyd paint or one coat epoxy mastic. Where exposed to weather, treat with corrosive atmosphere coatings.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Size, apply and install supports and anchors in compliance with manufacturers recommendations.
- B. Install supports to allow free expansion of the piping system. Support all piping from the structure using concrete inserts, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.
- C. Coordinate hanger and support installation to properly group piping of all trades.
- D. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with

the channels may be substituted for the specified supporting devices provided that similar types are used and all data is submitted for prior approval.

- E. Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping insulation. Where a vapor barrier is not required, hangers may be installed either on the exterior of pipe insulation or directly on piping.
- F. Perform welding in accordance with standards of the American Welding Society.

3.02 HANGER AND SUPPORT SPACING

- A. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
- B. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.
- C. Use hangers with 1 1/2-inch minimum vertical adjustment.
- D. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
- E. Support riser piping independently of connected horizontal piping.
- F. Adjust hangers to obtain the slope specified in the piping section of these specifications.
- G. Space hangers for pipe as follows:

Pipe Material	Pipe Size	Maximum Horizontal Spacing	Maximum Vertical Spacing
PVC	All	4'-0"	10'-0"

- H. Any piping materials not explicitly listed above shall have pipe support provided at maximum spacing intervals as noted in the applicable code or manufacturer recommendations, whichever is more restrictive.

3.03 RISER CLAMPS

- A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

3.04 ANCHORS

- A. Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

SECTION 22 13 16

SANITARY WASTE AND VENT PIPING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: All plumbing pipe and pipe fittings for this project within and up to 5 feet from the building foundation wall.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work under this section.

1.02 QUALITY ASSURANCE

- A. Quality assurance shall be in accordance with Section 01 45 00—Quality Control.
- B. Order all copper, cast iron, steel, PVC, and polyethylene pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.
- C. Any installed material not meeting the specification shall be replaced with material that meets these specifications without additional cost to OWNER.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. CONTRACTOR shall provide schedule indicating the ASTM or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.
- C. CONTRACTOR shall provide statement from manufacturer on manufacturer's letterhead that pipe furnished meets the ASTM or CISPI specification contained in this section.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Promptly inspect shipments to review that the material is undamaged and complies with specifications.
- B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, aboveground packaging.

- C. Offsite storage agreements will not relieve CONTRACTOR from using proper storage techniques.
- D. Storage and protection methods must allow observation to verify products.

1.05 DESIGN CRITERIA

- A. Use only new material, free of defects, rust, and scale, and meeting the latest revision of ASTM or CISPI specifications as listed in this specification.
- B. Construct all piping for the highest pressures and temperatures in the respective system.
- C. Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings.
- D. Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

PART 2-PRODUCTS

2.01 SANITARY WASTE AND VENT

- A. Interior Above Ground, Pressurized: PVC plastic pipe, Schedule 40, Class 12454, where temperature will not exceed 130°F, ASTM D1784, ASTM D1785, with solvent cement joints, pressure rated, ASTM D2466, medium or long radius fittings; Primer, ASTM F656; Solvent, ASTM D2564.

PART 3-EXECUTION

3.01 GENERAL

- A. Install pipe and fittings in accordance with reference standards, manufacturers recommendations and recognized industry practices.

3.02 PREPARATION

- A. Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

3.03 ERECTION

- A. Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

- B. Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.
- C. Maintain piping in clean condition internally during construction.
- D. Provide clearance for installation of insulation, access to valves and piping specialties.
- E. Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.
- F. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.
- G. Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

3.04 THREADED PIPE JOINTS

- A. Use a thread lubricant or tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

3.05 SOLVENT WELDED PIPE JOINTS

- A. Install in accordance with ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.
- B. Maintain pipe, fittings, primer, and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3-inch and smaller piping only) or clean natural bristle brushes about half the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4 to 5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of 2 installers is required on piping 4 inches and larger. Hold joint for 30 seconds or until set. Reference manufacturer recommendations for initial set time before handling and for full curing time before pressure testing. Cold weather solvent/cement may be utilized only under unusual circumstances and when specifically approved by OWNER.

3.06 SANITARY WASTE AND VENT

- A. Verify invert elevations and building elevations prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/4-inch per foot where possible and in no case less than 1/8-inch per foot for piping 3 inches and larger.

3.07 PIPING SYSTEM LEAK TESTS

- A. Drainage and Vent System:
 - 1. Subject gravity drainage and vent piping and joints to a test pressure and duration as outlined in the schedule at the end of this section. If, at end of indicated test duration, the level of the water has been lowered by leakage, the leaks must be found and stopped and the water level shall again be raised to the level described and the test repeated until, after another test duration period, there shall be no perceptible lowering of the water level in the system being tested.
 - 2. Piping located above sensitive areas and/or equipment that may be damaged or become contaminated because of test water leakage shall be tested with air. Air test may also be performed when allowed by ENGINEER. Isolate the test section from all other sections and slowly fill pipe with oil-free air until there is a uniform gauge pressure of 5 pounds per square inch. The air pressure shall be regulated to prevent the pressure inside the pipe from exceeding 5.0 psig. This pressure shall be held for a test period of at least 15 minutes. Any adjustments to the test pressure required because of changes in ambient temperature or the seating of gaskets shall be made prior to the beginning of the test period.
 - 3. Should the completion of these tests leave any reasonable question of a doubt relative to the integrity of the installation, additional tests or measures shall be performed to demonstrate the reliability of these systems to ENGINEER.
 - 4. Test plugs must extend outside the end of pipe to provide a visible indication for removal after the test has been completed.
 - 5. Each floor drain P-trap that has successfully passed pressure testing shall be proven clean and free of debris as follows:
 - a. A request shall be submitted to OWNER, identifying the quantity and location of drain(s) to be observed.
 - b. Vacuum out each floor drain P-trap. An observation of the trap shall be performed to verify that the trap is debris free.
 - c. Perform a free-flowing test by pouring two 5-gallon buckets of water down the floor drain.
 - d. After confirming that the floor drain trap is clean and free of debris, review that the trap is filled with water.
 - e. At the discretion of ENGINEER, an observation of the trap using a sewer scope may be required in addition to, or in lieu of, a vacuum procedure.
 - 6. OWNER may require that any portion of the drainage, waste, and vent systems installed be proven undamaged, clean and free of debris. Verification of the interior condition of piping shall be accomplished using a sewer scope or other method as acceptable to ENGINEER.

- B. Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.
- C. If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints.
- D. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.
- E. Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.
- F. Entire test shall be witnessed by OWNER or ENGINEER.

	Test	Final Test	
System	Medium	Pressure	Duration
Pressurized Sanitary Waste and Vent	Water	100 psig	2 hours

END OF SECTION

SECTION 22 13 29

SUBMERSIBLE SUMP PUMPS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Sump pumps and associated accessories with capacities as shown in the Mechanical Drawing schedules.
- B. Related Sections and Divisions: Applicable provisions of Division 01 govern work under this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within this specification.

1.03 QUALITY ASSURANCE

- A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the Drawing.
- B. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. New start-up shall be for the purpose of determining alignment, lubrication, voltage, and amperage readings. Proper electrical connections, pump rotation, and discharge and suction gauge readings shall be provided in start-up report. A copy of the start-up report shall be made and sent to both CONTRACTOR and to ENGINEER.
- C. Provide standard sump pump equipment manufactured by a company with no less than five years of experience in the manufacture of such equipment. Manufacturer shall have installed a minimum of five installations of comparable sized sumps.
- D. Pump and controls shall be suitable for operation in areas classified as Class I, Division II, hazardous locations.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.

- B. Include data concerning dimensions, required clearances, capacities, materials of construction, ratings, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.
- C. Submittals for motors associated with equipment specified in this section shall include data sheets from the motor manufacturer. Data sheets from the equipment manufacturer or supplier are not acceptable.
- D. Submit manufacturer's installation instructions.
- E. Submittals must be specific to this project. Generic submittals will not be accepted.
- F. Complete drawings of sump pumps, controls, and miscellaneous piping appurtenances.
- G. Pump performance data.
- H. GPM (gallons per minute).
- I. Total Dynamic Head (TDH) in feet.
- J. Voltage.
- K. Phase.
- L. Frequency (Hz).
- M. Pump Warranty. Warranty shall begin after the date of final acceptance.
- N. Painting Procedure and data sheets for shop prime coats.
- O. Provide Operation and Maintenance manuals.
- P. Spare parts list.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs, if required for handling.
- B. Materials that could be damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- C. Store materials in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- D. Use all means necessary to protect equipment before, during, and after installation.

- E. All scratched, dented, and otherwise damaged units shall be repaired or replaced at no additional cost to OWNER.

1.06 OPERATION AND MAINTENANCE DATA

- A. Include installation instructions, assembly views, lubrication instructions, recommended maintenance schedule and activities.
- B. Include replacement and spare parts lists.

1.07 WARRANTY

- A. Standard One-Year Warranty from the date of Final Acceptance of the entire Project by ENGINEER.: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion of the project.

PART 2-PRODUCTS

2.01 PLUMBING EQUIPMENT

- A. Sump Pumps:
 - 1. Manufacturers: Submersible sump pump(s) shall be manufactured by Hydromatic (H), Myers (M), PACO (P), or Zoeller (Z). Furnish and install complete sump pump system(s) as shown on the Drawing and specified herein. The complete system shall include pumps, electric controls, level controls, and all accessories.
 - 2. Type: Submersible pumps shall be constructed of epoxy-coated cast iron shell, cast iron volute, two-vane enclosed semiopen or recessed vortex nonclog cast iron pump. Impeller shall be cast iron with a stainless steel shaft and stainless steel fasteners and have upper and lower ball bearings. Pump shall be oil-lubricated or factory-sealed grease lubricated with a ceramic mechanical seal. Pump shall be capable of passing 1 1/2-inch solids.
 - 3. Motors: The motor shall be explosion-proof, submersible-type, ball-bearing design, and oil-filled with built-in thermal overload protection sized for nonoverloading over the entire pump curve. Motor housing shall be filled with dielectric pure, clean insulating oil. Motor shall have precision mechanical seal to prevent leakage into the housing. Seal faces shall be carbon and ceramic, super lapped for long leakproof life. Power cord and float switch cords shall be provided in lengths adequate to reach the control panel as provided by pump manufacturer. Pump motor shall be nonoverloading over the entire curve. Pump motor shall accept 208-volt, single-phase power.
 - 4. Controls:
 - a. Electrical components specified within this section shall be provided in accordance with Division 26-Electrical Specifications and Section 40 94 23-Controls and Instrumentation Equipment. All electrical equipment and controls specified to be furnished with the equipment shall comply with the requirements of Division 26.
 - b. Control Panel: A NEMA 12 control panel with controls as indicated below shall be furnished. The control panel shall include combination starters for each pump, circuit breaker, H-O-A switches, green "Run," and red "Fault" push-to-test indicating light,

- elapsed time meters, red "HWL" push-to-test indicating light, and a duplex alternator. Provide red beacon and horn.
- c. The following equipment shall be included with the control panel. This represents the minimum equipment required. Additional equipment may be required base on system operating requirements, manufacture design and NEC.
- (1) A thermal magnetic circuit breaker with operating handle shall be provided to protect the motor from short circuits and to serve as a motor branch circuit disconnect as required by the NEC. The operating handle shall be accessible from the front of the enclosure and have provisions for "lock-out". The operating mechanism shall not be through the door of the enclosure. Manufacturer shall be responsible for sizing the circuit breaker per NEC for protection of their equipment.
 - (2) A magnetic starter shall be provided for the pump motor. The starter shall be equipped with a bimetallic overload relay.
 - (3) A control transformer shall be provided to supply 120 volts for the control circuit.
 - (4) The transformer shall be a continuous duty, machine tool type, sized to meet the load requirements of the control circuit. The transformer primary shall be connected to the load side of the circuit breaker. One side of the secondary winding shall be grounded to the component mounting panel. A two pole, 600 VAC, 30 ampere rated fuse block shall be provided for transformer primary winding; a one pole, 250 VAC, 30 ampere fuse block will be provided for the secondary winding. Fuses shall be sized to protect the transformer in accordance with requirements of the NEC.
 - (5) Sump pump moisture sensing relay.
 - (6) Control power "ON/OFF" selector switch to control power to the floats and circuitry for additional protection.
 - (7) Intrinsic safety barriers for each float switch to interface with sump pump control. Float switches shall we wired intrinsically safe.
 - (8) Terminal blocks shall be provided for connection of level controls and other control wiring as required for proper pump installation. Provide a minimum of 10% spare terminal blocks.
 - (9) The control shall be wired in accordance with all applicable requirements of the NEC. Control wiring shall be 16 AWG minimum red for control circuits and white for neutral grounded conductors. Power wiring shall be a minimum of 9 AWG black. All grounded conductors shall be green. Each conductor shall be numbered. All wiring shall be performed in a net and orderly manner.
 - (10) Any other ancillary equipment required to insure proper system operation.
- d. Sequence of operation:
- (1) Manual Operation: When the Hand-Off-Selector switch is in the "Hand" position, the sump pump will start. The sump pump will continue to run until the selector switch is returned to the "Off" position or when the water level in the sum pit is below the "Stop" level sensor float switch activation level.
 - (2) Automatic Control: When the Hand-Off-Selector switch is in the "Auto" position, the sump pump will start when the water level in the sump pit is above the "Start" float switch activation level. The sump pump will continue to run until the selector switch is returned to the "Off" position or when the water level in the sum pit is below the "Stop" level sensor float switch activation level.

- e. Provide a "Stop," "Start," and "High Water" level sensor floats, all adjustable, with mounting rods and electric cables. CONTRACTOR shall be responsible for sizing the required cables between the control panel and sump pump pit.
- 5. Accessories:
 - a. Rails: Dual stainless steel liftout guide rails with stainless steel wall, pump and sump brackets. Provide bronze and neoprene quick-disconnect fitting and corrosion-proof pull chain or cable.
 - b. Sump Cover: Cover shall be open grating as indicated on the drawings. Pump discharges, vent, level control, and power cables shall enter the sump through the top of the sump.
 - c. Piping: Provide dual check valves, full port ball valves, union or flange for each pump discharge, and flexible connectors.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Plumbing system shall be installed in accordance with local plumbing requirements and applicable portions of the Illinois Plumbing Code. Where requirements conflict, the stricter standard shall apply.
- B. Install all piping, conduit, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the general contractor, making sure that access is available for all equipment and specialties. Where access is required in plaster walls or ceilings, furnish the access doors to the general contractor.
- C. CONTRACTOR shall identify piping, valves, and outlets in accordance with Division 09 and Section 20 05 53-Identification for Plumbing and HVAC Piping and Equipment.
- D. Install plumbing equipment where indicated in accordance with manufacturer's recommendations. Coordinate equipment location with piping, ductwork, conduit, and equipment of other trades to allow sufficient clearances. Locate equipment and arrange plumbing piping to provide access space for servicing all components.
- E. Startup and test equipment adjusting operating and safety controls for proper operation.
- F. Lubricate pumps before start-up. Remove suction diffuser strainers after initial system flushing and cleaning. Turn over to OWNER.
- G. Install pumps in accordance with manufacturer's instructions. Set level and plumb.
- H. Test fixtures to demonstrate proper operation. Replace malfunctioning units or components.
- I. Provide isolation valves at plumbing equipment.

3.02 TESTING AND CLEANING

A. General:

1. The water used for tests shall be obtained from a potable source of supply.
2. Prepare testing reports. If testing is performed in segments, submit separate report for each segment, complete with diagram or clear description of applicable portion of piping. After testing has been accepted for portions thereof, certify in writing the time, date, name, and title of the persons reviewing the test. This shall also include the description of what portion of the system has been accepted. A complete record shall be maintained of all testing that has been accepted and shall be made available at the jobsite. Upon completion of the work, all records and certifications regarding testing shall be submitted to ENGINEER before final payment is made.
3. Gauges used for testing shall have increments as follows:
 - a. Tests requiring a pressure of 10 psi or less shall use a testing gauge having increments of 0.10 psi or less.
 - b. Tests requiring a pressure of greater than 10 psi but less than or equal to 100 psi shall use a testing gauge having increments of 1 psi or less.
 - c. Tests requiring a pressure of greater than 100 psi shall use a testing gauge having increments of 2 psi or less.
4. Defective work or material shall be reworked and replaced and test repeated. Repairs shall be made with new materials. Pipe dope, caulking, tape, dresser couplings, etc., shall not be used to correct deficiencies.
5. For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

3.03 SUMP PUMP COMMISSIONING

- #### A. Final Checks Before Startup: Perform the manufacturers recommended preventive maintenance operations and checks before startup, including the following.
1. Check that pumps are free to rotate by hand. Do not operate pump, if bound or even drags slightly, until cause of trouble is determined and corrected.
 2. Check that pump controls are correct for required application.
- #### B. Starting procedure for pumps with shutoff power not exceeding safe motor power:
1. Start motors.
 2. Open discharge valves.
 3. Observe leakage from stuffing boxes and adjust sealing liquid valves for proper flow to provide lubrication of packing. Let packing "run in" before reducing leakage through stuffing boxes; then tighten glands.
 4. Check general mechanical operation of pumps and motors.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC EQUIPMENT

PART 1—GENERAL

1.01 SCOPE

- A. This section includes specifications for supports of all HVAC piping and equipment and materials as well as piping system anchors.

1.02 RELATED WORK

- A. Section 23 07 13—Ductwork Insulation for Heating, Ventilation, and Air Conditioning.

1.03 REFERENCE

- A. Applicable provisions of Division 01 shall govern work under this section.

1.04 REFERENCE STANDARDS

- A. MSS SP-58—Materials, Design, Manufacture, Selection, Application, and Installation

1.05 DESCRIPTION

- A. Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for pressure piping.
- B. Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.
- C. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.
- D. Protect insulation at all hanger points; see Related Work above.

1.06 SHOP DRAWINGS

- A. Refer to Division 01, General Conditions, Submittals.
- B. Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for each pipe size and type of service.

1.07 DESIGN CRITERIA

- A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58, unless noted otherwise.
- B. Piping connected to base mounted pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100 pipe diameter/3 support distance.
- C. Piping flexible connections and vibration isolation supports are required for piping connected to coils that are in a fan assembly where the entire assembly is mounted on vibration supports; the vibration isolation supports are required for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Piping flexible connection and vibration isolation supports are not required when the fan section is separately and independently isolated by means of vibration supports and duct flexible connections. Standard pipe hangers/supports as specified in this section are required when there are no vibration isolation devices in the piping and beyond the 100 pipe diameter/3 support distance.
- D. Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.
- E. Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine maintenance, etc.

PART 2-PRODUCTS

2.01 SUPPORT MANUFACTURERS

- A. Acceptable manufacturers include Anvil, B-Line, G-Strut, Fee and Mason, Kindorf, Michigan Hanger, Unistrut.

2.02 STRUCTURAL SUPPORTS

- A. Provide all supporting steel required for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.

2.03 HANGERS AND SUPPORTS

- A. Wall Support:
 - 1. Welded steel bracket with hanger.
 - 2. Perforated epoxy painted finish, 16-12 gauge min., steel channels securely anchored to wall structure with interlocking, split type, bolt secured, galvanized pipe/tubing clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic

isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp or provide manufacturers clamp and cushion assemblies.

B. Steel Hanger Rods:

1. Threaded both ends, threaded one end, or continuous threaded, black finish.
2. Size rods for individual hangers and trapeze support as indicated in the following schedule.
3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (pounds)	Rod Diameter (inches)
(650°F Maximum Temperature)	
610	3/8
1,130	1/2
1,810	5/8
2,710	3/4
3,770	7/8
4,960	1
8,000	1 1/4

4. Provide rods complete with adjusting and lock nuts.

2.04 CONCRETE INSERTS

- A. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

2.05 ANCHORS

- A. Use welding steel shapes, plates, and bars to secure piping to the structure.

2.06 CORROSIVE ATMOSPHERE SUPPORTS

- A. Supports for ductwork and equipment located in the wet well shall be 316SS meeting the performance as indicated above.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.
- B. Piping shall be supported independently from ductwork and all other trades.

- C. Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes for the supporting steel.
- D. Perform all welding in accordance with standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

3.02 VERTICAL RISER CLAMPS

- A. Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

3.03 ANCHORS

- A. Install where indicated on the Drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Balancing air systems.
 - 2. Thermal performance testing.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. ASHRAE 11—Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air Conditioning, and Refrigeration Systems.
 - 2. SMACNA—HVAC Systems Testing, Adjusting, and Balancing.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. Prior to final balancing, submit a preliminary report that includes the following design information for all control modes. Design information shall be from approved shop drawings. Report shall compare design and field tested data.
 - 1. For each supply, return and exhaust register, and ceiling outlet:
 - a. Room number.
 - b. Type of register and outlet and catalog size.
 - c. Air flow factor.
 - d. Design CFM and velocity.
 - e. Actual CFM and velocity.
 - f. Percent of design CFM.
 - g. Room pressure relationship.
 - 2. For each fan:
 - a. Unit number.
 - b. Fan size and wheel type.
 - c. Motor horsepower.
 - d. Motor nameplate voltage and amps.
 - e. Design CFM and static pressure (total pressure).
 - f. Actual CFM and static pressure (total pressure).

- g. Actual fan RPM.
- h. Actual motor voltage and amps (each phase).
- 3. Testing includes:
 - a. Checking all systems and components to verify that they meet Contract Document requirements for capacity, system operation, and control function.
 - b. Checking for proper flow directions.
 - c. Checking of all voltages for each motor.
 - d. Checking that all motors rotate in the correct direction and at the correct speed.
 - e. Checking all motors for possible overload (excess amperage draw) on initial start-up.
 - f. Checking systems for leaks.
- C. Provide summary sheet describing mechanical system deficiencies. Where not physically observable, provide pressure and/or flow readings to demonstrate suspected deficiencies. Describe objectionable noise or drafts found during testing, adjusting, and balancing. All deficiencies shall be corrected prior to final balancing.
- D. Upon completion of final balancing, provide updated report indicating thermal performance testing and changes to system during final balancing for all control modes including updated airflows, pressures, velocities, etc. Final report shall be submitted prior to substantial completion.

1.04 QUALITY ASSURANCE

- A. Obtain services of an independent testing organization to perform testing and balancing work. The organization shall have a certified membership in the Associated Air Balance Council (AABC) or certification by the National Environmental Balancing Bureau (NEBB).
- B. Division 23 shall provide a technician and/or controls contractor to observe and assist in balancing the system. Balancing report must include verification of participation, including name and contact information of assisting party.
- C. Comply with American Society of Heating, Refrigerating and Air- Conditioning Engineers, Inc. (ASHRAE) recommendations pertaining to measurements, instruments and testing, adjusting and balancing, except as otherwise indicated and NEBB "Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems."

PART 2-PRODUCTS

2.01 BALANCING EQUIPMENT

- A. CONTRACTOR shall have the following minimum equipment for balancing systems:
 - 1. Duct air velocities below 1,000 fpm: Pitot tube velometer and duct-jet using zero to 1,000 fpm range.
 - 2. Supply Register Velocities: Velometer and applicable jet.
 - 3. Fan Rotative Speed: Tachometer or RPM counter and stop watch (1-minute reading, minimum).
 - 4. Contact pyrometer 0 to 300°F range.

5. Inclined manometer 0 to 30 inches of water.
 6. Instruments used for measurements shall be accurate, and calibration shall be calibrated by the manufacturer or an AABC-approved method.
 7. Instruments shall be applied in accordance with manufacturer's instructions.
- B. All instruments used for measurements shall be accurate, and calibration histories for each instrument to be available for examination upon request. Calibration and maintenance of all instruments to be in accordance with the requirements of NEBB or AABC Standards.

PART 3-EXECUTION

3.01 PRELIMINARY BALANCING

- A. Division 23 shall provide an experienced installer to review the air distribution system with the testing and balancing agency for completion to confirm the test openings and volume dampers indicated on the drawings or called for in the specifications are installed, that dampers are in the open position, that the fans operate properly during all control modes, air filters are clean, and that the system is ready for balancing. Add test openings, volume dampers, air scoops, deflectrols, turning vanes, etc., as required. Adjust and change fan drives and belts, remove and reinstall ceilings, air terminals, access doors, and air devices as required to balance the system. Maintain the air handling equipment in good operating condition during the testing and balancing procedures.

3.02 PRESSURE DIAGRAM

- A. Provide a diagram indicating, at minimum, the static pressure at the following points while system is operating at 100% airflow.
1. Supply fan inlet.
 2. Supply fan outlet.
- B. Coordinate with Division 23 and equipment manufacturer to obtain readings where access is difficult or limited. Lack of readings due to inaccessibility will not be accepted.

3.03 SCHEDULE OF TOLERANCES

- A. Final air system measurements shall be within the following range of specified cfm:
1. Fans: 0% to +10%.
 2. Supply grilles, registers, diffusers: 0% to +10%.
 3. Return/exhaust grilles, registers: 0% to -10%.

3.04 GENERAL REQUIREMENTS

- A. Perform testing, balancing, and adjusting procedures in accordance with AABC or NEBB, unless specified below.
- B. Contact the Division 26 contractor for assistance in operation and adjustment of controls during testing, adjusting, and balancing procedures. Cycle controls and verify proper

operation and setpoints. Include in report description of temperature control operation for all control modes and any deficiencies found.

- C. Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.
- D. Division 23 shall correct any installation deficiencies found by the test and balance agency that were specified and/or shown on the Contract Documents to be performed as part of that division of work, including sheave and pulley replacement or corrections to the controls system. Test and balance agency shall notify CONTRACTOR of these items and instructions will be issued to Division 23 for correction of the deficient work. Testing and balancing reports shall be submitted only after all deficiencies have been corrected and balancing completed upon the corrected system.
- E. The contractor shall include the cost of new sheaves and belts if it becomes necessary to change the drives during balancing of system.
- F. Mark equipment settings, including damper control positions, fan speed control levers, and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.
- G. Balancing contractor shall coordinate damper position settings with temperature control contractor to verify airflows and positions. Include time for this verification. See HVAC controls specification for time included by temperature controls contractor to work with balancing contractor.
- H. Balancing contractor to work with temperature control contractor and HVAC contractor to verify correct operation of entire HVAC system, before submitting report.
- I. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

END OF SECTION

SECTION 23 07 13

DUCTWORK INSULATION FOR HEATING, VENTILATION, AND AIR CONDITIONING

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes:
 - 1. Rigid board fiberglass insulation.
 - 2. Adhesives, mastic, sealants, and reinforcing materials.
 - 3. Jacketing.
 - 4. Accessories.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ASTM B117—Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 2. ASTM C168—Standard Terminology Relating to Thermal Insulation.
 - 3. ASTM C272—Water Absorption of Core Materials for Sandwich Constructions.
 - 4. ASTM C547—Standard Specification for Mineral Fiber Pipe Insulation.
 - 5. ASTM C518—Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 6. ASTM C591—Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - 7. ASTM C612—Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - 8. ASTM C916—Standard Specification for Adhesives for Duct Thermal Insulation.
 - 9. ASTM C1071—Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - 10. ASTM C1290—Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 - 11. ASTM C1427—Standard Specification for Extruded Preformed Flexible Cellular Polyolefin Thermal Insulation in Sheet and Tubular Form.
 - 12. ASTM D1000—Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications.
 - 13. ASTM E84—Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 14. ASTM E96—Standard Test Methods for Water Vapor Transmission of Materials.
 - 15. FED L-P-535E: Plastic Sheet (Sheeting); Plastic Strip: Poly (Vinyl Chloride) And Poly (Vinyl Chloride-Vinyl Acetate), Rigid.

16. EPA Method 8260B–Volatile Organic Compounds By Gas Chromatography/Mass Spectrometry (Gc/Ms).
17. NFPA 262–Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00–Submittals.
- B. Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, and fitting materials, along with safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

- A. All components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the Drawings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs, if required for handling.
- B. Materials that could be damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- C. Store materials in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- D. Use all means necessary to protect insulation before, during, and after installation.
- E. All scratched, dented, and otherwise damaged insulation shall be repaired or replaced at no additional cost to OWNER.

1.06 GENERAL REQUIREMENTS

- A. Unless otherwise indicated, all duct covering, jackets, insulation, vapor barriers, adhesive, and mastics shall have flame spread rating of 25 or less and smoke spread rating of 50 or less when tested in accordance with ASTM E84.

PART 2–PRODUCTS

2.01 RIGID BOARD FIBERGLASS INSULATION

- A. Acceptable manufacturer is Johns Manville Spin-Glas Series 814, Owens Corning Type 703, or Knauf Insulation Board.

- B. Insulation shall be mineral fiber type conforming to ASTM C612.
- C. Minimum nominal density shall be 3 lbs/ft³.
- D. K-factor shall not exceed 0.23 (btu-in)/(hr-ft²-°F) at 75°F mean.
- E. Insulation shall be rated for service to 450°F.

2.02 ADHESIVES, MASTIC, SEALANTS, AND REINFORCING MATERIALS

- A. Products shall be compatible with surfaces and materials on which they are applied and shall be suitable for use at operating temperatures of systems to which they are applied.
- B. All adhesives used for ductwork insulation shall conform to ASTM C916, Type II.
- C. Fiberglass Insulation Adhesive. Acceptable Manufacturers: Foster 85-60, Childers CP-127, and Duro Dyne SSG.
- D. Vapor Retarding Mastic:
 - 1. Acceptable Manufacturers: Foster 30-65 Vapor Fas, Childers CP-34, and Vimasco 749.
 - 2. For ductwork insulation operating below 50°F, mastic water vapor permeance shall be less than 0.03 perms at 45 mils dry film thickness conforming to ASTM E96.
 - 3. Use insulation joint sealant at all joints. Acceptable manufacturers are Foster 95-50 Flextra, Childers CP-76 Chil-Byl, or Pittsburgh Corning CW Sealant.
- E. Weather Barrier Breather Mastic:
 - 1. Acceptable Manufacturers: Foster 46-50 Weatherite, Childers Vi-Cryl CP-10/CP-11, or Vimasco WC-5.
 - 2. For ductwork insulation operating at 50°F or above, mastic water vapor permeance shall be greater than 1.0 perms at 1/16-inch dry film thickness conforming to ASTM E96.

2.03 JACKETING

- A. Self-Adhering Jackets (SAJ):
 - 1. Jackets shall be 5-ply, self-adhering multiple laminated waterproofing material with reflective aluminum foil, high density polymer films and cold weather acrylic adhesive providing zero (0.0) moisture permeance.
 - 2. Jackets in Class I Division 2 areas shall be 4-ply poly vinyl fluoride, self-adhering multiple laminated waterproofing material with reflective aluminum foil, high density polymer films and cold weather acrylic adhesive providing zero (0.0) moisture permeance.
 - 3. Minimum material thickness shall be 6 mils.
 - 4. Minimum puncture resistance shall be 25 lbs conforming to ASTM D1000.

2.04 ACCESSORIES

- A. All products shall be compatible with surfaces and materials on which they are applied and be suitable for use at operating temperatures of the systems to which they are applied.

- B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.
- C. Insulation bands shall be 3/4-inch wide, constructed of aluminum or stainless steel. Minimum thickness shall be 0.015 inch for aluminum and 0.010 inch for stainless steel.
- D. Staples shall be clinch style.
- E. Tack fasteners shall be stainless steel ring grooved shank tacks.
- F. Joint sealants and metal jacketing sealants shall be non-shrinking and permanently flexible.

PART 3-EXECUTION

3.01 GENERAL

- A. All insulation damaged during construction shall be replaced in accordance with these specifications.
- B. All insulation shall be applied in accordance with the manufacturer's written recommendations. Destructive methods such as sheet metal screws are not acceptable.
- C. Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates.
- D. All duct insulation shall be continuous through walls, ceiling or floor openings and through sleeves except where firestop or firesafing materials are required.

3.02 RIGID BOARD FIBERGLASS INSULATION INSTALLATION

- A. Provide finished edges at all access doors and ends of insulation.
- B. Provide additional insulation trim pieces over flanged ductwork joints to completely insulate and seal to the thickness specified.
- C. For exterior ductwork, insulate duct such that minimum thickness is maintained and is sloped/peaked to shed water.
- D. Flexible connections from ducts to HVAC equipment shall not be insulated.

3.03 PROTECTIVE JACKET INSTALLATION

- A. Self-Adhering Jackets (SAJ):
 - 1. Install according to manufacturer's recommendations. Cut allowing minimum 4-inch overlap on ends and 6 inches on longitudinal joints. Align parallel to surface. Remove release paper and press flat to surface to avoid wrinkles. Rub entire surface

for full adhesion and sealing at joint overlaps. On exterior applications, provide a bead of compatible caulk along exposed edges.

2. Wrap elbows, fittings, valves and butt joints with two layers of vapor retarding tape. Vapor retarding tape shall be compatible with the jacket material used.

3.04 DUCTWORK INSULATION

A. Provide insulation on new ductwork as indicated in the following schedule:

Service	Insulation	Jacket	Thickness
Exhaust/Relief Ducts from Exterior to 12 Inches Beyond Damper	Rigid Board Fiberglass	SAJ	2.0"
Outside Intake and Exhaust Damper Frames	Rigid Board Fiberglass	SAJ	2.0"

END OF SECTION

SECTION 23 09 13

TEMPERATURE CONTROLS AND INSTRUMENTATION

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Electrical components.
 - 2. Dampers and actuators.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit under provision of Section 01 33 00—Submittals.
- B. Submittal shall include control schematics with wiring and logic diagrams in addition to equipment information. All wiring shall be color coded and labeled at each end with corresponding numbers in accordance with Section 20 05 53—Identification for Plumbing and HVAC Piping and Equipment. This numbering shall be shown on the shop and record drawings. Wiring diagrams shall be job-specific and indicate all point-to-point wiring connections. Manufacturer's standard wiring diagrams are not acceptable.

1.03 QUALITY ASSURANCE

- A. Temperature control equipment including panels and other standard marketed apparatus shall bear the nameplate of the manufacturer. The entire system including temperature control wiring shall be installed by mechanics employed by or under contract to the temperature control provider, a factory-licensed distributor, or factory-licensed dealer. The provider shall be responsible for the quality and satisfactory operation of all materials.
- B. All control panels shall bear a serialized UL label.
- C. Comply with the National Electrical Code (NFPA 70) and any and all local codes as applicable to construction of electrical wiring devices, material, and equipment herein specified.

PART 2—PRODUCTS

2.01 ELECTRICAL COMPONENTS

- A. Provide electrical work in accordance with Division 26. All line voltage wiring and conduit shall be provided by Division 26 contractor.

2.02 DAMPERS AND ACTUATORS

A. Outside Air Intake and Exhaust Outlet:

1. Dampers shall be TAMCO Series 9000 BF, Alumavent Series 3900SS, or Arrow AFDTI-25LT, thermally insulated control damper with aluminum construction. Dampers for Class I, Division 2 environments shall be provided with an anodized coating and stainless steel linkage.
2. Dampers shall be parallel blade.
3. Extruded aluminum (6063T5) damper frame shall be thermally broken, minimum 0.080 inch thickness. Damper frame to be 4 inches deep and shall be insulated with polystyrene on four sides. Damper shall be rated at a leakage of less than 8.0 cfm per square foot at 4.0 inches of water column pressure differential at 20°F.
4. Blades to be extruded aluminum (6063T5), internally insulated with non-CFC, expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55 as tested in accordance with AMCA Standard 511.
5. Blade gaskets shall be extruded EPDM; blade seals shall be silicone.
6. Shaft to actuator shall be hex type, material to match damper construction.
7. Side seals shall be silicone.
8. Dampers shall be flanged to duct type. Clear opening in damper shall be same size as ductwork.

B. Actuators:

1. Actuators shall be Belimo NFBUP, Honeywell MS4110, or Siemens GCA, maintenance-free actuator rated at minimum 88 in-lb. of torque. Dampers shall be power-to-open, spring-closed and to fail position indicated on Drawings. Provide auxiliary switch where noted on drawings. Actuator shall be capable of accepting 120-volt power for operation and control.
2. Actuators shall include electronic overload protection and visual position indication throughout range of motion.
3. Actuators shall include a manual override via a manufacturer-supplied hex crank.
4. Actuator enclosure:
 - a. Unless noted otherwise, NEMA 2 housing.
 - b. Where actuators are located in Class I, Division 2 rated spaces, provide explosion-proof (NEMA 7) housing.
5. All actuators shall be direct-coupled to damper and mounted outside the air stream utilizing motor mounting bracket unless otherwise noted. CONTRACTOR shall verify suitability of mounting bracket prior to ordering.
6. If auxiliary switch is not used, terminate cord in nearest junction box.
7. All actuators shall be of the same manufacturer. Manufacturer shall be responsible for furnishing quantity of actuators required to meet minimum damper torque rating, plus an additional 10% torque.
8. Actuators shall have a minimum operating range of -22°F to 122°F.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Install all equipment in accordance with manufacturer's recommendations and Division 26.
- B. Coordinate location of exposed devices prior to rough-in. Thermostats shall be mounted where shown on the drawings. Thermostats on exterior walls shall have insulated bases.
- C. Install all dampers in accessible locations with ample space to install direct-coupled actuator, housing and accessories.

3.02 SEQUENCE OF OPERATION

- A. Devices and control logic for the following equipment shall be provided by the Division 26 contractor. Refer to Section 40 94 23–Controls and Instrumentation.
 - 1. EF-1.
 - 2. EF-2.
 - 3. SF-1.
 - 4. SF-2.
 - 5. EF-3.
- B. Controls for electric unit heaters (EUH) shall be provided by Division 26 contractor. Thermostats shall be suitable to meet room electrical rating. Control power shall be from control power transformer at unit.
- C. Controls for split system (SS) shall be provided by manufacturer. Thermostat shall be as indicated in equipment specifications.

END OF SECTION

SECTION 23 31 00

DUCTWORK AND DUCTWORK SUPPORTS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Duct Pressure/System Class.
 - 2. Duct Materials.
 - 3. Fasteners, Hangers and Supports.
 - 4. Duct Sealants and Gaskets.
 - 5. Ductwork Fabrication.

1.02 REFERENCES

- A. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. Provide layout drawing for review prior to ductwork fabrication. Layout drawings shall be coordinated between all other trades prior to review.

1.04 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01 77 00—Contract Closeout.
- B. Record actual locations and sizes of ducts and duct fittings. Record changes in fitting location sizes and types. Show additional fittings used.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA—HVAC Duct Construction Standards—Metal and Flexible.

1.06 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A standards.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

- B. Maintain recommended minimum temperatures during and after installation of duct sealants.
- C. Ductwork shall be stored indoors or in durable, waterproof, abovegrade packing.

1.08 DUCTWORK DESIGN

- A. Duct layout and design shown on the Drawings are based on design of supply, return and exhaust system components. Any changes to the design for installation shall be submitted to and approved by OWNER and ENGINEER. Proposed changes shall be submitted with layout and pressure drop calculations. CONTRACTOR shall be responsible for the cost of any changes to the duct system or any system components.

PART 2-PRODUCTS

2.01 DUCT PRESSURE/SYSTEM CLASS (METAL DUCTWORK)

- A. Ductwork shall be constructed to the static pressure class as shown below, unless otherwise noted:
 - 1. Supply ductwork: 2-inch positive pressure class.
 - 2. Exhaust air ductwork: 2-inch negative pressure class.
 - 3. Outside air ductwork: 2-inch negative pressure class.

2.02 DUCT MATERIALS

- A. All sheet metal used for construction of duct shall be 24 gauge, or heavier, except for round ductwork 12 inches and smaller shall be 26 gauge where allowed by SMACNA.
- B. Stainless Steel Ducts: ASTM A240/A240M and A480/A480M, Type 316 as indicated on Drawings. Provide Number 2B finish.

2.03 FASTENERS, HANGERS, AND SUPPORTS

- A. Ductwork shall be supported in accordance with SMACNA–HVAC Duct Construction Standards–Metal and Flexible. Secure wire method of support is not acceptable.
- B. Inserts and Fasteners:
 - 1. Concrete inserts installed prior to pouring shall be manufactured inserts. Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Acceptable manufacturers include Hilti, Rawl, and Redhead.
 - 2. Concrete fasteners installed after pouring shall be epoxy-type.
 - 3. Fasteners to ductwork shall be 316 stainless steel, unless otherwise indicated.
- C. Hangers: Hanger rod shall be 316 stainless steel. Rods shall be continuously threaded.
- D. Supports:
 - 1. Duct support material shall be as noted below.

2. Acceptable supports for trapeze hangers are steel angles or uni-strut. Exposed ductwork shall be supported by steel angle supports painted to match duct.
 3. Riser supports shall be angles or channels secured to the sides of the duct with welds or fasteners.
 4. Provide all supporting steel required for the installation of ductwork and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.
- E. Corrosive Atmosphere Coatings: Steel supports and fasteners shall be used in tanks and wet wells shall be 316 stainless steel.

2.04 DUCT SEALANTS AND GASKETS

- A. Sealant shall be UL classified for flame and smoke development and shall be suitable for mating materials.
- B. Gaskets at flanged joints shall be butyl rubber or EPDM.

2.05 DUCTWORK FABRICATION

- A. Rectangular Field and Shop Fabricated Ductwork:
1. Fabricate and support in accordance with SMACNA–Duct Construction Standards–Metal and Flexible. Duct material, gauges, reinforcing, joint types and sealing shall be in accordance with required pressure class in the standard.
 2. Construct tees, bends, and elbows with radius of not less than 1 1/2 times width of duct on centerline. Where not possible, rectangular elbows may be used with turning vanes in accordance with Section 23 33 00–Air Duct Accessories.
 3. Increase duct sizes gradually, not exceeding 15 degree divergence wherever possible; maximum 30 degree divergence upstream of equipment and 45 degree convergence downstream.
 4. Provide 45 degree expanded entry takeoffs unless otherwise indicated. Flange ductwork for attachment to grille registers and outlets, unless otherwise noted.
 5. Provide reinforcement and rigidity required for pressure class.
 6. Provide cross breaking or cross beading on duct sides larger than 18 inches.
 7. Seal all joints airtight with gaskets and sealants.
- B. Round Manufactured Ductwork and Fittings:
1. Fabricate and support in accordance with SMACNA–Duct Construction Standards–Metal and Flexible. Duct material, gauges, reinforcing, joint types and sealing shall be in accordance with required pressure class in the standard.
 2. Ductwork shall be fabricated spiral seam round.
 3. Ductwork shall be constructed with locktight spiral grooved seams, gored elbows with centerline radius of 1 1/2 times the duct diameter, and male/female fittings. Conical tees, conical 45 degree laterals, conical bellmouth taps, and fittings shall be used.
 4. Seal all joints airtight with gaskets and sealants.
 5. Where grilles and registers are shown to be tapped into ductwork sides, the entire assembly including the round duct section and the rectangular tap shall be fully welded and provided by the manufacturer.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards-Metal and Flexible.
- C. Duct sizes are inside clear dimensions.
- D. Provide openings in ductwork to accommodate testing equipment and controllers. Where openings are provided in insulated ductwork, install a metal insulation sleeve of same material as ductwork.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities. Make all necessary incidental changes in cross-section, offsets, etc., to avoid interference with other equipment and supports.
- F. Supports:
 - 1. Use double nuts and lock washers on threaded rod supports.
 - 2. Strip hangers are not acceptable.
 - 3. Inserts shall be coordinated with general contractor for installation in concrete.
 - 4. The weight of the ductwork shall be supported independently of connected equipment.
- G. Connect air diffusers, registers, and grilles to supply and return ducts directly. Where registers and grilles are to be mounted on exposed ductwork, provide flanged opening for finished appearance.
- H. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- I. Provide an experienced installer to go through the air distribution system with the balancer.
- J. Any modifications to the ductwork shown on the Drawings must be reviewed by ENGINEER prior to installation.

3.02 CLEANING AND PROTECTION

- A. Clean air handling unit and ductwork prior to the installation of textile ductwork system unit-by-unit as it is installed. Clean external surfaces of foreign substance which may cause corrosive deterioration of facing.
- B. Temporary Closure: At ends of ducts which are not connected to equipment or distribution devices at time of ductwork installation, cover with polyethylene film or other covering which will keep the system clean until installation is completed.

END OF SECTION

SECTION 23 33 00

AIR DUCT ACCESSORIES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Air turning devices.
 - 2. Duct access doors.
 - 3. Duct test holes.
 - 4. Flexible duct connections.
 - 5. Duct screens.
 - 6. Balancing dampers.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. NFPA 90A—Installation of Air Conditioning and Ventilating Systems.
 - 2. SMACNA—HVAC Duct Construction Standards—Metal and Flexible.
 - 3. UL 33—Heat Responsive Links for Fire-Protection Service.
 - 4. UL 555—Fire Dampers and Ceiling Dampers.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. Damper submittals shall include actual pressure drop, free area, and torque requirements for each type of damper provided.
- C. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - 1. Special fittings.
 - 2. balancing damper installations.
 - 3. Wiring Diagrams: For power, signal, and control wiring.

1.04 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01 77 00–Contract Closeout.
- B. Record actual locations of access doors, fire dampers, flexible duct connections, dampers, and screens.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products in accordance with manufacturers recommendations and Section 01 60 00–Materials and Equipment.

1.06 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion of the project.

PART 2–PRODUCTS

2.01 AIR TURNING DEVICES

- A. Provide factory-fabricated metal air turning vanes in all square elbows and bends according to SMACNA Standards. Turning vanes shall be constructed of the same material specified for the ductwork.

2.02 DUCT ACCESS DOORS

- A. Provide access doors for ductwork. Access door hinge and cover shall be constructed of material similar to that specified for ductwork. Provide insulated access doors where ductwork is insulated. All access doors shall be gasketed.

2.03 DUCT TEST HOLES

- A. Provide complete with gaskets and screw caps. Coordinate test hole height with insulation thickness.
- B. On uninsulated ductwork only, plastic pull-tab centered tapered plugs may be used. Plugs shall have minimum diameter of 0.36-inch.

2.04 FLEXIBLE DUCT CONNECTIONS

- A. Flexible duct connections in rated spaces shall be fluorocarbon resin-coated glass fabric. Fabric shall be suitable for continuous operation up to 500°F. Fabric shall have zero leakage at ± 8 inches water column.

2.05 DUCT SCREENS

- A. Provide screens 3/4 inches square, 12-gauge sheet metal with border frame for protection on open duct inlets and outlets, and as indicated on the Drawings. Frame and screen shall be of similar material to ductwork.

2.06 BALANCING DAMPERS

- A. All balancing dampers shall be provided with locking devices to hold the dampers in a fixed position without vibration. Single blade dampers shall be stiffened to operate in a stable manner.
 - 1. Balancing dampers for rectangular metal ductwork 12 inches high or less and for round metal ductwork shall be single blade manual balancing dampers of same material as specified for the ductwork. Dampers shall conform to SMACNA standards for single blade-type volume dampers.
 - 2. Balancing dampers for rectangular ductwork over 12 inches high shall be multi-blade volume dampers of same material as specified for the ductwork. Damper blades shall be 3V type of 16-gauge construction. Bushings shall be nylon. Axles shall be 1/2-inch diameter. Blade operation shall be opposed. Damper shall include an indicator to show position of the blades. Where dampers are installed in vertical ductwork, provide dampers with jamb seals designed for vertical duct installation.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards-Metal and Flexible. Refer to Section 23 31 00-Ductwork and Ductwork Supports for duct construction and pressure class.
- B. Provide duct access doors for inspection and cleaning before and after intake louver screens, filters, coils, fans, automatic dampers, at fire dampers, underneath duct smoke detectors, and elsewhere as indicated. Provide minimum 8-inch by 8-inch size for hand access, 18-inch by 18-inch size for shoulder access, and as indicated.
- C. Division 23 shall be responsible for coordinating with testing and balancing agency and providing test holes in all locations required for testing and balancing agency to complete their scope of work.
- D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment. Metal-to-metal gap shall be approximately 4 inches.
- E. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts for air balancing and where indicated on the Drawings. Install minimum two duct widths from duct takeoff.

- F. Provide balancing dampers on duct takeoff to diffusers, grilles, and registers regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

SECTION 23 34 13

AXIAL HVAC FANS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Mixed flow fans.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. AMCA 99—Standards Handbook.
 - 2. AMCA 210—Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - 3. AMCA 300—Reverberant Room Method for Sound Testing of Fans.
 - 4. AMCA 301—Method for Calculating Fan Sound Ratings from Laboratory Test Data.
 - 5. ASTM B117—Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 6. NFPA 70—National Electrical Code.
 - 7. NEMA MG 1—Motors and Generators.

1.03 QUALITY ASSURANCE

- A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the Drawings.
- B. Fans shall bear AMCA-certified rating seals.
- C. Electrical components shall be UL listed for the service specified.
- D. Electrical components and work shall be in accordance with the National Electrical Code.
- E. Fan motors shall be sized such that the fan brake horsepower shall be less than 90 percent of the motor's rated horsepower, excluding service factor.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.

- B. Include data concerning dimensions, required clearances, capacities, materials of construction, ratings, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification. Include plans, elevations, sections, and details.
- C. Submittal shall include fan-specific performance curves showing airflow, head, and motor horsepower.
- D. Submit manufacturer's installation instructions and recommendations.
- E. Submittals must be specific to this project. Generic submittals will not be accepted.
- F. Hanging and support requirements should follow the recommendations in the manufacturer's installation instructions.
- G. If not already included in the items above, additional submittal information shall include:
 - 1. Plans, elevations, sections, and attachment details.
 - 2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Diagrams for power, signal, and control wiring.
 - 4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs, if required for handling.
- B. Materials damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- C. Store materials in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- D. Use all means necessary to protect equipment before, during, and after installation.
- E. All scratched, dented, and otherwise damaged units shall be repaired or replaced.
- F. Motors, shafts and bearings shall be protected from weather and dust.

1.06 OPERATION AND MAINTENANCE DATA

- A. Include installation instructions, assembly views, lubrication instructions, recommended maintenance schedule and activities.

- B. Include replacement and spare parts lists.

1.07 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion of the date of final acceptance of the project.

PART 2-PRODUCTS

2.01 MIXED FLOW FANS

- A. Acceptable manufacturers are Greenheck, Cook, or Twin City Fans.
- B. Mixed flow fans shall be of the belt-driven mixed flow type. Fan performance shall be as indicated on equipment schedules. Fans shall be UL listed.
- C. Impeller construction shall be cast aluminum airfoil. A standard square key or tapered bushing shall lock the propeller to the motor shaft. Impeller shall be statically and dynamically balanced.
- D. The housing shall be constructed of continuously welded, heavy gauge steel so that there is no leakage. Provide access panels for servicing drives and motors.
- E. The fan shall be quiet operating and vibration free. Fan performance shall include AMCA-certified air and sound ratings and AMCA seal. Furnish and install spring-type vibration isolators provided by fan manufacturer.
- F. Belt drives shall have a sliding or pivoting motor plate for belt tensioning. The belt and motor shall be totally enclosed by a guard with tachometer holes. The motor shall be mounted out of the airstream. The fan motor shall be totally enclosed, fan-cooled, and NEMA-approved ball-bearing type. Starters and disconnects shall be provided as noted on equipment schedules.
- G. Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled static pressure. The motor furnished with the fan shall not operate into the motor service factor when operating under these conditions.
- H. Provide a fan and motor suitable for Class I, Division 2 environments where Drawings or schedules indicate.
- I. Belt-driven fan shafts shall be mounted in prelubricated ball bearing pillow blocks. Bearings shall be sealed and rated for 200,000 hours.
- J. All surfaces of the fan, screens, guards, etc. shall be coated with 2 to 3 mils of polyester powder coating. Wheel shall be rebalanced statically and dynamically by the fan

manufacturer after application of the coatings. Color shall be selected by OWNER. Submit color chart with shop drawings.

PART 3-EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify ENGINEER of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.
- B. Install in accordance with manufacturer's instructions and approved submittals. Test for proper operation and adjust until satisfactory results are obtained.
- C. Install units with vibration isolators as recommended or supplied by manufacturer.
- D. Provide flexible duct connections on all duct connections to unit in accordance with Section 23 33 00-Air Duct Accessories.
- E. Provide lubrication line extenders as required to allow regreasing of bearings without removal of equipment components.
- F. Provide all mounting hardware and accessories necessary for complete installation.
- G. Touch-up, repair or replace damaged products at no additional cost to OWNER.
- H. Installation of all equipment furnished under this Contract shall be supervised by a qualified representative of the equipment manufacturer. All equipment shall be placed in operation, and plant operators/building maintenance personnel shall be trained to the satisfaction of OWNER by a qualified representative of the equipment manufacturer. OWNER may videotape training presentations given by manufacturer's representatives. Final payment for various items of equipment will not be made by OWNER until the equipment is operating to their satisfaction.

- I. CONTRACTOR shall pay all costs for revisions of drawings by ENGINEER. Any changes shall be coordinated and provided at no additional cost to OWNER.

END OF SECTION

SECTION 23 34 16

CENTRIFUGAL HVAC FANS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Sidewall centrifugal fans.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. AMCA 99—Standards Handbook.
 - 2. AMCA 210—Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - 3. AMCA 300—Reverberant Room Method for Sound Testing of Fans.
 - 4. AMCA 301—Method for Calculating Fan Sound Ratings from Laboratory Test Data.
 - 5. ASTM B117—Standard Practice for Operating Salt Spray (Fog) Apparatus.
 - 6. NFPA 70—National Electrical Code.
 - 7. NEMA MG 1—Motors and Generators.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. Include data concerning dimensions, required clearances, capacities, materials of construction, ratings, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification. Include plans, elevations, sections, and details.
- C. Submittal shall include fan-specific performance curves showing airflow, head, and motor horsepower.
- D. Submit manufacturer's installation instructions and recommendations.
- E. Submittals must be specific to this project. Generic submittals will not be accepted.
- F. Hanging and support requirements shall follow the recommendations in the manufacturer's installation instructions.

- G. If not already included in the items above, additional submittal information shall include:
 - 1. Plans, elevations, sections, and attachment details.
 - 2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Diagrams for power, signal, and control wiring.
 - 4. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
 - 5. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights

1.04 QUALITY ASSURANCE

- A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.
- B. Fans shall bear AMCA-certified rating seals.
- C. Electrical components shall be UL listed for the service specified.
- D. Electrical components and work shall be in accordance with the National Electrical Code.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs, if required for handling.
- B. Materials that could be damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- C. Store materials in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- D. Use all means necessary to protect equipment before, during, and after installation.
- E. All scratched, dented, and otherwise damaged units shall be repaired or replaced at no additional cost to OWNER.
- F. Motors, shafts and bearings shall be protected from weather and dust.

1.06 OPERATION AND MAINTENANCE DATA

- A. Include installation instructions, assembly views, lubrication instructions, recommended maintenance schedule and activities.
- B. Include replacement and spare parts lists.

1.07 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion or the date of final acceptance of the project.

PART 2-PRODUCTS

2.01 SIDEWALL CENTRIFUGAL FANS

- A. Acceptable manufacturers are Greenheck, Cook, or Twin City Fans.
- B. Sidewall centrifugal fans shall be of drive type listed on drawing schedules. Fan installation shall include drain trough and bird guard. Fan performance shall be as indicated on drawings schedules. Fans shall be UL listed.
- C. The fan housing shall be aluminum with all fasteners either aluminum or stainless steel.
- D. All fan wheels shall be aluminum construction, have backward-inclined or forward-curved blades, and the fan wheel shall be statically and dynamically balanced.
- E. The entire drive assembly shall be mounted on neoprene vibration isolators to provide quiet, vibration-free operation. Fan performance shall include AMCA-certified air and sound ratings, and fans shall bear the AMCA seal.
- F. The fan motor shall be totally enclosed, fan-cooled, and shall be NEMA-approved. Motor shall be provided with a 1.15 service factor. Starters and disconnects shall be provided as noted on equipment schedules.
- G. Provide a fan and motor suitable for Class I, Division 2 environments where schedules indicate.
- H. Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled static pressure. The motor furnished with the fan shall not operate into the motor service factor when operating under these conditions.
- I. The belt-driven fan shafts shall be mounted in prelubricated sealed ball bearing pillow blocks. Bearings shall have a minimum L_{10} life of 100,000 hours. Belt drives shall have an adjustable motor plate for belt tensioning. Belt driven motors and drives shall be mounted out of the airstream.
- J. Provide an aluminum wire bird guard on the fan's discharge.
- K. All surfaces of fan and bird screen shall be coated with 2 to 3 mils of polyester powder coating. Wheel shall be rebalanced statically and dynamically by the fan manufacturer after application of coating. Color to be selected by OWNER. Submit color chart with shop drawings.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.
- B. Install in accordance with manufacturer's instructions and approved submittals. Test for proper operation and adjust until satisfactory results are obtained.
- C. Install units with vibration isolators as recommended or supplied by manufacturer.
- D. Provide flexible duct connections on all duct connections to unit in accordance with Section 23 33 00-Air Duct Accessories.
- E. Provide lubrication line extenders as required to allow regreasing of bearings without removal of equipment components.
- F. Provide all mounting hardware and accessories necessary for complete installation.
- G. Touch-up, repair or replace damaged products at no additional cost to OWNER.
- H. Installation of all equipment furnished under this Contract shall be supervised by a qualified representative of the equipment manufacturer. All equipment shall be placed in operation, and plant operators/building maintenance personnel shall be trained to the satisfaction of OWNER by a qualified representative of the equipment manufacturer. OWNER may videotape training presentations given by manufacturer's representatives. Final payment for various items of equipment will not be made by OWNER until the equipment is operating to their satisfaction.
- I. CONTRACTOR shall pay all costs for revisions of drawings by ENGINEER. Any changes shall be coordinated and provided at no additional cost to OWNER.

END OF SECTION

SECTION 23 37 08

LOUVERS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Louvers.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. ADC 1062—Certification Rating and Test Manual.
 - 2. AMCA 500—Test Method for Louvers, Dampers, and Shutters.
 - 3. ARI 650—Air Outlets and Inlets.
 - 4. ASHRAE 70—Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
 - 5. NFPA 90A—Installation of Air Conditioning and Ventilating Systems.

1.03 QUALITY ASSURANCE

- A. Performance of air terminals shall be in accordance with ADC 1062.
- B. Louvers shall be tested and certified in accordance with AMCA 500 and shall bear the AMCA seal.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. Include a louver schedule that includes louver model, screen type, screen location, louver size, finish type, free areas, face velocity, and pressure drop for each louver.
- C. Submit manufacturer's installation instructions and recommendations.
- D. Submit color selection chart with submittal for selection by OWNER.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage.
- B. Materials that could be damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- C. Store materials in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- D. Use all means necessary to protect equipment before, during, and after installation.
- E. Scratched, dented, and otherwise damaged units shall be repaired or replaced with no additional cost to OWNER.

PART 2-PRODUCTS

2.01 LOUVERS (EXTRUDED ALUMINUM)

- A. See Drawings for sizes and locations.
- B. Blades and frame shall be extruded aluminum 6063-T5 alloy and 0.08-inch thickness.
- C. Blades shall be 35-degree drainable type spaced at 4 inches on center. Louver shall be capable of a velocity of 1,077 fpm with no water penetration. Performance shall include AMCA-certified air and moisture penetration data and louver shall bear the AMCA seal. Vertical and horizontal mullions and connections between panels shall not be exposed.
- D. Provide channel frame unless noted otherwise on the Drawings.
- E. Provide aluminum screen on louver (type and location) in accordance with louver schedule and detail on the Drawings. All fastenings shall be stainless steel or aluminum. Screen frame shall be painted to match louver. Paint shall be by manufacturer or per Section 09 91 00-Painting.
- F. Louver free area shall be equal to or greater than damper free area.
- G. Louvers shall be furnished with three coats of PVDF finish with custom color selected by OWNER. Submit manufacturer's standard color chart with shop drawings.

PART 3-EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

- B. If substrate preparation is the responsibility of another installer, notify ENGINEER of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.
- B. Install in accordance with manufacturer's instructions, drawing details, and approved submittals.
- C. Clean surface of louvers after installation.

END OF SECTION

SECTION 23 37 13

DIFFUSERS, REGISTERS, AND GRILLES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Diffusers, registers, and grilles.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. ADC 1062—Certification Rating and Test Manual.
 - 2. AMCA 500—Test Method for Louvers, Dampers, and Shutters.
 - 3. ARI 650—Air Outlets and Inlets.
 - 4. ASHRAE 70—Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
 - 5. NFPA 90A—Installation of Air Conditioning and Ventilating Systems.

1.03 QUALITY ASSURANCE

- A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the Drawings.
- B. Performance of air terminals shall be in accordance with ADC 1062.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. Include data concerning dimensions, required clearances, capacities, materials of construction, ratings, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.
- C. Submittal shall include a schedule that includes model, size, and finish type.
- D. For product requiring color selection, provide a hard copy color chart to OWNER for color selection.
- E. CONTRACTOR shall provide all required sizes and quantities as shown on Drawings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs, if required for handling.
- B. Materials that could be damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- C. Store materials in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- D. Use all means necessary to protect equipment before, during, and after installation.
- E. All scratched, dented, and otherwise damaged units shall be repaired or replaced at no additional cost to OWNER.

PART 2-PRODUCTS

2.01 DIFFUSERS, REGISTERS, AND GRILLES

- A. Acceptable manufacturers are Carnes (C), Price (P), Nailor (N), or Titus (T). Submit standard color chart with shop drawings for selection by OWNER.
- B. SG-1: Stainless steel supply grilles for sidewall and surface mounting shall be (C) RLDB, (N) 67DH, (T) 300RL-SS, or (P) 720. Grilles shall be 304 stainless steel construction with double deflection blades.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.
- B. Install in accordance with manufacturer's instructions and approved submittals.
- C. Provide all mounting hardware and accessories necessary for complete installation.
- D. Clean surface of diffusers, grilles, and registers after installation.
- E. Drawings and specifications are based on the scheduled manufacturer and model number. CONTRACTOR shall be responsible for the cost of any changes because of substitutions or alternates of other manufacturers or model numbers including but not limited to, structural, mechanical, and electrical work. CONTRACTOR shall pay all costs for revisions of drawings

by ENGINEER. Any changes shall be coordinated and provided at no additional cost to OWNER.

END OF SECTION

SECTION 23 81 26

SPLIT-SYSTEM AIR CONDITIONERS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Split systems (SS).
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. ASHRAE 15—Safety Code for Mechanical Refrigeration.
 - 2. ASHRAE 62—Ventilation for Acceptable Indoor Air Quality.
 - 3. ASHRAE 90A—Energy Conservation in New Building Design.
 - 4. NFPA 70—National Electrical Code.
 - 5. NFPA 90A—Installation of Air Conditioning and Ventilating Systems.
 - 6. UL900—Test Performance for Air Filter Units.

1.03 QUALITY ASSURANCE

- A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the Drawings.
- B. Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session.
- C. Electrical components shall be UL listed for the service specified.
- D. Electrical components and work shall be in accordance with the National Electrical Code.
- E. Insulation and insulation adhesive shall comply with NFPA 90A requirements for flame spread and smoke generation.
- F. Direct expansion coils shall be designed and tested in accordance with ASHRAE 15 Safety Code for Mechanical Refrigeration, latest edition.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.

- B. Include data concerning dimensions, required clearances, capacities, materials of construction, ratings, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification. Include plans, elevations, sections, and attachment details. Include details of equipment assemblies.
- C. Project specific wiring diagrams for power, signal, and control.
- D. Submit manufacturer's installation instructions and recommendations.
- E. Submittals must be specific to this project. Generic submittals will not be accepted.
- F. Hanging and support requirements shall follow the recommendations in the manufacturer's installation instructions.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs, if required for handling.
- B. Materials that could be damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- C. Store materials in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- D. Use all means necessary to protect equipment before, during, and after installation.
- E. All scratched, dented, and otherwise damaged units shall be repaired or replaced at no additional cost to OWNER.

1.06 OPERATION AND MAINTENANCE DATA

- A. Include parts list, installation instructions, assembly views, lubrication instructions, recommended maintenance schedule and activities.

1.07 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion or the date of final acceptance of the project.

PART 2-PRODUCTS

2.01 SPLIT SYSTEM (SS)

- A. Acceptable manufacturers are LG, Mitsubishi, or Daikin.

B. General:

1. Split system unit shall be an indoor wall-mounted evaporator/blower section and matching outdoor condensing section.
2. Systems shall bear the ARI label showing that the system is ARI 210 or 240, and 270 Certified. Systems shall be listed by ETL Testing Laboratories and bear the ETL label. Matching systems shall meet or exceed the minimum Federally mandated Seasonal Energy Efficiency Rating (SEER) of 13, as certified by the ARI testing programs.
3. Matching indoor and outdoor sections shall be connected by deoxidized, annealed refrigerant copper tubing, type "L" cleaned and capped. All systems shall have flared refrigeration connections on both indoor and outdoor sections.
4. Systems indoor and outdoor sections shall be completely factory assembled and wired with a precharge of refrigerant. A single power source shall provide voltage to both the outdoor and indoor units. Electrical wire and connections to outdoor section and between indoor and outdoor sections shall be sized, installed and grounded by the installer in conformance with the National Electrical Code (NEC), local codes, as well as manufacturer's instructions.
5. System shall be equipped with a microprocessor control system with an infrared remote controller with LCD display, that provides access to all system functions, and transmits room conditions and programs to the indoor microprocessor every 3 minutes. Infrared remote controller shall be capable of operating system mounted up to 26 feet from the indoor section according to manufacturer's recommendations and instructions. System shall have the capability of continuous operation in the case of a lost or damaged remote controller, utilizing a factory-installed integral manual switch in conjunction with the system microprocessor.

C. System Remote Controller: Controller shall include system mode selection, programmable temperature control, 24-hour programmable timer, automatic three-speed indoor fan speed control, constant fan speed selection, night setback mode, user selectable room temperature sensor located on either wired remote controller or indoor unit multiple system control using a single wired controller.

D. Outdoor Condensing Section:

1. Outdoor condensing section shall be factory assembled, wired, piped, and precharged with a start-up amount of R-410a refrigerant.
2. Unit shall be constructed of G90 galvanized steel with corrosion-inhibiting, acrylic, baked-on enamel finish.
3. Unit shall be furnished with a high-efficiency, rotary compressor with internal overload protection, mounted with vibration isolators to reduce noise and vibration.
4. Condenser coil heat exchanger shall be constructed of nonferrous rifled copper tubing with enhanced aluminum slit fins mechanically bonded to the copper. A suction line accumulator, a coil temperature sensor, and cap tube metering device shall be factory installed.
5. Fan motor shall be direct drive with internal overload protection, permanent lubrication, with propeller-type fan, mounted for horizontal air discharge.
6. Brass valves with refrigeration flare connections and flare nuts and service ports shall be factory mounted prior to shipment for installation.

7. Low ambient outdoor section shall contain a printed circuit board, factory mounted and wired, to assist in control of low ambient operation. Unit shall be able to operate in the A/C mode down to 0°F outdoor temperature. A factory-installed 20-watt crankcase heater shall provide additional compressor protection.
 8. Outdoor condensing unit shall be coated with electronic fin coating by manufacturer.
 9. Provide security cage for outdoor condensing section.
- E. Indoor Evaporator Section:
1. Indoor section shall be wall-mount type with single direction airflow, factory assembled and wired.
 2. Unit shall contain an evaporator heat exchanger constructed of nonferrous, rifled copper tubing with enhanced aluminum slit fans, mechanically bonded to the copper.
 3. A single centrifugal blower wheel, statically and dynamically balanced shall be attached to a single direct-drive PSC fan motor with overload protection, permanent lubrication, and multispeed capability.
 4. Unit shall contain a printed circuit board with a control circuit fuse and microprocessor, factory mounted and wired, that receives and processes all commands and transmissions from the system Infrared Remote Controller. Indoor unit shall also contain an Operation Switch with visible lamps for operation, standby and timer functions, as well as a system test switch and manual ON/OFF switch.
 5. Unit shall contain an air sensor thermistor, a coil-freeze safety thermistor to prevent freeze-up, a factory-installed condensate drain pump, drain pan, hose and fitting, and refrigeration line connections with flare nuts.
 6. Indoor section shall be provided with factory assembled supply and return air grille with a motorized louver/flap on the supply air opening. The motorized louver/flap, controlled by the infrared remote controller, shall provide automatic, full-oscillating supply airflow, as well as being capable of being placed in a set, stationary position.
 7. Unit shall also contain adjustable horizontal air louvers to provide user defined directional airflow. Indoor unit will be furnished with an in-ceiling plenum which surrounds the evaporator coil section.
 8. Unit shall be furnished with antimold, poly type washable air filters that can be removed without removing indoor unit casing. Indoor unit shall be powered by voltage from the matching outdoor unit.

PART 3-EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify ENGINEER of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.
- B. Install in accordance with manufacturer's instructions and approved submittals. Test for proper operation and adjust until satisfactory results are obtained.
- C. Pipe and trap condensate to grade and as shown on Drawings.
- D. Protect installed products until completion of project.
- E. Touch-up, repair or replace damaged products at no additional cost to OWNER.
- F. Installation of all equipment furnished under this Contract shall be supervised by a qualified representative of the equipment manufacturer. All equipment shall be placed in operation, and plant operators/building maintenance personnel shall be trained to the satisfaction of OWNER by a qualified representative of the equipment manufacturer. OWNER may videotape training presentations given by manufacturer's representatives. Final payment for various items of equipment will not be made by OWNER until the equipment is operating to their satisfaction.
- G. CONTRACTOR shall pay all costs for revisions of drawings by ENGINEER. Any changes shall be coordinated and provided at no additional cost to OWNER.

3.04 CLEANING

- A. Unit shall be cleaned and filters shall be cleaned prior to final acceptance by OWNER.

END OF SECTION

SECTION 23 82 39

UNIT HEATERS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Electric Unit Heaters.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All material, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references.
 - 1. ARI 410—Forced Circulation Air-Cooling and Air-Heating Coils.
 - 2. NFPA 70—National Electrical Code.
 - 3. UL 2021—Standard for Fixed and Location—Dedicated Electric Room heaters.
 - 4. UL 823—Standard for Electric Heaters for Use in Hazardous (Classified) Locations

1.03 QUALITY ASSURANCE

- A. All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.
- B. Electrical components shall be UL listed for the service specified.
- C. Electrical components and work shall be in accordance with the National Electrical Code.
- D. Coil performance shall be certified in accordance with ARI 410.
- E. Comply with UL 2021.
- F. Comply with UL 823.
- G. Heater shall be suitable for Class I, Group D, Division 2 hazardous locations.

1.04 SUBMITTALS

- A. Submit under provisions of Section 01 33 00—Submittals.
- B. Include data concerning dimensions, required clearances, capacities, materials of construction, ratings, weights, manufacturer's installation requirements, manufacturer's

performance limitations, and appropriate identification. Include plans, elevations, sections, and details.

- C. Shop drawings:
 - 1. Include plans, elevations, sections, and details.
 - 2. Include location and size of each field connection.
 - 3. Include details of anchorages and attachments to structure and to supported equipment.
 - 4. Include equipment schedules to indicate rated capacities, operating characteristics, furnished specialties, and accessories.
 - 5. Indicate location and arrangement of integral controls.
 - 6. Wiring Diagrams: Power, signal, and control wiring.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids and lifting lugs, if required for handling.
- B. Materials that could be damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.
- C. Store materials in a clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.
- D. Use all means necessary to protect equipment before, during, and after installation.
- E. All scratched, dented, and otherwise damaged units shall be repaired or replaced at no additional cost to OWNER.

1.06 WARRANTY

- A. Standard One-Year Warranty: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion or the date of final acceptance of the project. .

PART 2-PRODUCTS

2.01 ELECTRIC UNIT HEATERS

- A. CONTRACTOR shall provide electric heaters of the type, size, capacity, and accessories as listed on the equipment schedule. All units shall be UL listed.
- B. All electric unit heaters shall be factory-assembled and tested.
- C. Electric Unit Heaters (Standard) (EUH):
 - 1. Acceptable manufacturers are Chromalox, QMark, or Indeeco.
 - 2. The cabinet shall be constructed of heavy gauge, die-formed steel with baked enamel coating. Manufacturer shall provide mounting bracket.

3. Provide a propeller fan with direct-drive, totally enclosed motor.
 4. Provide an aluminum-finned copper-clad steel sheath heating element.
 5. Provide an automatic reset thermal cutout to protect the element.
 6. Disconnect shall be provided by Division 26.
 7. Mount units to provide 8 feet 0-inch clearance below, unless otherwise shown on the drawings.
 8. Unit shall include a thermal fan delay to dissipate heat when coil deenergizes, and prevent cold air drafts when it starts.
 9. Unit control voltage shall be 120 V. Line voltage (120 V) thermostat shall be provided by Division 26.
- D. Electric Unit Heaters (Explosion-proof) (EUH):
1. Acceptable manufacturers are Chromolox, QMark, or Indeeco.
 2. The cabinet shall be constructed of heavy gauge corrosion-resistant 316 stainless steel with a louvered grille and wall-mounting bracket.
 3. Unit shall include an aluminum propeller fan with direct-drive, totally enclosed motor for operation in a Class I, Division 1, Groups C and D hazardous environment.
 4. Unit shall include a manual reset thermal cutout to protect the element, and a thermal fan delay.
 5. Unit control voltage shall be 120 V. Line voltage (120 V) thermostat shall be provided by Division 26.
 6. Unit-mounted equipment disconnect shall be ABB OT Series provided by manufacturer suitable for Class I, Division 1, Groups C and D locations and meet the requirements of Division 26.
 7. Mount bottom of units 8 feet 0-inch above finished floor, unless otherwise shown on drawings.
 8. Heat exchanger shall be sealed liquid-to-air-type with a field-replaceable immersion heating element. Heat transfer fluid shall be propylene glycol. Heat exchanger shall include a pressure relief valve. Heat exchanger shall be of 316 stainless steel construction with aluminum fins.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install units level and plumb, maintaining manufacturer's recommended clearances and tolerances.
- B. Install in accordance with manufacturer's instructions and approved submittals. Test for proper operation and adjust until satisfactory results are obtained.
- C. Provide all mounting hardware and accessories necessary for complete installation.
- D. Installation of all equipment furnished under this Contract shall be supervised by a qualified representative of the equipment manufacturer. All equipment shall be placed in operation, and plant operators/building maintenance personnel shall be trained to the satisfaction of OWNER by a qualified representative of the equipment manufacturer. OWNER may videotape training presentations given by manufacturer's representatives. Final payment for

various items of equipment will not be made by OWNER until the equipment is operating to their satisfaction.

- E. Drawings and specifications are based on the scheduled manufacturer and model number. CONTRACTOR shall be responsible for the cost of any changes because of substitutions or alternates of other manufacturers or model numbers including but not limited to, structural, mechanical, and electrical work. CONTRACTOR shall pay all costs for revisions of drawings by ENGINEER. Any changes shall be coordinated and provided at no additional cost to OWNER.

3.02 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation.
 - 3. and electrical connections.
 - 4. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Units will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION

SECTION 26 05 00

GENERAL ELECTRICAL REQUIREMENTS

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes general requirements for all electrical work.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern Work in this section.

1.02 REFERENCES

- A. ANSI/NFPA 70—National Electrical Code (NEC).
- B. ANSI/IEEE C2—National Electrical Safety Code.

1.03 CONTRACT DOCUMENTS

- A. Any equipment roughed in improperly and/or not positioned on implied centerlines or as dictated by good practice shall be repositioned at no cost to OWNER.
- B. The Drawings are generally diagrammatic, and CONTRACTOR shall coordinate the Work so that interferences are avoided. Provide all offsets in conduit, fittings, etc., necessary to properly install the work. All offsets, fittings, etc., shall be provided without additional expense to OWNER.
- C. Hazardous or classified locations, where referenced in the Specifications or on the Drawings, shall be as defined in the NEC.

1.04 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70.
- B. Conform to ANSI/IEEE C2.
- C. The rules and regulations of the federal, state, local, and civil authorities and utility companies in force at the time of execution of the Contract shall become a part of this specification.
- D. Obtain electrical permits and inspections from authority having jurisdiction. Costs for permits and inspections shall be paid by CONTRACTOR.

1.05 CODES AND ORDINANCES

- A. CONTRACTOR is expected to know or to ascertain, in general and in detail, the requirements of all codes and ordinances applicable to the construction and operation of systems covered by this Contract. CONTRACTOR shall know or ascertain the rulings and interpretations of code requirements being made by all authorities having jurisdiction over the work to be performed by them.
- B. In preparing a Bid, CONTRACTOR shall include the cost of all items and procedures necessary to satisfy the requirements of all applicable codes, ordinances, and authorities, whether or not these are specifically covered by the Drawings and Specifications. All cases of apparent conflicts between the Drawings, Specifications, and codes shall be brought to ENGINEER's attention, as herein before specified. CONTRACTOR shall carry out work and complete construction as required by applicable codes and ordinances and in such a manner as to obtain approval of all authorities whose approval is required.
- C. When requested by ENGINEER, CONTRACTOR shall provide written calculations to show compliance with applicable codes or the Contract Documents. This shall include, but not be limited to, conduit and wire sizing, junction and pull box fill and sizing, conductor derating, and voltage drop. CONTRACTOR shall indicate calculation method used as well as compliance with applicable code, drawing, or specification.

1.06 EQUIPMENT PROVIDED UNDER OTHER DIVISIONS

- A. Included in this Contract are electrical connections to equipment provided under other divisions. CONTRACTOR shall refer to final shop drawings for equipment being furnished under other divisions, for exact location of electrical equipment, and the various connections required.

1.07 ELECTRICAL DISTRIBUTION SYSTEM

- A. Provide a complete electrical distribution system consisting of components indicated on the Drawings or specified herein including, but not limited to:
 - 1. All miscellaneous equipment coordination and related appurtenances required by power company.
 - 2. 277/480-volt, three-phase, 4-wire service entrance conductors.
 - 3. Feeders, branch wiring, and electrical distribution equipment.
 - 4. All control wiring.
 - 5. Access panels and access doors for access to equipment installed by Division 26.
 - 6. Wiring between system components if equipment is not prewired.
 - 7. Lighting fixtures, lighting controls, and associated wiring.
 - 8. Telephone raceway system.
 - 9. Support system design and supports for electrical raceways.
 - 10. Code-required disconnects.
- B. CONTRACTOR shall connect all equipment furnished by other Divisions consisting of components indicated on the Drawings or specified herein.
- C. Provide balancing and adjusting of electrical loads.

- D. CONTRACTOR shall instruct OWNER's representative in the operation and maintenance of all equipment. The instruction shall include a complete operating cycle on all apparatus.
- E. Provide miscellaneous items for a complete and functioning system as indicated on the Drawings and specified herein.
- F. A partial list of work not included in Division 26 is as follows: Painting (except as otherwise specified herein).

1.08 NOISE

- A. Eliminate any abnormal noises that are not considered by ENGINEER to be an inherent part of the systems as designed. Abnormal buzzing in equipment components will not be acceptable.

1.09 DRAWINGS

- A. The Drawings indicate approximate locations of the various items of the electrical systems. These items are shown approximately to scale and attempt to show how these items should be integrated with building construction. Locate all the various items by on-the-job measurements in conformance with Contract Documents and cooperation with other trades.
- B. Prior to locating equipment, confer with ENGINEER as to desired location in the various areas. In no case should equipment locations be determined by scaling drawings. Relocate equipment and bear cost of redoing work or other trades' work necessitated by failure to comply with this requirement.
- C. In certain instances, receptacles, switches, light fixtures, or other electrical devices and equipment, etc., may be relocated. Where relocation is within 10 feet of location shown on the Drawings, and when CONTRACTOR is informed of necessary relocation before work is begun on this portion of the job, the relocation shall be at CONTRACTOR's expense.
- D. The Drawings are schematic in nature and are not intended to show exact locations of conduit, but rather to indicate distribution, circuitry, and control.
- E. CONTRACTOR shall familiarize themselves with the details of the total construction insofar as they may affect the work under this Division, including floor elevations, physical dimensions of structures, materials of construction and the nature of work required under other Divisions. No additional compensation will be granted for failure to consider the total project work.

1.10 EXISTING UNDERGROUND UTILITIES

- A. The Drawings show approximate location of existing underground utilities based on site survey information. CONTRACTOR shall excavate and verify the location of all underground utilities prior to installing electrical equipment. This shall include, but not be limited to, feeders to structures and equipment, branch circuit wiring, phone and communication cabling, instrument wiring, and control wiring. CONTRACTOR shall temporarily relocate existing

underground utilities to keep the existing facility in operation and for any new construction, and all costs for relocating existing electrical shall be included in the Bid.

1.11 SUBMITTALS

- A. CONTRACTOR shall submit to ENGINEER for approval prior to beginning work, shop drawings on the equipment and materials proposed to be furnished and installed. See Section 01 33 00–Submittals for requirements.
- B. CONTRACTOR shall, in addition, submit drawings and/or diagrams for review and for job coordination in all cases where deviation from the Contract drawings are contemplated because of job conditions, interference or substitution of equipment, or when requested by ENGINEER for purposes of clarification of CONTRACTOR's intent. CONTRACTOR shall also submit detailed drawings, rough-in sheets, etc., for all special or custom-built items or equipment. Drawings and details under this section shall include, but not be limited to, the following, where applicable to this project:
 - 1. Electrical interconnection wiring diagrams; see Section 26 24 19–Motor Control and Section 40 94 23–Controls and Instrumentation.
 - 2. Major feeder routing in plan and elevation, including service entrance raceways and cable.
 - 3. Equipment room layouts showing exact locations and arrangements of equipment, conduit, wiring, etc., and clearances.
- C. These drawings and diagrams shall show applicable electrical switch and breaker sizes as well as the manufacturer's name and catalog number for each piece of equipment used.
- D. Equipment and material submittals must show sufficient data to indicate complete compliance with Contract Documents as follows:
 - 1. Proper sizes and capacities.
 - 2. That the item will fit in the available space in the manner that will allow proper service.
 - 3. Construction materials and finishes.
- E. When the manufacturer's reference numbers are different from those specified, provide correct cross-reference number for each item. The shop drawings shall be clearly marked and noted accordingly.
- F. When equipment and items specified include accessories, parts, and additional items under one designation, shop drawings shall be complete and include all components.
- G. See additional requirements of shop drawings under Division 01–General Requirements.

1.12 O&M MANUALS AND DATA TO BE FILED WITH THE ENGINEER

- A. Submit legible 11-inch by 17-inch shop drawings and product data and O&M manuals under provisions of Section 01 33 00 and data, as specified herein, shall be furnished to ENGINEER when installation and testing are complete, before final acceptance.

- B. As a minimum, in addition to O&M manual information requirements specified in the specification sections herein, the data files shall include the following:
 - 1. A tabulation of cable insulation / megger tests. Tabulations shall include acceptable insulation resistance test values.
 - 2. A tabulation of motor and equipment technical nameplate data.
 - 3. A tabulation of voltage tests.
 - 4. A tabulation of motor current tests.
 - 5. A tabulation of relay and control device set points.
 - 6. A tabulation of alarm set points.
 - 7. A tabulation of breaker settings, timer set points, and protection relay set points. Tabulation shall include complete model or catalog number of each breaker, protection relay and fuse.
 - 8. A tabulation of motor winding resistance tests for pump motors.
 - 9. A Power System Study Report shall include summary of results of power systems study under Section 26 05 73 including:
 - a. Description, purpose, basis, and scope of study and legible one-line diagram of power system.
 - b. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short circuit duties.
 - c. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
 - d. Fault current calculations including definition of terms and guide for interpretation of computer printout.
 - e. Tabulation of appropriate tap settings for relay units.
 - f. Arc flash calculations and tabulation of incident energy level (calories/cm²) for each equipment location and recommended personal protective equipment (PPE).

1.13 WARRANTY

- A. The equipment supplier shall warrant that its equipment shall be free from defects in material and workmanship; and that it will replace or repair, any part or parts returned to it, which examination shall show to have failed under normal use and service by the user within twelve (12) months of the date of Final Acceptance of the entire Project by ENGINEER.

PART 2-PRODUCTS

2.01 STANDARD PRODUCTS

- A. All equipment and products shall be of new manufacture per applicable specifications.
- B. All equipment shall be UL and NEMA approved.
- C. Unless specified otherwise, major distribution equipment such as motor control centers, motor starters, SPD, transformers, etc., shall each be by the same manufacturer.
- D. All equipment and wiring shall be selected and installed for conditions in which it will perform (e.g., general purpose, weatherproof, raintight, explosionproof, dustproof, or any other special type).

2.02 SUBSTITUTION OF MATERIALS AND EQUIPMENT

- A. While it is not the intention of OWNER to discriminate against any manufacturer of equipment which may be equivalent to specified equipment, a strict interpretation of such equivalency will be exercised in considering any equipment offered as a substitute for specified equipment. CONTRACTOR shall submit with each request for approval of substitute material or equipment sufficient data to show conclusively that it is equivalent to that specified in the following respects:
 - 1. Performance:
 - a. Capacity at conditions and operating speeds scheduled shall be equal to or greater than that of the specified equipment.
 - b. Energy consumption at the point of rating shall not exceed that of the specified equipment.
 - c. Vibration and noise production at the point of rating shall not exceed that of the specified equipment.
 - 2. Materials of construction.
 - 3. Gauges, weights, and sizes of all portions and component parts.
 - 4. Design arrangements, methods of construction, and workmanship.
 - 5. Coatings, finishes, and durability of wearing parts.
 - 6. National reputation of the manufacturer as a producer of first quality equipment of the type under consideration.
 - 7. Availability of prompt, reliable, and efficient service facilities franchised by or affiliated with the equipment manufacturer. This shall include the maintenance of local stocks of critical replacement parts equal to those maintained for the specified equipment.
- B. See General Conditions for additional requirements.

PART 3-EXECUTION

3.01 UTILITY SERVICES

- A. Utility connection requirements shall be determined. All costs for coordinating utility service shall be included in the price bid as described in Section 26 21 00-Electrical Service System of these specifications.
- B. All costs for temporary service, temporary routing of piping, or any other requirements of a temporary nature associated with the utility service shall be included in the Base Bid.
- C. It is the intent that in the latter stages of construction, the permanent electrical service will be used and the temporary construction service discontinued. The following requirements shall govern the use of the permanent services:
 - 1. No permanent service shall be available until structure is enclosed, watertight, and heated.
 - 2. Only permanently connected and protected circuits and outlets shall be available.
 - 3. Temporary wiring shall not be connected to permanent distribution equipment.
 - 4. Under the above conditions, the use of permanent service equipment shall in no way affect the Contract conditions of the guarantee.

- D. It shall be CONTRACTOR's responsibility to police this situation and protect its equipment.

3.02 CONTINUITY OF SERVICE

- A. CONTRACTOR shall provide and maintain continuous services (power, controls, alarms, etc.) during the entire construction period.
- B. No service shall be interrupted or changed without permission from OWNER. Written permission shall be obtained before any work is started.
- C. When interruption of service is required, all persons concerned shall be notified and a prearranged time agreed upon. Notice shall be a minimum of 72 hours prior to the interruption.

3.03 CLEANUP AND REMOVAL OF RUBBISH

- A. All lighting and appliance panelboards, MCCs, disconnect switch enclosures, junction boxes, and pullboxes shall be cleaned of debris and wires neatly arranged with surplus length cut off before installation of covers.
- B. Where louvers are provided in MCCs or transformer enclosures, louvers shall be vacuumed free of all dust and dirt. Where air filters are provided in equipment such as control panels, motor control centers and transformers, CONTRACTOR shall replace all filters with new at the time of final completion.
- C. All lighting fixture lenses (interior and exterior fixtures) shall be cleaned at the time of installation, and all lens exteriors shall be cleaned just prior to final inspection.
- D. Equipment shall be thoroughly cleaned of all stains, paint spots, dirt, and dust. All temporary labels not used for instruction or operation shall be removed.

3.04 CONCRETE WORK

- A. All cast-in-place concrete for new electrical equipment bases shown on the Drawings shall be provided by CONTRACTOR, except where specifically noted to be provided by others. All new equipment shall be set on 3 1/2-inch minimum leveling slabs including MCCs, free-standing enclosures, etc. Pads shall be 3 inches larger than equipment being supported.
- B. Concrete shall comply with Section 03 30 00–Cast-In-Place Concrete.
- C. Provide all anchor bolts, metal shapes, and templates to be cast in concrete or used to form concrete for support of electrical equipment.

3.05 PAINTING

- A. All painting of electrical equipment shall be done by CONTRACTOR unless equipment is specified to be furnished with factory-applied finish coats.

- B. All electrical equipment shall be provided with factory-applied prime finish, unless otherwise specified.
- C. If the factory finish on any equipment furnished by CONTRACTOR is damaged in shipment or during construction, the equipment shall be refinished by CONTRACTOR.
- D. One can of touch-up paint shall be provided for each different color factory finish which is to be the final finished surface of the product.

3.06 CAULKING

- A. Caulk with a caulking sealant where indicated on the electrical drawings or hereinafter specified.
- B. Caulking sealant shall be silicone construction sealant as manufactured by General Electric or two-part polysulfide conforming to the requirements and bearing the seal of the Thiokol Chemical Corporation.
- C. Caulking sealant shall contain no acid or ingredients that will stain stone, corrode metal, or have injurious effect on painting. It shall be colored to match adjacent surroundings.

3.07 BUILDING ACCESS

- A. CONTRACTOR shall arrange for the necessary openings in the building to allow for admittance of all apparatus.
- B. When the installation requires openings and access through existing construction and the openings are not provided, CONTRACTOR shall provide the necessary openings.

3.08 COORDINATION

- A. Provide wiring for all motors and all electrically powered or electrically controlled equipment.
- B. All starters, disconnects, relays, wire, conduit, push buttons, pilot lights, and other devices for the power and control of motors or electrical equipment shall be provided by CONTRACTOR except as specifically noted elsewhere in these specifications or on the Drawings.
- C. Where starters or other devices are provided by others, they shall be connected and wired by CONTRACTOR.
- D. CONTRACTOR's drawings and specifications shall show number and horsepower rating of all motors furnished, together with their actuating devices. Should any change in size, horsepower rating, or means of control be made to any motor or other electrical equipment after the Contract is awarded, any additional costs because of these changes shall be the responsibility of CONTRACTOR.

- E. All motors shall be provided for starting in accordance with local utility requirements and shall be compatible with starters as specified herein or under the various trades' sections of these specifications.
- F. CONTRACTOR shall provide all line voltage power and control wiring (100 volts and above), including temperature control wiring for operation, control, and supervision of all motorized equipment, including wiring between motor starters and control devices as specified herein and as shown on the Drawings. Low-voltage control wiring (below 100 volts) shall be provided by CONTRACTOR supplying the equipment that has low-voltage wiring, unless otherwise noted. CONTRACTOR shall provide raceways for all low-voltage wiring.
- G. CONTRACTOR shall connect and wire all apparatus according to approved wiring diagrams furnished by the various trades.
- H. Motors 1/2 hp and larger shall be NEMA rated 460 volts, three-phase, 60 Hz, unless otherwise shown. Motors 1/3 hp and below shall be 115 volts, single-phase, 60 Hz, unless otherwise shown.

3.09 EXCAVATION AND BACKFILL

- A. Backfilling of all trenches beneath concrete floor and stair slabs within building shall be accomplished with gravel fill and shall be specially compacted to same density as surrounding area. Backfill of exterior trenches shall be compacted granular fill, unless otherwise noted. Compaction shall meet the requirements of Section 31 23 00—Excavation, Fill, Backfill, and Grading. Refer to Section 26 05 33—Conduit for additional requirements associated with PVC conduit installed in concrete duct banks in earth.
- B. Lines passing under foundation walls shall have a minimum of 1 1/2-inch clearance.
- C. Care shall be taken so that there is no disturbance of bearing soil under foundations.
- D. CONTRACTOR shall follow underground pipe runs where possible to avoid additional rock excavation. See Division 31 for rock excavation requirements.

3.10 EQUIPMENT ACCESS AND LOCATION

- A. CONTRACTOR shall coordinate work of this division with that of other divisions so that all systems, equipment, and other components of the building will be installed at the proper time, will fit the available space, and will allow proper service access to those items requiring maintenance. This means adequate access to all equipment not just that installed under this division. Any components for the electrical systems that are installed without regard to the above shall be removed and relocated as required to provide adequate access at CONTRACTOR's expense.
- B. Where various items of equipment and materials are specified and scheduled, the purpose is to define the general type and quality level, not to set forth the exact trim to fit the various types of ceiling, wall, or floor finishes. Provide materials that will fit properly the types of finishes actually installed.

- C. All equipment, junction and pull boxes, and accessories shall be installed to permit access to equipment for maintenance. Any relocation of conduits, equipment, or accessories to provide maintenance access shall be accomplished by CONTRACTOR at no additional cost.
- D. Electrical equipment, devices, instruments, hardware, etc., shall be installed with ample space allowed for removal, repair, calibration or changes to the equipment. Ready accessibility to equipment and wiring shall be provided without moving other equipment that is to be installed or that is already in place.
- E. Locate electrical outlets and equipment to fit the details, panels, decorating, or finish of the space. ENGINEER shall reserve the right to make minor position changes of the outlets before the work has been installed. Verify door swings before installing room lighting switch boxes, and install boxes on the latch side of door unless noted otherwise.

3.11 WORKMANSHIP

- A. All work shall be performed in compliance with the NEC.
- B. Install work using procedures defined in NECA Standard of Installation.
- C. Location of process equipment as shown on the Drawings is approximate.
- D. Utilization equipment and control devices required under these specifications shall be mounted in a code-approved manner.
- E. Locations of utilization equipment and control devices as shown on the Drawings are within 10 feet of actual positions. Any mounting of this equipment within this 10-foot distance shall be performed at no additional cost to OWNER.
- F. Unless otherwise noted, conduit shall be fastened to building structure or equipment framework and not placed on the floor.
- G. Where materials, equipment apparatus, or other products are specified by manufacturer, brand name, and type or catalog number, such designation is to establish standards of desired quality and style and shall be the basis of the Bid.
- H. Materials and equipment of the types for which there are National Board of Fire Underwriters Laboratories (UL) listings shall be so labeled and shall be used by CONTRACTOR.

3.12 AREA CLASSIFICATION

- A. As noted on the Drawings.
- B. Where referenced herein, damp and wet locations shall include, but not be limited to, all structures and areas below grade and exterior locations.

3.13 TESTING

- A. All electrical equipment and systems provided under this Division shall be adjusted and tested. CONTRACTOR shall adjust, repair or replace faulty or improper Division 26 work or equipment discovered during testing.
- B. In addition, all electrical items provided under other Divisions and connected and/or adjusted under this Division shall be tested and if a failure occurs due to the connecting or adjusting methods used, the failure shall be remedied under this Division by repair, replacement, or change, as determined by ENGINEER, at no additional cost to the Department.
- C. Tests may be made progressively as portions of the work are complete; all systems will require demonstration that they are functional and comply with the Contract Documents.
- D. Tests shall be made in the presence of ENGINEER; ENGINEER and IDOT shall be notified a minimum of 14 days prior to testing.
- E. A written record of tests shall be maintained by CONTRACTOR and, when complete, it shall be submitted to ENGINEER for the record.
- F. Independent Contractor shall perform all tests necessary to verify proper functioning of materials and equipment. As a minimum, the tests shall include the following:
 - 1. Before making final connections check the insulation resistance of all cables of three-phase circuits that operate above 150 volts.
 - 2. Check wiring for proper phase sequencing including buses, feeder cables and transformers and provide proper connection at motors for proper rotation.
 - 3. Measure and record the line-to-line and line-to-neutral voltages at the line side of the service entrance, all panel buses or main terminals and at the primary and secondary terminals of all transformers furnished under this Division except for control transformers which are integral to motor starter units. Set the taps on transformers as required or as requested by ENGINEER.
 - 4. Check and record the motor nameplate data for each motor. Check the ratings of motor circuit protective devices and provide compatibility of the devices for the connected motors. In particular, provide that the motor starter overload elements are proper for the motor nameplate full load amperes.
 - 5. Set control relays, protective relays and instruments in accordance with manufacturer's recommendations. Record the set points.
 - 6. Check all control circuits for proper functioning of all devices and check all switches, contactors, pushbuttons, limit switches, thermostats, circuit breakers and the like for proper operation.
 - 7. Check all alarm circuits for proper operation and proper set points, as applicable. Record any appropriate set points.
 - 8. Measure and record the line currents of each phase of each three-phase motor under load.
 - 9. Align and adjust lighting fixtures and assure proper operation of all controls, ballasts and lamps.
 - 10. All equipment must be properly calibrated for proper operation of the system.
 - 11. All equipment devices shall be tested for proper operation, including but not limited to, selector switches, pushbuttons, indicating lights, timers, lock-out relay, and counters.

- G. Testing must be complete prior to final inspection. All instruments, tools, etc., required for the tests shall be provided by CONTRACTOR. All equipment shall be properly calibrated for proper operation of the complete system. Additional testing may be requested by ENGINEER during final inspection to spot-check test results or to demonstrate proper functioning of the systems. These tests shall be performed by CONTRACTOR at no additional cost to the State.
- H. CONTRACTOR shall simulate the automatic operation of the complete pump station to assure proper operation. After assurance of proper operation, CONTRACTOR shall demonstrate automatic operation including simulation to ENGINEER's satisfaction.
- I. Note that failure to test the equipment completely is not an allowance for an extension.

3.14 PROTECTION OF WORK

- A. All electrical work, including equipment, fixtures and appurtenances shall be protected from damage until final acceptance. Fixtures and equipment shall be covered to protect against dirt, moisture, paint and the like. The work shall be protected from mechanical injury by appropriate covering or shielding.
- B. Prior to final acceptance, protective measures shall be removed and equipment and items shall be cleaned as required to deliver the installation to the State in clean, undamaged condition.

3.15 FINAL ACCEPTANCE TESTING

- A. When the work is complete, tested and fully operational, and only after the Record Drawings have been reviewed and accepted, CONTRACTOR shall schedule a Final Acceptance Inspection with ENGINEER.
- B. The Final Acceptance Inspection shall be made for the complete work at the facility as a whole.

3.16 CLEAN-UP AND SAFETY

- A. The work site shall be maintained in a clean condition, free of hazards, all in conformance with the requirements of Article 107 of the Standard Specifications. Special care shall be taken to assure that electrical systems are not left in an exposed or otherwise hazardous condition. All electrical boxes, cabinets, handholes, etc., which contain wiring, either energized or non-energized, shall be closed or shall have their covers in place and shall be locked when possible, during off-work hours.

END OF SECTION

SECTION 26 05 19

WIRE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Wire.
 - 2. Wiring connections and terminations.
 - 3. Terminal blocks and accessories.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. Manufacturers of Wire: Firms regularly engaged in the manufacture of electrical wire products of the types and ratings needed whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that in this project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide electrical material, which has been listed and labeled by Underwriters Laboratories.
- E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.03 SUBMITTALS

- A. Submit shop drawings and product data under the provisions of Section 01 33 00—Submittals.
- B. Submit shop drawings for wiring system including layout of distribution devices, branch circuit conduit and cables, circuiting arrangement, and outlet devices.
- C. Submit manufacturer's instructions.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Provide factory-wrapped, waterproof, flexible-barrier material for covering wire on wood reels, where applicable, and weather-resistant fiberboard containers for factory-packaging of wire, connectors, outlets, boxes, lamps, fuses, etc., to protect against physical damage in transit. Do not install damaged wire or other material; remove from project site.
- B. Store wire and other material in factory-installed coverings in a clean, dry, indoor space which provides protection against the weather.

1.05 WARRANTY

- A. All equipment shall be furnished complete with the manufacturer's standard trade warranty, applicable to the Illinois Department of Transportation, from the date of final acceptance. Such warranty shall accompany submittal shop drawings and product data.
- B. Prior to final payment, the original and one copy of all warranties, and similar documents, including those customarily provided by manufacturers and suppliers which cover a period greater than the one year correction period shall be delivered to ENGINEER.
- C. The warranties shall include parts and labor and shall begin from the date of final acceptance.

PART 2—PRODUCTS

2.01 WIRE

- A. All wire for permanent installation shall be new stranded copper delivered to project in unopened cartons or reels, except where specifically noted and be UL listed for the use intended. No wire smaller than 12 AWG shall be used unless specifically noted. The use of multiconductor cable is not allowed.
- B. Motor circuit branch wiring and associated control wiring:
 - 1. Insulation type shall be THWN (90°C) (indoors).
 - 2. Minimum size for motor control wiring shall be 14 AWG.
 - 3. Control wiring for supervisory equipment shall be shielded, sized per equipment manufacturer's recommendations, or as shown on Drawings.
- C. All power wiring for power feeders, motor feeders, and starter feeders shall be type XHHW-2.
- D. All wiring within control panels, supervisory control centers, and motor control centers that does not extend outside of the enclosure or the motor control center bucket shall be insulation-type MTW, minimum size 16 AWG.
- E. All wiring for branch circuits shall be type THWN (90°C).
- F. Refer to Section 26 05 53—Electrical Identification for required wire insulation color coding and conductor labeling requirements. Initial phase color shall be used throughout the run,

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even for switch legs. Colors must meet code requirements for each class voltage. Do not duplicate colors, including neutral, on different voltages.

- G. Branch circuit wiring for exit lights, emergency lights, and exterior lights in excess of 75 feet shall be minimum 10 AWG. Circuits 150 feet or over shall be sized for a maximum 2% voltage drop.

2.02 LOW-VOLTAGE WIRING (LESS THAN 100 VOLTS)

- A. Low-voltage wiring specified in this section shall be applicable to all systems installed that utilize low-voltage wiring where such wiring is not specified in other technical sections.
- B. All wiring shall have copper conductors with 300-volt insulation rating and meet the requirements of NEC Article 725.
- C. All conductors must be suitable for the application intended. Conductors 16 AWG and larger shall be stranded. Conductors 18 AWG and smaller may be solid or stranded.
- D. Control Cable for Class 1 Remote Control and Signal Circuits: Individual conductors twisted together, shielded, and covered with an overall PVC jacket. Cable shall be UL listed, temperature rated, and plenum or nonplenum rated for the application as required in the National Electrical Code.
- E. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits shall be constructed, UL listed, temperature rated, and plenum or nonplenum rated for the application as required in the NEC Article 725.

2.03 WIRING CONNECTIONS AND TERMINATIONS

- A. Provide crimp type UL or ETL listed terminations for 6 AWG and smaller stranded conductor connections to electrical devices and equipment such as receptacles, switches, and terminal strips.
- B. Provide insulated, silicone-filled spring wire connectors with plastic caps for 8 AWG conductors and smaller. Spring wire connectors shall only be allowed in junction, outlet, or switch boxes. Spring wire connectors are not allowed for terminating motor conductors.
- C. All feeder cable connections to motor leads up to 600 volts shall be insulated and sealed with factory-engineered kits. Motor connection kits shall consist of split-bolt connector for 8 AWG and smaller and motor-lead pigtail splice kit. Individual components shall be as follows:
 - 1. Split-bolt connectors shall be for use with copper conductors only.
 - 2. Pigtail splice kit shall consist of one-hole lug cover, silicone grease, and mastic sealing strip. Kit shall be selected based on motor, feeder, and lug sizes installed.
- D. No splices will be allowed unless reviewed by ENGINEER. Where allowed, provide in-line splices for all conductor connections, 6 AWG and larger. Splice shall be made with crimp tool by manufacturer that allows expanded conductor ranges. Splice insulation component shall be heavy-wall, low-voltage tubing.

2.04 TERMINAL BLOCKS AND ACCESSORIES

- A. Terminal Blocks: ANSI/NEMA ICS 4: UL listed or UL recognized under UL 467, UL 486E, UL1059, and UL 1953 (power terminals only).
- B. Power Terminal Blocks: Unit construction type, closed-back type, tin-plated copper, with tubular pressure screw connectors, rated 600 volts.
- C. Signal and Control Terminal Blocks:
 - 1. General-Purpose Terminal Blocks:
 - a. Terminal blocks shall be rated up to 600 volts AC/DC.
 - b. Terminal blocks shall accept center-mounted jumper bars without increasing the installed space.
 - c. Terminal block color shall be gray.
 - 2. Grounding Terminal Blocks:
 - a. Terminal blocks shall be feed through grounding type.
 - b. Terminal block color shall be green/yellow.
 - 3. Disconnect-type Terminal Blocks (300-Volt Class):
 - a. Terminal blocks shall be feed-through type with a knife-blade disconnect.
 - b. Terminal block color shall be gray.
 - 4. Fuse-type Terminal Blocks with Indicator (300-Volt Class):
 - a. Terminal blocks for applications from 100 to 300 volts AC shall have a neon blown-fuse indicator.
 - b. Terminal blocks for applications from 10 to 50 volts AC/DC shall have a LED blown-fuse indicator.
 - c. Terminal block color shall be black.
 - 5. Terminal Blocks for Power Meters and Current Transformers: Provide test-disconnect terminal blocks for disconnecting, shorting, and testing current transformers and for disconnecting and testing voltage sensing inputs. Provide test-disconnect terminals for individual current transformer or voltage sensing installations, and provide a group of terminals for all current transformer and voltage sensing inputs for each power meter installation.
 - a. Provide a pair of terminal blocks for each current transformer including one feed-through terminal block, one sliding disconnect terminal block with a cross-connection short-circuit slider. The pair of terminal blocks shall include the following:
 - (1) Feed-through terminal block.
 - (2) Sliding disconnect terminal block.
 - (3) Short-circuit slider. The short-circuit slider shall cover the terminal block conductor screws on the meter-side of the terminal blocks when in the non-shorting position, and expose the terminal block conductor screws when slid into the shorting position.
 - (4) Provide two cross-connection sliders with connecting sleeves. Provide one slider fixing screw. Connecting sleeves and fixing screws shall be color coded for each current transformer.
 - b. Provide disconnecting terminal blocks for each voltage sensing and neutral connection. The terminal blocks shall include the following:
 - (1) Sliding disconnect terminal block.

- (2) Provide one cross-connection slider with connecting sleeve for each voltage sensing and neutral connection terminal block. Provide one slider fixing screw. The neutral connecting sleeve shall be a different color than the voltage sensing connecting sleeves.
 - c. Terminal block colors shall be gray. Provide end plates and end brackets as required to complete the test-disconnect terminal block assembly.
 - 6. Terminal blocks shall have self-locking screw compression clamps rated for the size of conductors being terminated and upstream overcurrent protection for each application.
 - 7. The same manufacturer and style of terminal block shall be used throughout the entire project for all applications.
 - 8. Terminal blocks shall have tin-plated copper current bars and tin-plated steel screws. Terminal housings shall be completely finger safe from all live circuits and be constructed of self-extinguishing material with minimum UL 94-V0 flammability rating.
 - 9. Terminal blocks shall accept pre-printed, snap-in labeling cards on both sides without increasing the installed space. Provide terminal block manufacturer's end barriers and screw-type retainers for all terminal block groupings.
 - 10. Terminal blocks shall mount on standard DIN rail and shall be able to be removed without removing adjacent terminal blocks.
 - 11. Multi-level terminal blocks and stacked, single-level terminal block installations are not acceptable.
- D. Refer to Section 26 05 53—Electrical Identification for terminal block labeling requirements.

PART 3—EXECUTION

3.01 GENERAL WIRING METHODS

- A. Install electrical wire and connectors in accordance with the manufacturer's written instructions, applicable requirements of the NEC, the National Electrical Contractors Association's "Standard of Installation," and in accordance with recognized industry practices so that products serve the intended functions. Use appropriate wiring methods and materials for the equipment or environment.
- B. Stranded conductors shall be terminated using crimp-type devices specified herein. Conductors may not be wrapped around a terminal screw.
- C. Place an equal number of conductors for each phase of a circuit in the same raceway.
- D. Torque conductor connections and terminations with calibrated torque wrench to manufacturer's recommended values. Provide permanent marking on lug, bolt, nut, or connection for conductors larger than 4 AWG.
- E. Splice only in junction or outlet boxes. Splicing is not allowed in disconnects, motor control centers, panelboards, control panels, equipment, etc. Avoid splices between terminals of interconnecting power and control wiring.
- F. Spring wire connectors shall only be used in junction, outlet, or switch boxes. Equipment wireways (e.g., motor control centers, panelboards, disconnects, etc.), and control panels

shall not have any spring-wire connectors installed; all terminations shall be on terminal strips.

- G. Neatly train, lace, and tie wrap all wiring inside boxes, equipment, control panels, MCCs, and panelboards.
- H. Make conductor lengths for parallel circuits equal.
- I. The same color shall be used for each numbered wire throughout its entire length.
- J. Terminate all wiring on terminal blocks in control panels, starter cubicles, and similar equipment. This shall include all spare or unused wires.
- K. Provide a dedicated neutral for each branch circuit or feeder requiring a neutral. Ampacity of neutral conductor shall match that of the branch circuit or feeder.
- L. Do not use a pulling means that can damage the raceway.
- M. Signal wiring (below 100 volts) and intrinsically safe wiring must be in a conduit separate from power and/or control wiring (over 100 volts). Signal wire shall include, but not be limited to, loop-powered devices, voice and data communications, and communication wiring (i.e., Ethernet, serial, etc.). Analog wiring shall be in a conduit separate from all other wiring. Intrinsically safe wiring shall be separated and identified in accordance with Article 504 of the NEC.
- N. Provide junction or pull boxes to facilitate the “pulling in” of wires or to make necessary connections. All raceways and apparatus shall be thoroughly blown out and cleaned of foreign matter prior to pulling in wires.
- O. Thoroughly clean wires before installing lugs and connectors.
- P. Make splices, taps, and terminations to carry full capacity of conductors without perceptible temperature rise.
- Q. Terminate spare conductors within equipment, MCCs, control panels, etc., on terminal strips and label as “SPARE.” Spare wiring in pull or junction boxes may be terminated with electrical tape and labeled as “SPARE.” All spare conductor labels shall indicate where the conductors terminate. Refer to Section 26 05 53—Electrical Identification, for additional requirements.
- R. Feeder connections to motors shall be installed within the motor junction box utilizing factory engineered kits as specified herein. Spring wire connectors are not allowed for connections to motors.

3.02 GENERAL LOW-VOLTAGE WIRING METHODS (LESS THAN 100 VOLTS)

- A. Low-voltage wiring installation requirements specified herein shall be applicable to all systems installed that utilize low-voltage wiring where such wiring installation is not specified in other technical sections.

- B. Low-voltage wiring shall be installed in conduit.
- C. Do not use wire smaller than 14 AWG for control wiring greater than 60 volts, or 18 AWG for voltages less than 60 volts. All sizes subject to NEC 725 requirements.
- D. Low-voltage cable splices shall only be allowed in junction boxes.

3.03 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL-listed wire-pulling lubricant for pulling 4 AWG and larger wires. Wax-based pulling lubricant is not allowed unless it includes a Teflon additive.
- B. Install wire in raceway after interior of building is enclosed, watertight, and dry, and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.
- D. Conductors No. 6 AWG and larger shall be pulled into conduits by hand or by utilizing a tugger with built-in tension meter. Other motorized machines of any type are not allowed for any wire pulling. CONTRACTOR shall provide a report to ENGINEER for each pull indicating maximum tension reached during the pull along with manufacturer's maximum pulling tension.
- E. Conductors shall be installed in conduit system in such a manner that insulation is not damaged, conductors are not overstressed in pulling, and walls are not damaged. No splices are permitted except in junction boxes or outlet boxes.
- F. CONTRACTOR shall observe code limitation on the number and size of wires in an outlet box. CONTRACTOR shall either lay out work so that the wires do not exceed the particular box limitation or provide larger boxes approved for additional capacity.
- G. Panel riser feeder conductors shall be identified with colored tape at panel lugs. The same phase relation shall be maintained throughout.
- H. Circuiting is indicated diagrammatically on the Drawings.

3.04 TERMINAL BLOCK INSTALLATION

- A. A maximum of one conductor shall be installed on the field-wired side of each terminal block. If rated to accept more than one conductor, a maximum of two conductors shall be installed on the enclosure-wired side of each terminal block. Provide additional terminal blocks and shorting jumpers as required.
- B. Provide a separate ground-type terminal block for each shielded-cable drain conductor.
- C. For each grouping of terminal blocks, provide 25% spare DIN rail space.

- D. Maintain a minimum of 1 1/2 inches between terminal blocks and adjacent devices and enclosure wireways.
- E. For current transformer shorting terminal blocks, the short-circuit slider shall cover the terminal block conductor screws on the meter-side of the terminal blocks when in the non-shorting position, and expose the terminal block conductor screws when slid into the shorting position.

3.05 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Prior to energizing, check conduit, raceways, outlet boxes, and wire for continuity of circuitry and for short circuits. Correct malfunction when detected.
- C. Subsequent to wire hookups, energize circuitry and demonstrate functionality in accordance with these specifications.
- D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.
- E. Perform field inspection and testing according to provisions of this section.

3.06 ACCEPTANCE TESTS

- A. CONTRACTOR shall furnish all materials, labor, and equipment necessary for the acceptance tests specified herein. Acceptance tests shall be performed in the presence of OWNER or OWNER's representative and must be passed before final acceptance of the work.
- B. CONTRACTOR shall be responsible for powered tests of each field-installed device unless specifically noted otherwise. CONTRACTOR shall be responsible for device operation as powered from its power source and signals as received at the I/O modules.
- C. Operation Test: By operational testing, OWNER will give final acceptance of the wiring system when all of the wiring is considered a complete system. All equipment shall function and operate in the proper manner as indicated in the details of the specifications and on the Drawings. All motors shall be properly connected to protective devices, and motor rotation shall be in the correct direction.
- D. At the request of OWNER's representative, demonstrate by test the compliance of the installation with these specifications and Drawings, the National Electrical Code, and the accepted standards of good workmanship. These tests shall include operation of equipment, continuity of the conduit system, grounding resistance and insulation resistance.
- E. A written record of performance tests on electrical and control and instrumentation systems and equipment shall be supplied to OWNER. Such tests shall show compliance with governing codes.

- F. The transformer, feeder, and subfeeds to the lighting panels shall be completely phased out as to sequence and rotation. Phase sequence shall be A-B-C as follows:
 - 1. Front-to-rear, top-to-bottom, or left-to-right when facing equipment.
 - 2. Phasing shall be accomplished by using distinctive colors for the various phases. The same color or variation of it shall be used for a particular phase throughout the building and project.

3.07 WIRE INSTALLATION SCHEDULE

- A. Install all wiring in raceways except as otherwise noted. This includes all low-voltage wiring such as temperature control, instruments, phone, network, etc.

END OF SECTION

SECTION 26 05 23

INSTRUMENT AND COMMUNICATION WIRE AND CABLE

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: This specification contains the requirements for instrument wire and cable as opposed to electrical power wire and cable.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. Standards: Comply with standards specified in this section as listed in Division 01.
- B. Qualifications of Installers: Workers who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work.

1.03 PRODUCT HANDLING

- A. Instrument cable shall be furnished in lengths as necessary.
- B. Reels, coils, or package rolls of instrument cable shall be identified with the project name and other tagging identification as called for.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.

1.05 QUALIFICATIONS

- A. CONTRACTOR shall have at least 10 years of experience in the installation of similar systems. CONTRACTOR shall provide documentation upon request to certify that all assigned staff have attended training courses corresponding to the type of cabling and equipment specified herein.
- B. CONTRACTOR shall currently be licensed to install low voltage electronic cabling systems in the state of the project.
- C. CONTRACTOR shall currently meet all manufacturer's requirements for the provision and installation of all equipment specified herein.

PART 2-PRODUCTS

2.01 SHIELDED PAIR CABLING FOR ELECTRONIC INSTRUMENTS

- A. Shielded pair cabling shall have stranded, tinned-copper conductors, No. 16 AWG, twisted with 2-inch lay.
- B. Insulation of conductors shall be 15 mil, 90°C minimum PVC, rated for 300 volts. Materials shall equal or exceed UL 13 requirements for physical properties.
- C. Color coding shall be manufacturer's standard or as stated.
- D. The outer jacket shall be flame-retardant and weather- and ultraviolet-resistant PVC, 35 mils thick, and 80°C minimum rating. The outer jacket shall contain a ripcord and shall equal or exceed the requirements of UL 1277. Cable shall be UL labeled as power-limited circuit cable.
- E. A 100% coverage shield shall be applied over the insulated conductors. The shield shall consist of a 0.85 mil minimum thickness aluminum mylar tape. A stranded, tinned-copper drain wire shall be furnished in continuous electrical contact with the shield.

2.02 SHIELDED PAIR CABLING FOR CURRENT TRANSFORMERS

- A. Shielded pair cabling shall have stranded, tinned-copper conductors twisted with 2-inch lay.
- B. Insulation of conductors shall be 15 mil, 90°C minimum PVC, rated for 600 volts. Materials shall equal or exceed UL 13 requirements for physical properties.
- C. Color coding shall be manufacturer's standard or as stated.
- D. The outer jacket shall be flame-retardant and weather- and ultraviolet-resistant PVC, 47 mils thick, and 80°C minimum rating. The outer jacket shall contain a ripcord and shall equal or exceed the requirements of UL 1277. Cable shall be UL labeled as power-limited circuit cable.
- E. A 100% coverage shield shall be applied over the insulated conductors. The shield shall consist of a 0.85 mil minimum thickness aluminum mylar tape. A stranded, tinned-copper drain wire shall be furnished in continuous electrical contact with the shield.
- F. Single-pair shielded current transformer cables shall have No. 14 AWG conductors and No. 14 AWG drain wire. Current transformer cable runs over 25 feet in length, including the length of potted transformer leads, shall have No. 12 AWG conductors and No. 12 AWG drain wire. When extending potted transformer leads or when splicing conductors from shorting terminal blocks to meters with loop-through current sensors (no terminations), provide crimpless, self-soldered, tin-plated, heat shrink-type butt splices.

PART 3-EXECUTION

3.01 INSTALLATION REQUIREMENTS AND SPECIAL CONSIDERATIONS

- A. Shielded pair cabling specified in this section shall be installed in conduit, and may not be run free-air or in nonmetallic tubing such as innerduct.

3.02 GROUNDING

- A. The shielded connection for shielded network cabling shall be connected at the network switch and not at the field device connection. Ground network switches accepting shielded network cables.
- B. Shielded cabling shall be installed in accordance with manufacturer's instructions and to minimize electrical noise and interference to associated instruments. Refer to instrument manufacturer's instructions for additional requirements.
- C. Ends of signal wires shall be sealed to prevent the migration of moisture into the cable and to prevent unintentional grounding of the shield at the open end. Seal signal wires using a minimum 1-inch piece of heat-shrink tubing installed over PVC jacket and individual wires, and heat-shrink to a watertight fit.
- D. All shields must be grounded.
- E. Shields shall be grounded at one point only. Shielded cabling shall be isolated and left open at the instrument.
- F. Cable shield grounds shall be isolated from control system signal grounds.
- G. The control room instrument ground shall be separate and isolated from the electrical power grounding system.
- H. See grounding riser diagram in the Drawings for additional requirements.

3.03 CURRENT TRANSFORMER INSTALLATION

- A. Minimize the length of current transformer cables to maintain current transformer burdens below the specified accuracy burden limits.
- B. Shielded-pair transformer lead extension cables wired to power meters with loop-through current sensors (i.e., no current input terminals at the metering device) shall be spliced with a short length of No. 14 AWG conductor as specified in Section 26 05 19-Wire for the final loop-through connection at the power meter. Limit the length of the conductor to maintain as much of the shielded-pair cable as possible. Splices shall use self-soldered butt splices as specified herein.

END OF SECTION

SECTION 26 05 26

SECONDARY GROUNDING

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Power system grounding.
 - 2. Electrical equipment and raceway grounding and bonding.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 SUBMITTALS

- A. Indicate location of system grounding electrode connections and routing of grounding electrode conductor.
- B. Submit shop drawings and product data in accordance with provisions of Section 01 33 00–Submittals.

1.03 QUALITY ASSURANCE

- A. Grounding system shall be provided in accordance with NEC Article 250 and in accordance with the latest IDOT Lighting Design Guidelines.

PART 2–PRODUCTS

2.01 MATERIALS

- A. Ground Rods: Copper-bonded, 3/4-inch diameter; minimum length 10 feet.
- B. Ground Connections Below Grade: Exothermic type or compression type. Compression connectors shall be prefilled with an oxide inhibitor. Ground connections at ground test wells shall have compression type connectors with bolted and/or clamped type connections between the ground conductors and test well round rod.
- C. Ground Fittings: UL listed, all copper alloy, specification grade fittings.
- D. Ground Test Wells: Ground rod driven through drilled hole in bottom of handhole. Refer to Section 26 05 44–Handholes for handhole requirements.

PART 3—EXECUTION

3.01 INSTALLATION

- A. Compression-type connectors shall be installed with the manufacturer recommended tools. Compression dies shall emboss an index on the connector when installed correctly. An indenter crimp shall be made on ground rods prior to connection of grounding conductor.
- B. Provide a separate insulated equipment grounding conductor for each feeder and branch circuit. Terminate each end on a grounding lug, bus, or bushing.
- C. Bond together system neutrals, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and cold water plumbing systems.
- D. Connect grounding electrode conductors to metal water piping, metal frame of building or structure, structural reinforcing bars, and lightning protection system ground conductors using suitable ground clamps.
- E. Ground system, transformer neutrals, and equipment as required by code and local ordinances.
- F. All feeder neutrals shall be connected to neutral at only one point in the MCC.
- G. All bare copper conductors installed outdoors shall be buried a minimum of 2 feet below grade.
- H. Water system grounds and a minimum of three ground rods at 15-foot separations near service or feeder entrance of each building shall be provided and ground wires must attach to point ahead of meter or service shutoff valve. These shall be connected to ground bus by conductors sized to code requirements. The above are minimum requirements.
- I. All grounding electrode conductors shall be installed in PVC conduit. All conduit bends shall be made using sweep elbows. Conduit bodies and 90-degree bends are not allowed.
- J. Include ground for grounded receptacles, light fixtures, motors, and equipment items shown on the Drawings.
- K. Flexible connections do not qualify for ground. All flexible connections must have separate green ground wire from motor base, lighting fixture, or equipment frame to conduit system.
- L. Provide a separate grounding conductor system for the grounding of all lighting fixtures and devices installed in the same conduit as the branch circuit conductors. Ground conductors shall be individually connected at each fixture or device.
- M. Separately derived systems as defined by the National Electrical Code shall be grounded as such. This shall include, but not be limited to, 4-wire transformers.

- N. Refer to Section 26 05 23—Instrument and Communication Wire and Cable for additional grounding requirements.

3.02 TESTING

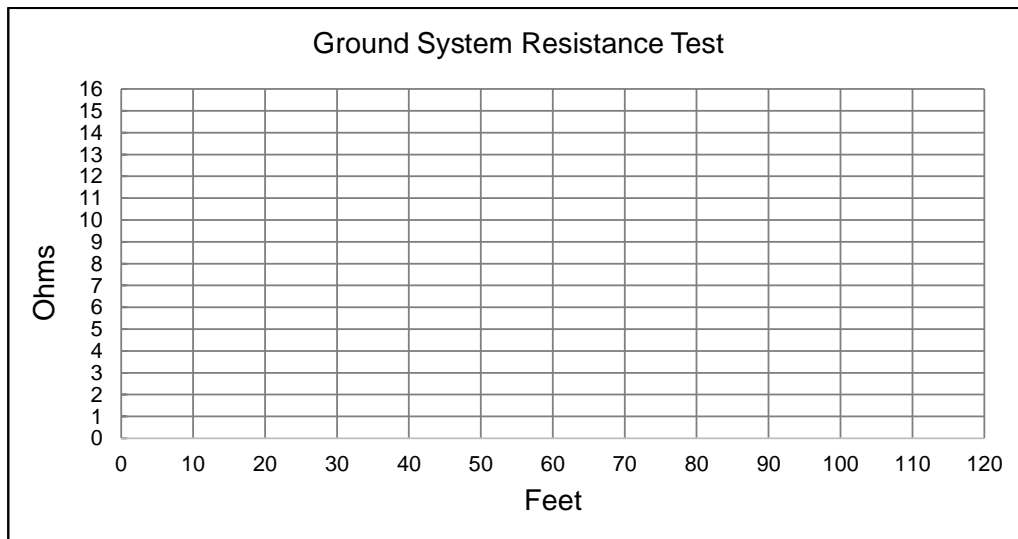
- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Provide ground system resistance test report for each ground rod location, service disconnect, and ground test well. Test reports shall document ground system resistance following the three-point “Fall-of-Potential” test. The test results shall include a graph of the results plus a diagram of the testing layout. The remote current probe (C2) shall be placed a minimum of 100 feet from the ground system potential/current probe (P1/C1) or as required to provide sufficient spacing to demonstrate a resistance plateau on the graph. The ground resistance shall be tested with the potential probe (P2) between the P1/C1 probe and the C2 probe at 10% intervals starting at 0% and ending at 100% of the distance between P1/C1 and C2, 11 points total. A single point of measurement is not acceptable, and the two-point method of ground system testing shall only be used where there is no or insufficient “open earth” area to use the three-point Fall-of-Potential method. Resistance at any point in the grounding system shall not exceed 5 ohms. All ground system tests shall be witnessed by ENGINEER or OWNER. ENGINEER shall be notified a minimum of 72 hours in advance of all ground system testing.
- C. The test meter shall be Associated Research Vibroground test set with null balance, or equal. All ground system tests shall be performed in accordance with the procedures outlined in the instruction manuals of the ground system test equipment.
- D. Ground resistance testing shall be performed with all rods connected and shall be isolated from all metallic connections, such as from the ground rod to other grounded structures and electrical system neutrals.
- E. Multiple ground rod grids shall be isolated from all metallic connections such as from grid under test to other grounded structures and electrical system neutrals.
- F. Provide test report using the attached Form 26 05 26. Each ground rod location, service disconnect, and ground test well, including service entrance transformers, MCCs, etc., shall have a form submitted.

END OF SECTION

FORM 26 05 26

GROUND ROD RESISTANCE TO EARTH TEST RECORD

1. DATE _____
2. PROJECT NAME _____
3. LOCATION OF TEST _____
4. GROUND ROD TYPE _____
DIAMETER _____ LENGTH _____
5. TEST METHOD _____
INSTRUMENT TYPE _____
SERIAL NO. _____
6. REQUIRED MAXIMUM RESISTANCE TO EARTH _____
7. MEASURED RESISTANCE TO EARTH _____
GROUND ROD SYSTEM _____



TEST PERFORMED BY: _____
Signature

TEST WITNESSED BY: _____
Signature

SECTION 26 05 29
SUPPORTING DEVICES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Conduit and equipment support members.
 - 2. Fastening hardware.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.

PART 2—PRODUCTS

2.01 MATERIAL

- A. Support Members:
 - 1. 316 stainless steel in exterior locations, Class I locations, and damp and wet locations.
 - 2. Hot-dipped galvanized steel in all other areas.
- B. Hardware:
 - 1. Stainless steel in exterior locations, Class I locations, and damp and wet locations.
 - 2. PVC-coated steel clamps and stainless steel hardware with stainless steel members where used to support PVC-coated rigid steel conduits.
 - 3. Hot-dipped galvanized steel in all other areas.
- C. Manufacturers: Unistrut P-1000, B-line, or Superstrut.

PART 3—EXECUTION

3.01 INSTALLATION

- A. All supporting devices and support structures shall be constructed such that the structure

adequately supports the load of the equipment installed on it including any wind and/or snow loads. Provide additional support members to those shown on the Drawings to adequately support load.

- B. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using expansion anchors or support members. Do not use spring steel clips and clamps. Provide standoffs as specified in other technical sections.
- C. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; and self-drilling anchors or expansion anchors on concrete surfaces.
- D. The ends of all support members shall be ground smooth.
- E. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- F. Do not use powder-actuated anchors.
- G. Do not drill structural steel members.
- H. Fabricate supports with welded end caps and all welds and surfaces ground smooth for neat appearance. Use hexagon head bolts with steel spring-lock washers under all nuts.
- I. In wet locations, install free-standing electrical equipment on concrete pads. Anchor all equipment to adjacent walls with standoffs and caulk.
- J. Install surface-mounted cabinets and enclosures with a minimum of four anchors.
- K. Do not use chain, wire rope, or perforated strap hangers.
- L. All welds shall be continuous and ground smooth.

END OF SECTION

SECTION 26 05 33

CONDUIT

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Rigid metal conduit and fittings.
 - 2. PVC externally and internally coated galvanized rigid metal conduit and fittings.
 - 3. Polyvinyl chloride conduit and fittings.
 - 4. Liquidtight flexible metal conduit and fittings.
 - 5. Conduit seals and special fittings.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ANSI C80.1—Electrical Rigid Steel Conduit (ERSC).
- B. ANSI/NEMA FB 1—Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable.
- C. NEMA RN 1—Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal.

1.03 QUALITY ASSURANCE

- A. Manufacturers of Raceways: Firms regularly engaged in the manufacture of electrical raceways of the types and capacities required whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that for the project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide electrical materials, which have been listed and labeled by Underwriters Laboratories.
- E. Prior to shipment to the site, all conduit provided shall be new, unused material, and shall not have been stored outdoors or exposed to weather.

- F. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00–Submittals.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Provide color-coded thread protectors on the exposed threads of threaded rigid metal conduit.
- B. Handle conduit carefully to prevent end damage and to avoid scoring the finish.
- C. Store conduit inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.

PART 2–PRODUCTS

2.01 RIGID METAL CONDUIT AND FITTINGS

- A. Rigid Steel Conduit: ANSI C80.1 and UL6. Heavy wall seamless tubing with hot-dipped galvanized coating.
- B. Conduit bodies for rigid steel conduit shall be constructed of stamped steel for sizes 2 inches and under, and cast malleable iron for sizes over 2 inches. Conduit bodies shall have domed gasketed covers and stainless steel screws. Conduit bodies sizes 1 1/4-inch and larger shall have built-in pulling rollers. Covers for conduit bodies must have bolts that thread into the conduit body. Snaptight and wedgenut covers are not allowed. CONTRACTOR shall select body style and size according to application.
- C. PVC-coated conduit and fittings shall be internally and externally hot dipped galvanized rigid metal conduit with hot dipped galvanized threads and PVC coating. PVC coating shall be UL listed with rigid metal conduit as the primary means of corrosion protection for the conduit, and PVC coating shall have an external 40 mil thickness with an internal 2 mil urethane coating. Acceptable manufacturers shall be Plasti-bond RedH₂OT by Robroy Industries, Ocal-Blue by ABB (Thomas & Betts), or Calbond. All installers shall be field-certified from the factory for installation and shall provide proof of certification. PVC-coated conduit and fittings shall meet the following listings and manufacturing standards, without exception:
1. ANSI C80.1.
 2. UL6.
 3. NEMA RN1.
- D. Conduit bodies for PVC-coated rigid conduit shall be as manufactured by Plasti-bond RedH₂OT by Robroy Industries, Ocal-Blue by ABB (Thomas & Betts), or Calbond and have a 40 mil PVC exterior coating and 2 mil red urethane interior coating.

Conduit bodies shall be Form 8 style or pulling elbow and include domed, gasketed covers and stainless steel screws. Covers for conduit bodies must have bolts that thread into the conduit body. Snaptight and wedgenut covers are not allowed. CONTRACTOR shall select body style and size according to application.

- E. Fittings and Conduit Bodies: ANSI/NEMA FB 1 and UL 514B; threaded-type material to match conduit. For hazardous locations, fittings and conduit bodies shall meet the requirements of UL 886. Split couplings are not allowed.
- F. Supports: One-hole straps with conduit clamps and backspacers shall be used for surface-mounted conduit. Where standoffs are required, provide conduit clamps and supporting devices as specified in Section 26 05 29—Supporting Devices. One-hole straps with conduit clamps and backspacers for PVC-coated rigid steel conduit shall be PVC-coated rigid steel material.

2.02 POLYVINYL CHLORIDE CONDUIT (PVC) AND FITTINGS

- A. Conduit: Heavy wall rigid, Schedule 40, UL listed for underground, encased, and aboveground applications. PVC conduit installed in exterior locations shall be UV resistant.
- B. Conduit bodies for PVC conduit shall be suitable for use with Schedule 40 PVC conduit. Conduit bodies shall have smooth hubs, textured lids, and foam-in-place gaskets. CONTRACTOR shall select body style and size per application.
- C. Supports: Two-hole nonmetallic clamps shall be used for surface-mounted conduit. Where standoffs are required, provide pipe straps and supporting devices as specified in Section 26 05 29—Supporting Devices. Support material shall match that of the conduit type being provided.

2.03 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS

- A. Liquidtight Flexible Metal Conduit:
 - 1. Conduit: Spiral-wound, electrogalvanized, single-strip steel with integral grounding conductor continuously enclosed within the entire length of the convolutions. The flexible PVC jacket shall be sunlight-resistant, flame-retardant, and resistant to damage from mild acids. Conduit shall be UL Listed and be rated for installation in Class I, Division 2, Groups C and D locations.
 - 2. Fittings: UL listed with thermoplastic elastomer sealing gasket.
 - a. Provide stainless-steel fittings in exterior and damp and wet locations, unless noted otherwise.
 - b. Provide electro-zinc plated steel fittings in all other areas, unless noted otherwise.

2.04 CONDUIT SEALS AND SPECIAL FITTINGS

- A. Conduit seal-offs for Class I Locations: UL listed, PVC-coated rigid steel fitting, with plug installation verification and water soluble, sealing compound, for Class I, Groups C and D locations.
- B. Conduit Seals: UL listed, non-hardening, gray color, paintable sealing compound.

- C. Expansion Fittings: In non-hazardous locations provide UL listed for use in wet locations, electrogalvanized steel, expansion fittings with internal bonding springs and metallic bushings. In hazardous locations provide UL listed, rated for Class I, Division 1, Groups C and D locations, expansion fittings with internal bonding jumper rings. Hazardous location expansion fitting material shall match the associated conduit. For PVC conduit provide UL listed, rigid PVC expansion fittings with sealing o-rings for use with Schedule 40 and Schedule 80 PVC conduits.
- D. Expansion Deflection Fittings: O-Z type "DX," Crouse Hinds, type XD (PVC conduit only), or Appleton.
- E. Ground Bushings: UL listed, 105°C rated, copper lugged, threaded ground bushing with plastic throat liner.
- F. Mechanical Seals: Link seals shall be provided with reinforce nylon polymer pressure plates and 316 stainless steel bolts, nuts, and fasteners.
- G. Watertight Hubs: Diecast, insulated and gasketed, rated for wet or dry locations indoors or outdoors. Watertight hubs shall be Appleton HUBXXXDN, Crouse-Hinds Myers Hubs, or Leviton.
- H. Conduit Plugs: Plug shall include natural rubber O-ring with galvanized wing nut and hex nut.
- I. Conduit Threads Joint Compound: Conductive, anti-corrosion joint compound.

PART 3-EXECUTION

3.01 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduits for branch circuit conductors, control wires, and instrumentation cables so as to have not less than 25% spare capacity after installation; 3/4 inch minimum size. Minimum size for liquidtight flexible metal conduit is 3/4 inch.
- B. Maintain at least 1 inch of separation between conduit sizes to 1 1/2 inches and 2 inches between conduits 1 1/2 inches or larger. Maintain 1 foot of separation between signal conduits (below 100 volts) and power conduits (100 volts and above).
- C. All conduit shall be supported in accordance with the NEC and as specified herein. This shall apply to all conduit types, including flexible conduit.
- D. Provide for the proper application, installation, and location of inserts, supports, and anchor bolts for a satisfactory raceway system. Where any component of the raceway system is damaged, replace or provide new raceway system.

- E. Run conduits to avoid adverse conditions such as heat and moisture, to permit drainage, and to avoid all materials and equipment of other trades. Maintain a minimum clearance of 6 inches from all hot water pipes, flues, or any high-temperature piping or ductwork.
- F. Conduits shall be attached to building surfaces and not suspended unless installed in a Unistrut-type conduit rack as specified herein. Individual conduits shall not be suspended. Clevis hangers are not allowed.
- G. Conduits shall not be run in slabs-on-grade or structural topping slabs.
- H. Independently support or attach the raceway system to structural parts of construction in accordance with good industry practice.
- I. Conduit attached to building surfaces that may be damp or wet shall be spaced out to avoid rust and/or corrosion using fittings approved for the use. Use back straps on all conduit in damp and wet locations, or mount conduit with Unistrut straps. Watertight hubs shall be used in all damp and wet locations.
- J. Conduits shall be securely fastened to building structure at intervals not exceeding 8 feet or closer, if necessary. Where hangers are necessary, 3/8-inch rod/eyelets/rings/or trapeze type in Unistrut channel and pipe clamps shall be used. Wire or perforated strap iron is not acceptable. PVC conduit shall be securely fastened to building structure at intervals not exceeding 3 feet.
- K. Vertical conduit runs 1 1/4 inches and larger passing through floors shall be supported at each floor with conduit riser grips.

3.02 GENERAL CONDUIT INSTALLATION REQUIREMENTS

- A. Exterior conduit shall be buried below grade in underground concrete duct banks. Refer to Section 26 05 43–Underground Concrete Duct Banks for additional information.
- B. Run exposed conduit grouped and parallel or perpendicular to construction. Do not route exposed conduits over high-temperature machinery nor in contact with such equipment.
- C. Each conduit shall be identified by a unique tag number per the conduit schedule, at both terminating ends and when conduit enters/leaves each floor and/or room..
- D. In all PVC conduit runs in underground concrete duct banks, PVC coated rigid steel conduit shall be used for all 90 degree bends.
- E. Ream conduit smooth at ends, cap upon installation, rigidly attach to structural parts of the building, and securely fasten to all outlet boxes, cabinets, junction boxes, pull boxes, splicing chambers, disconnect switches, and all other components of the raceway system.
- F. Conduits shall not be routed through ductwork or chases.
- G. Provide all empty raceways 2 1/2 inches and over with No. 10 galvanized fishwire, and nylon cord for conduits smaller than 2 1/2 inches. Empty raceways and fishwire/nylon cord shall

be identified with permanent label, and label shall include conduit termination point. All empty conduits shall be threaded, capped and flush with finished floor or wall. Exposed conduits shall be threaded and capped.

- H. Provide conduit raceway for exposed cables that are not UV resistant. This shall include, but not be limited to, instrument wiring, pump cables, float cables, etc.
- I. Conduit seals shall be provided for intrinsically safe circuits, where conduits pass from the interior to exterior of the building, where conduits enter a room which at any time is a low or high temperature room, where conduits enter a room which at any time is subject to internal air pressures above or below normal, and any conduit entering a wet location.
- J. Liquidtight flexible conduit shall be installed in such a manner that liquids tend to run off the surfaces and not drain toward the fittings.
- K. All runs of flexible conduit and flexible conduit couplings to equipment and devices shall be as short as practicable, of the same size as the conduit it extends, and with enough slack to reduce the effects of vibration to a minimum. A minimum of 18 inches of flexible conduit shall be installed for each motor.
- L. Provide conduit expansion-deflection fittings as specified herein in all conduit runs where movement perpendicular to axis of conduit may be encountered.
- M. Conduits shall be pitched so that drainage is towards handholes and away from all structures.
- N. Conduit bends for PVC conduit shall be made using a hot box, heat blanket, or glycol bender. Open flame or point heat sources of any type are not allowed.
- O. The PVC-coated rigid conduit manufacturer's touch-up compound shall be used on all conduit interior and exterior bare steel exposed because of nicks, cuts, abrasions, thread cutting, and reaming; minimum six coats.
- P. Where below-grade PVC conduit is connected to PVC coated rigid metal conduit, the length of PVC conduit shall be a minimum of 10 feet. For short, below-grade conduit runs where required lengths of PVC coated rigid metal conduit limit the length of PVC conduit to less than 10 feet, PVC coated rigid metal conduit shall be used for the entire run.
- Q. Routing of conduits on exterior of buildings shall be avoided to the extent possible and shall not cover or interfere with lighting, signage, windows, louvers, or other openings. All conduit routing on exterior walls shall be reviewed with ENGINEER for approval prior to installation.
- R. Conduits installed in damp and wet locations shall have all threads coated with conduit threads joint compound.

3.03 CONDUIT PENETRATIONS AND TERMINATIONS

- A. Where fittings are brought into an enclosure with a knockout, a gasket assembly consisting of an O-ring and retainer shall be installed on the outside. Fittings shall be insulated throat type.
- B. Conduit penetrations for control panels or enclosures containing electronic equipment shall utilize watertight hubs and, if entering the top of the enclosure, shall be located at the front of the enclosure and not over any electronic equipment (e.g., PLC, power supplies, etc.).
- C. Conduit penetrations for all exterior enclosures (e.g., disconnects, junction boxes, control panels) shall utilize watertight hubs and enter the sides or bottom of the enclosure. Conduits shall not penetrate the top of the enclosure.
- D. Provide conduit expansion fittings as specified herein in all conduit runs that cross a structural expansion joint, for conduits protruding from duct banks that are routed above grade and into structures, and for conduits protruding from earth.
- E. Provide firestopping for all conduits penetrating fire barriers as specified in Section 07 84 00–Firestopping.
- F. All conduits that protrude from poured concrete shall be PVC-coated rigid conduit. Conduit shall extend continuously (i.e., no joints) a minimum of 4 feet beyond the poured concrete (both sides).
- G. Conduits passing through masonry, concrete, or similar construction shall be cast in place using PVC-coated rigid conduit extending completely through the construction.
- H. Where above-grade conduits pass through cores through masonry walls, grout openings between conduit and walls or floors with sand cement mortar.
- I. Where wall penetrations through walls are below grade, cored openings shall be sealed with waterproof mechanical seals. Cores shall be pitched slightly such that conduit slopes away from building. Sleeve diameter shall be provided and mechanical seals installed as recommended by the manufacturer. Conduit shall extend continuously (i.e., no joints) a minimum of 4 feet beyond the wall (exterior).
- J. All spare conduits that terminate in a building or structure below grade shall be plugged with conduit plugs as specified herein.

3.04 CONDUIT INSTALLATION IN HAZARDOUS LOCATIONS

- A. All conduits installed in or passing through “hazardous locations” as defined by the NEC, NFPA, or as noted on the Drawings, shall be installed with seal-offs as specified herein.
- B. All conduits in hazardous locations shall be installed in accordance with the NEC.

- C. Conduits for intrinsically-safe circuits shall be dedicated to intrinsically-safe wiring. Conduits shall be installed and identified by labeling or color coding in accordance with Article 504 of the NEC.

3.05 EXTERIOR CONDUIT DRAIN INSTALLATIONS

- A. Conduit drain fittings shall be provided at exterior conduit transitions and at exterior equipment.

3.06 CONDUIT INSTALLATION FOR EMERGENCY LIGHTING AND POWER CIRCUITS

- A. All emergency egress lighting and power circuits shall be installed in dedicated conduits.
- B. Conduits for emergency egress lighting and power circuits shall be installed and permanently marked in accordance with the NEC.

3.07 CONDUIT INSTALLATION SCHEDULE

- A. The following schedule lists specific conduit types allowed in designated areas. Those areas not listed under a specific conduit type shall not have that type of conduit installed:
 - 1. Rigid steel: All exposed interior locations in the Electrical Room.
 - 2. PVC-coated rigid steel:
 - a. Class I, locations.
 - b. Conduits protruding from concrete and masonry.
 - c. Interior and exterior locations requiring mechanical protection.
 - d. Earth.
 - e. Exterior locations and locations exposed to weather.
 - f. Within 4 feet of building or structure footing, wall, or handhole.
 - g. Wet and damp locations.
 - h. Conduit bends in underground concrete duct banks.
 - 3. PVC:
 - a. Earth, except conduits serving Class I locations, and within 4 feet of a building or structure footing, wall, or handhole.
 - b. Service entrance ground conductors.
 - c. Concrete encased duct banks (Schedule 40).
 - 4. Liquidtight flexible metal conduit not over 3 feet in length for final connections to:
 - a. Equipment with sliding bases or flexible positioning.
 - b. Equipment with vibration isolation mounting.
 - c. Equipment housing ferromagnetic cores or with integral moving components capable of generating noise or vibrations, including motors.
 - d. All pumps and associated equipment.

END OF SECTION

SECTION 26 05 35

BOXES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Switch, outlet, and small junction boxes.
 - 2. Pull and junction boxes.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern Work in this section.

1.02 REFERENCES

- A. ANSI/NEMA OS 1—Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- B. NEMA 250—Enclosures for Electrical Equipment (1000 Volts Maximum).

1.03 QUALITY ASSURANCE

- A. Manufacturers of switches, outlets, boxes, lamps, fuses, lugs, etc.: Firms regularly engaged in the manufacture of these products, of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation Work similar to that in this project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide electrical cable, boxes, raceways, wire, connectors, outlets, switches, etc. that have been listed and labeled by Underwriters Laboratories.
- E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.

PART 2-PRODUCTS

2.01 SWITCH, OUTLET, AND SMALL JUNCTION BOXES

- A. Masonry and Partition Boxes: Galvanized steel, nongangable. Provide number of gangs for devices shown on the Drawings.
- B. Cast Boxes: Aluminum or cast ferrous alloy, deep-type, gasketed cover, threaded hubs.
- C. PVC-Coated Cast Boxes: Boxes shall be deep type and be by the same manufacturer as the conduit.
- D. Covers for switch and outlet boxes used as junction boxes shall have covers that match box type.

2.02 PULL AND JUNCTION BOXES

- A. PVC-Coated Cast Boxes: Provide PVC-coated cast boxes in areas where PVC-coated conduit is used. Boxes shall be by the same manufacturer as the conduit. Boxes larger than 12 inches in any dimension shall have hinged cover.
- B. NEMA 4X Boxes: 316 stainless steel with hinged cover, recessed quarter-turn latches, and gasket, where specified herein.
- C. NEMA 12 Boxes: Painted steel with hinged cover, recessed quarter-turn latches, and gasket.
- D. Where terminal blocks or other devices are mounted in a pull or junction box, provide a 14-gauge steel back panel with a white enamel finish for mounting.
- E. All enclosures with double doors or that are free-standing shall have a three-point latch.
- F. Boxes specified in this section are not allowed to have knockouts and are not allowed to be used as enclosures for control panels.

PART 3-EXECUTION

3.01 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on the Drawings and as necessary for splices, taps, wire pulling, cable bending radii, equipment connections, and code compliance.
- B. Electrical box locations shown on the Drawings are approximate. Verify location and size of outlet boxes in all work areas prior to rough-in.
- C. Where dedicated raceways are provided for different voltage systems or wiring, (e.g., motor power wiring and motor space heaters), separate boxes shall also be provided unless

acceptable to ENGINEER. Where acceptable to ENGINEER, combined boxes shall be physically divided to separate the wiring.

- D. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of access doors.
- E. Locate and install to maintain headroom and to present a neat appearance.
- F. All boxes attached to building surfaces that may be damp or wet shall be spaced to avoid rust and/or corrosion. All boxes in damp and wet locations shall be on 1/2-inch standoffs.

3.02 SWITCH, OUTLET, AND SMALL JUNCTION BOX INSTALLATION

- A. Locate boxes in masonry walls for cutting of masonry unit corners only. Coordinate masonry cutting to achieve neat openings for boxes.
- B. Provide knockout closures for unused openings.
- C. Support boxes independently of conduit.
- D. Use multiple gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- E. Install boxes in walls without damaging wall insulation.
- F. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- G. Switch and outlet boxes provided for branch circuits and feeders shall not contain control wiring. Control wiring, wiring for emergency egress lighting, and intrinsically safe wiring shall each have dedicated pull and junction boxes provided. Wiring for different voltage systems (e.g., 24 V, 120 V, 480 V) shall have dedicated pull and junction boxes for each voltage.
- H. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- I. In unplastered brick or block walls, use masonry boxes for exterior devices and equipment.
- J. For weatherproof switches, devices, and exterior fixtures, use cast boxes with proper cover and gasket.
- K. All interior exposed wall and ceiling outlet boxes shall be cast boxes, unless otherwise noted.
- L. Knockout punches or saws shall be used for holes; boxes with prepunched holes are not acceptable.
- M. Boxes shall be of a depth to accommodate wires and splices and shall be equipped with both fixture hanging studs and tapped fixture ears. Boxes shall be installed so that they will support the weight of the fixture. Conduit will not be considered as adequate supports.

- N. Cast boxes with 3/4-inch hubs and aluminum fittings and enclosures may be used with all conduit types, unless noted otherwise.
- O. Provide PVC-coated cast boxes in all areas where PVC-coated conduit is used. Boxes in hazardous locations shall be rated for Class I, Division 2, Group D locations. Boxes shall be by the same manufacturer as the PVC-coated conduit.

3.03 PULL AND JUNCTION BOX INSTALLATION

- A. Support pull and junction boxes independent of conduit.
- B. Knockout punches or saws shall be used for holes; boxes with prepunched holes are not acceptable.
- C. Refer to Section 26 05 53—Electrical Identification for junction box labeling requirements.
- D. All interior exposed junction and pull boxes shall be NEMA 12, unless noted otherwise.
- E. All exterior junction and pull boxes shall be NEMA 4X.
- F. Boxes in hazardous locations shall be rated for Class I, Division 2, Group D locations. Boxes shall be by the same manufacturer as the PVC-coated conduit.

END OF SECTION

SECTION 26 05 43

UNDERGROUND CONCRETE DUCT BANKS

PART 1–GENERAL

1.01 DESCRIPTION

- A. Work Included: Provide all labor, materials, equipment and incidentals as shown on the Drawings, specified and required to furnish and install underground concrete duct banks.
- B. Coordination: Duct bank routing on the Drawings is diagrammatic. Coordinate installation with piping and other underground systems and structures and locate clear of interferences.

1.02 QUALITY ASSURANCE

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown on the Drawings or specified.
 - 1. National Electrical Code/NFPA 70.
 - 2. National Electrical Safety Code, (NESC).

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00–Submittals.
- B. Shop Drawings: Submit for approval the following:
 - 1. Layouts showing the proposed routing of duct banks and areas of reinforcement.
 - 2. Cross sections of each unique duct bank segment with all conduits identified.
- C. Record Drawings: Include the actual routing of underground duct runs on Record Drawings in accordance with Section 01 77 00–Contract Closeout.

PART 2–PRODUCTS

2.01 MATERIALS

- A. Duct: Schedule 40 PVC conduit and fittings in accordance with Section 26 05 33–Conduit. Provide long sweeping PVC coated rigid steel conduits for all elbows in accordance with Section 26 05 33–Conduit.
- B. Warning Ribbon: Provide tape with nominal dimension of 6 inches wide, 4 mil thickness, permanently imprinted with “CAUTION BURIED ELECTRIC LINE BELOW” for installation above, and centered on direct-buried cables, electrical duct banks, and conduits without duct bank encasement.
- C. Backfill: Refer to Section 26 05 00–General Electrical Requirements.

Section 26 05 43-1

- D. Reinforcement: In accordance with Section 03 20 00—Concrete Reinforcement.
- E. Concrete: In accordance with Section 03 30 00—Cast-In-Place Concrete.

PART 3—EXECUTION

3.01 INSTALLATION

- A. Provide excavation and backfilling required for duct bank installation.
- B. Make duct bank installations and penetrations through foundation walls watertight.
- C. Top of duct banks shall be a minimum of 24 inches below grade.
- D. Assemble duct banks using nonmagnetic saddles, spacers and separators. Position separators to provide 3-inch minimum concrete separation between the outer surfaces of the ducts. Provide side forms for each duct bank.
- E. Provide a 3-inch minimum concrete covering on both sides, top and bottom of concrete envelopes around conduits. Concrete covering size shall be as shown on the Drawings. Add red dye on top of concrete for easy identification during subsequent excavation. Red dye shall be applied to the top of the concrete after being poured.
- F. Firmly fix ducts in place during placing of concrete. Carefully place and vibrate the concrete to fill all spaces between ducts.
- G. Make PVC coated rigid steel conduit bends with sweeps of not less than 48-inch radius or 5 degree angle couplings.
- H. Make a transition from nonmetallic to PVC-coated rigid steel conduit where duct banks terminate and conduits continue to run exposed. Transition shall be within concrete encasement and be a minimum of 5 feet from encasement termination.
- I. Reinforce all duct banks. Unless otherwise shown on the Drawings, reinforce with No. 4 longitudinal steel bars placed at each corner and along each face at a maximum parallel spacing of 18 inches on centers, and No. 3 closed ties transversely placed at 18-inch maximum longitudinal intervals. Maintain a minimum clearance of 2 inches from bars to the edge of the concrete encasement.
- J. Where ducts enter structures such as buildings, terminate the ducts in suitable end bells, insulated bushings or couplings on PVC-coated rigid steel conduits.
- K. Duct banks abutting concrete structures shall be tied into structure. All No. 4 longitudinal bars shall be adhesive anchored into concrete structures with a minimum 6-inch embedment.

- L. Do not backfill with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material, or other materials which can damage or contribute to corrosion of ducts or cables, or prevent adequate compaction of backfill.
- M. Slope duct runs for drainage away from buildings with a slope of approximately 3 inches per 100 feet.
- N. Install a bare-stranded #6 AWG copper duct bank ground cable in each duct bank envelope. Make ground electrically continuous throughout the entire duct bank system. Connect ground cable to building and station ground grid or to equipment ground buses. In addition, connect ground cable to steel conduit extensions of the underground duct system. Provide ground clamp and bonding of each steel conduit extension where necessary to maintain continuity of the ground system. Terminate ground cable at last outlying structures.
- O. After completion of the duct bank and prior to pulling cable, pull a mandrel not less than 12 inches long and with a cross section approximately 1/4 inch less than the inside cross section of the duct through each duct. Then, pull a rag, swab or sponge through to make certain that no particles of earth, sand, or gravel have been left in the duct.
- P. Install a warning ribbon as specified herein, approximately 12 inches below finished grade over all underground duct banks carrying cables of 120 volts and higher.
- Q. Plug and seal empty spare ducts entering buildings and structures. Seal watertight all ducts in use entering buildings and structures with duct sealing compound.
- R. Provide survey points including northing, easting and elevation every 50 feet, including changes in elevation or direction. Update Record Drawings to reflect survey information. Submit both redlines and electronic data to ENGINEER weekly.
- S. Wherever duct banks cross roadways, driveways, parking areas, and any paved areas, provide brass medallion over location of duct bank crossing. Medallion shall indicate "Electrical duct bank crossing."

END OF SECTION

SECTION 26 05 44

HANDHOLES

PART 1–GENERAL

1.01 DESCRIPTION

- A. Work Included: Precast polymer concrete handholes.
- B. Related Sections: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ANSI/SCTE 77–Specification for Underground Enclosure Integrity.

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00–Submittals.
- B. Shop drawing submittals shall include the following:
 - 1. Interior elevations of each wall of all handholes provided under this Contract. Each conduit shall be identified as to what it serves.
 - 2. Product data (handholes): Manufacturer's technical information for handholes and accessories proposed for use.

PART 2–PRODUCTS

2.01 PRECAST POLYMER CONCRETE HANDHOLES

- A. Material and Construction:
 - 1. Precast polymer concrete.
 - 2. Duct entrances sized and located to suit duct banks.
 - 3. Enclosures, boxes and covers are required to conform to test provisions of ANSI/SCTE 77 for Tier 22 applications.
 - 4. Handholes shall be a minimum of 30 inches deep. Handholes shall be sized in accordance with the NEC.
 - 5. Covers shall have the following stamped logo:

“ELECTRICAL”

PART 3–EXECUTION

3.01 INSPECTION AND COORDINATION

- A. Examine conditions under which the Work is to be installed and notify ENGINEER in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.

3.02 HANDHOLE INSTALLATION

- A. Coordinate handhole installation with piping, sheeting, and other underground systems and structures, and locate clear of interferences.
- B. Install handholes where shown and verify locations in field. Perform excavation and backfilling required for installation. Excavation and backfilling shall be in accordance with Section 26 05 00–General Electrical Requirements.
- C. Install handholes on a 3/4-inch crushed stone foundation 1 foot under all handholes, and within 2 feet of handholes. Handhole bases shall be set at the proper grade and carefully leveled and aligned.
- D. All conduits must enter the sides of handholes. Conduits entering the bottom will not be permitted. Conduits shall enter handholes a minimum of 6 inches above bottom of handhole. Provide handhole depth as required. Conduit burial depth shall be 24 inches as specified.
- E. Handholes shall be considered wet locations for purposes of equipment selection.
- F. All conduits shall be pitched so that drainage is towards handholes and away from all structures.

3.03 GRADING AT HANDHOLES

- A. Handholes in unpaved areas shall be built as shown to a rim elevation higher than the original ground. The ground surface shall be graded to drain away from the handhole. Fill shall be placed around handholes to the level of the upper rim of the handhole frame, and the surface evenly graded on a one (vertical) to five (horizontal) slope to surrounding ground, unless otherwise shown.
- B. CONTRACTOR shall be solely responsible for proper height of handholes necessary to reach final grade. ENGINEER's review of shop drawings for handhole components is general in nature, and CONTRACTOR shall provide random length handhole riser sections to adjust handholes to meet field conditions for final grading.

END OF SECTION

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Nameplates.
 - 2. Labeling tags.
 - 3. Wire markers.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00-Submittals.
- B. Provide schedule for nameplates and labeling tags with shop drawings. Reference Drawings for type used.

PART 2-PRODUCTS

2.01 NAMEPLATES

- A. Type "A":
 - 1. Use:
 - a. Each separately mounted circuit breaker or disconnect switch.
 - b. Each device in motor control centers.
 - c. SPD.
 - d. Each device on Supervisory Control Center exterior.
 - e. Cabinets, enclosures, pull, and junction boxes.
 - f. Field devices (level transmitters).
 - 2. Size: 2 inches by 4 inches.
 - 3. Material: 2-layer laminated phenolic.
 - 4. Background Color: White.
 - 5. Character Color: Black.
 - 6. Character Size: 1/2-inch.
 - 7. Engraving: See MCC schedule, one-line, and I/O list for labels, or as requested by ENGINEER. Label shall include equipment number and description (i.e., SCAL-60-01, Fluoride Scale).
 - 8. Mounting Location: Front exterior.
- B. Type "B":
 - 1. Use: Automatic Transfer Switches.

2. Size: 2 inches by 4 inches.
3. Material: 2-layer laminated phenolic.
4. Background Color: White.
5. Character Color: Red.
6. Character Size: 1/4-inch.
7. Engraving: See MCC schedule and one-line for labels, or as requested by ENGINEER.
8. Mounting Location: As requested by ENGINEER.

C. Type "C":

1. Use:
 - a. Motor Control Centers.
 - b. Network Cabinet.
 - c. Supervisory Control Centers.
2. Size: 4 inches by 4 inches.
3. Material: 2-layer laminated phenolic.
4. Background Color: White.
5. Character Color: Black.
6. Character Size: 2 1/4 inches.
7. Engraving: Equipment label, Emergency shall be red with white letters. Label shall include equipment number and description (i.e., LP-10-01, First Floor Power Panel).
8. Mounting Location: Equipment: Top wire way.

D. Type "D":

1. Use: Control stations, thermostats, conduit fittings, etc.
2. Size: 1/2-inch by 4 inches.
3. Material: 2-layer laminated phenolic.
4. Background Color: White.
5. Character Color: Black.
6. Character Size: 1/4-inch.
7. Engraving: Control station number and equipment description (e.g., T-15-01, Chlorine Room).
8. Mounting Location: Device front at top.

E. Type "E":

1. Use:
 - a. Electrical Distribution System Equipment not previously specified.
 - b. Fire Alarm System.
 - c. Intrusion Alarm System.
 - d. Operator Instructions.
2. Size: As necessary.
3. Material: 2-layer laminated phenolic.
4. Background Color: Yellow.
5. Character Color: Black.
6. Character Size: 1/4-inch.
7. Engraving and Mounting Location: As requested by ENGINEER.

F. Type "F":

1. Use: Leak detection horn and strobe.
2. Size: Minimum 7 inches wide by 12 inches high; 1/8-inch thick.
3. Material: Laminated phenolic.

4. Background Color: Yellow.
5. Character Color: Black.
6. Character Size: Minimum 3 inches.
7. Engraving for Leak Detection:
First Line: "WARNING, WHEN ALARM SOUNDS"
Second Line: "THE ENVIRONMENT WITHIN THE"
Third Line: "ROOM MAY BE HAZARDOUS."
8. Mounting Location: Below Devices.

2.02 LABELING TAGS

- A. Use: Field-mounted devices without surfaces suitable for mounting fixed nameplates (Limit Switches, Level Transmitters, etc.).
 1. Size: 3/8-inch by 2 inches.
 2. Material: 2-layer laminated phenolic.
 3. Character Size: 1/4-inch.
 4. Engraving: As requested by ENGINEER.
- B. Labeling tags shall be provided for each conduit and shall be identified by a unique tag number, per the conduit schedule, at both terminating ends and when conduit enters/leaves each floor and /or room.

2.03 WIRE AND CABLE MARKERS

- A. Wire and cable markers shall be permanently-attached, heat-shrink type labels.
 1. Sleeve: Permanent, PVC, white, with legible machine-printed black markings.
 2. Grounding Conductor: Provide green wire marker; minimum 2 inches wide.
- B. Wire or cable numbering preprinted on the conductor or cable insulation, flag-type labels, and individual wraparound numbers are not acceptable. All wire markers shall be the same throughout the project.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Affix nameplates with weatherproof, UV-resistant adhesive in outdoor locations and sticky back adhesive in indoor locations.
- D. Affix labeling tags to devices with stainless steel leaders; vinyl locking wire ties are not acceptable. Provide 3/8-inch hole to accommodate wire tie.
- E. Affix labeling tags to conduits with heavy duty, UV resistant, nylon locking cable ties.

- F. Prepare and install neatly-typed circuit directories and schedules in all panels, including, but not limited to, panelboards where Work is done under this Contract.
- G. Labeling tags shall only be used for equipment enclosures without surfaces suitable for mounting fixed nameplates.

3.02 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor, including neutral and spare conductors, in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Neutral conductor labels shall include the associated branch circuit number. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams for control wiring. Spare conductors shall have control wire number or shall indicate termination point of wire.
- B. Conductors in pull boxes, motor control centers, supervisory control panels, control panels, cabinets, and panelboards shall be grouped as to circuits and arranged in a neat manner. All conductors of a feeder or branch circuit shall be grouped, bound together with nylon ties, and identified. Phase identification shall be consistent throughout the system. All wiring labels shall be able to be read without removing wire management (i.e., wiring trough covers, spiral windings, etc.) or twisting the wire/cable.
- C. Where terminal blocks are factory provided with non-project-specific labels by equipment manufacturers in MCC buckets, control panels, and similar equipment and are wired to terminal blocks in control panels with project-specific labels, the interconnecting wiring shall be labeled at both ends to match the project-specific terminal blocks in the control panel. Provide an additional label on the end of each wire that is connected to a terminal block with a non-project-specific label to indicate the associated terminal block.
- D. Power Conductor Insulation Color Code:
 1. 6 AWG and Larger: Provide general-purpose, flame-retardant, permanent tape at each termination and at accessible locations such as handholes, junction and pull boxes, panelboards, motor control centers, etc. Apply tape with at least six full, overlapping wraps; minimum 2 inches wide.
 2. 8 AWG and Smaller: Provide conductors with color-coded insulation.
 3. Colors:

System	Conductor	Color
All Systems	Equipment Grounding	Green
120/208 Volts Three-Phase, Four-Wire	Grounded Neutral	White*
	Phase A	Black
	Phase B	Red
	Phase C	Blue
277/480 Volts Three-Phase, Three-Wire	Grounded Neutral	Grey (comply with NEC)
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow
Note: Phase A, B, C implies direction of positive phase rotation.		

System	Conductor	Color
* When installed as part of a 120-volt branch circuit, provide a color-coded stripe on the white neutral conductor insulation matching the branch circuit insulation.		

- E. Control Panel and Field-Installed Control Conductor Insulation Color Code:
- All conductors shall have color-coded insulation.
 - Colors:

System	Conductor	Color
Supply Voltage	Ungrounded Circuit Conductors Neutral	Black White
Discrete 120-volt AC Input/Output	Control Circuit Conductor Neutral	Red White
Discrete 12/24-volt DC Input/Output	Control Circuit Conductor Common	Blue White with Blue Stripe
Conductors energized when the main disconnect is in the "off" position (e.g., foreign supply voltages)	Control Circuit Conductor AC Neutral DC Common Ground	Orange White White with Blue Stripe Green
Intrinsically Safe	Control Circuit Conductor DC Common	Light Blue White with Two Light Blue Stripes

- F. Circuit Identification:
- Identify power, instrumentation, and control conductors at each termination and at accessible locations such as handholes, junction and pull boxes, panelboards, motor control centers, etc.
 - Conductors for panelboard circuits shall identify circuit matching the circuit directory designations, including the neutral conductor.
 - Control conductor identification shall match the associated terminal block label.
 - Circuits Not Listed in Circuit Directories:
 - Assign circuit name based on unique device or equipment at load end of circuit.
 - Where unique device or equipment names are not available or apparent, add a unique number or letter modifier to each otherwise identical circuit name.

3.03 DATA CABLE AND COMMUNICATION EQUIPMENT IDENTIFICATION

- Individual labels shall be placed on network racks and both ends of all cables.
- Refer to Section 26 05 23—Instrument and Communication Wire and Cable and Section 27 10 00—Structured Cabling for cable insulation and jack color requirements.

3.04 JUNCTION BOX IDENTIFICATION

- All junction boxes shall be labeled with permanent nameplates. Nameplates shall indicate circuit or load served, as well as the power source and highest voltage present on any conductor.

3.05 CONDUIT FITTINGS IDENTIFICATION

- A. All conduit fittings that contain splices of any kind shall be labeled with permanent nameplates indicating "splice within." Nameplates shall be clearly visible at location installed. Nameplates shall be fastened to each conduit fitting with heavy duty, UV-resistant, cold weather cable ties.

3.06 TERMINAL BLOCK IDENTIFICATION

- A. Terminal blocks shall be labeled on both sides of each terminal block. Terminal block numbering shall match the numbers shown on the project-specific wiring diagrams.
- B. Fused terminal blocks labels shall be located on top of the terminal blocks and include the fuse voltage and ampere rating.

3.07 COMPONENT IDENTIFICATION

- A. All components (e.g., relays, timers, power supplies, transformers, etc.) within enclosures shall be identified with sticky-back adhesive, self-laminating, machine-printed marking labels. Labels shall be installed on the enclosure back panel and not on the device itself, wireway covers, or any other removable devices. Labels shall be included on the as-built drawings.

3.08 LABELING FONT REQUIREMENTS

- A. The font for all conductor, cable, and device labels shall be Arial with black characters on white background, and minimum font size 12.
- B. The text for all conductor, cable, and device labels shall be machine printed. Handwritten labels are not acceptable.

END OF SECTION

SECTION 26 05 73

POWER SYSTEM STUDY

PART 1—GENERAL

1.01 SUMMARY

- A. Work included: CONTRACTOR shall retain the services of an independent third-party firm to perform a power system study of the electrical distribution system shown on the drawings and described herein. The third-party firm shall be responsible for collecting all data and information required to complete this study. The power study shall include Short-Circuit, Coordination, and Arc Flash Assessments as specified herein. The initial power system study shall be submitted prior to receiving final approval of the equipment shop drawings and prior to release of equipment for manufacture.
- B. The assessment shall include all portions of the electrical distribution system including, but not be limited to, the following items. Equipment not specifically noted below that is part of the distribution system shall also be included.
 - 1. Utility service entrance including primary switching and fusing.
 - 2. Transformers.
 - 3. Automatic transfer switches.
 - 4. Generator connection enclosure.
 - 5. Motor control centers.
 - 6. Power panels.
 - 7. Lighting panels.
 - 8. Disconnect switches.
 - 9. 480-volt junction boxes and enclosures containing terminations or splices.
 - 10. Motors rated 10 hp and larger modeled individually. Motors rated less than 10 hp shall be grouped as a single load.
 - 11. Cable, wiring, and conduit systems.
 - 12. Main switching station.
- C. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the power system study. Alternative scenarios shall be included to illustrate normal and standby power sources and the relative effects on the distribution system.
- D. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ANSI/IEEE Standards C37, 242, and 399.
- B. ASTM E 1934-99a—Standard Guide for Examining Electrical and Mechanical Equipment with Infrared Thermography.

- C. IEEE Standard 1584—IEEE Guide for Performing Arc Flash Hazard Calculations.
- D. NFPA70—National Electrical Code.
- E. NFPA70E—Standard for Electrical Safety in the Workplace, Latest Edition.
- F. OSHA 29 Code of Federal Regulations (CFR) Part 1910, Subpart S.
- G. UL 489—Underwriters Laboratories.

1.03 QUALITY ASSURANCE

- A. The third-party firm shall be NETA accredited and currently involved in high- and low-voltage power system evaluation. The power system study shall be performed, stamped, and signed by a registered professional engineer (electrical) in the State where the project is located. Credentials of the individual(s) performing the study and background of the firm shall be submitted to ENGINEER for review prior to start of the work. A minimum of 10 years of experience in power system analysis shall be required for the project manager.
- B. The firm performing the power system study shall demonstrate capability and experience to provide assistance during start-up, as required.

1.04 SUBMITTALS

- A. The following submittal process shall be followed and be coordinated with the suppliers of equipment specified in other Divisions, along with other Division 26 sections. The report specified below shall be completed prior to equipment shop drawings being approved and prior to equipment being released for manufacture, such that equipment changes may be made during shop drawing review if changes are recommended by the report. If completion of the report may cause delay in equipment manufacture, partial approval from ENGINEER may be obtained if the preliminary submittal includes data sufficient to determine that the selection of device ratings, settings, and characteristics will be satisfactory.
- B. The following submittals shall be provided for review.
 - 1. Statement of Qualifications: Prior to equipment shop drawings being submitted, the third-party firm shall submit a statement of qualifications including resumes of individuals who will perform the work, specific software and analysis tools that will be used, and at least three example reports that were completed for projects similar in size and nature.
 - 2. Initial Power System Study Report: At the time of, or prior to equipment shop drawings being submitted, the finalized report shall be submitted for review. The report shall include all new equipment being provided based on shop drawing submittals, existing equipment based on information collected during site visits, and estimated cable lengths. The report shall also include a written document from the utility company indicating single-phase and three-phase short circuit contributions and X/R ratios for each utility service. This submittal shall be a completed, finalized report that will be updated with actual cable lengths once installed.
 - 3. Final Power System Study Report: Once all equipment is operating based on its design intent, the recommended overcurrent protective device setting adjustments shall be

completed. The third-party firm shall visit the site to confirm that the new equipment matches the shop drawings. Additionally, the initial power system study report shall be updated with actual installed cable lengths and changes made during construction. This shall be completed prior to substantial completion.

- C. The final power system study report shall meet the following requirements:
1. Submit two bound copies of the final report. Provide two USB flash drives with the final report in PDF format. The two USB flash drives shall also include all report files in Word format, one-line diagrams in PDF and CAD formats, and all power analysis software files and associated libraries.
 2. Organize and submit the report with the following sections. Below are minimum requirements:
 - a. Part I: Overview.
 - b. Part II: Short-Circuit Assessment:
 - (1) Purpose.
 - (2) Explanation of data.
 - (3) Assumptions.
 - (4) General and specific procedures followed.
 - (5) Analysis of results.
 - (6) Recommendations.
 - (7) Fault Analysis Input Report.
 - c. Part III–Coordination Assessment:
 - (1) Purpose.
 - (2) Explanation of data.
 - (3) Assumptions.
 - (4) General and specific procedures followed.
 - (5) Analysis of results.
 - (6) Recommendations, including trip curves and device settings for project-specific equipment.
 - (7) Spreadsheet or report showing the range of all device settings and recommended settings.
 - d. Part IV–Arc Flash Hazard Assessment:
 - (1) Purpose.
 - (2) Explanation of data.
 - (3) Assumptions.
 - (4) General and specific procedures followed.
 - (5) Analysis of results, including arcing fault currents, device clearing times, incident energy levels, working distances, flash protection boundary, and recommended personal protective equipment (PPE).
 - (6) Recommendations, including system modifications that may reduce arc flash hazard based on analysis of results.
 - (7) Arc flash evaluation report including sample labels for major distribution equipment.
 - e. Appendices:
 - (1) One-line diagrams of the system in similar format as the Contract Documents from the power analysis software showing project-specific equipment, wire and cable types and lengths, fault currents, and recommended device settings.
 - (2) Protective device summaries generated by the power analysis software.

- (3) Reference data.
- (4) Paper copy of warning labels to be provided for the project.

D. Refer to Part 3–Execution for additional requirements and specific analyses to be performed.

PART 2–PRODUCTS

2.01 POWER SYSTEM STUDY SOFTWARE

- A. The power system study shall be performed using the latest version of software utilizing all required evaluation modules to perform the assessments specified herein.

2.02 ARC FLASH HAZARD LABELS

- A. Labels shall be provided for equipment shown on the one-line diagrams on the Drawings, all equipment as specified herein, and as specified in all Division 26 sections, as well as for equipment provided in other Divisions where an arc flash hazard may exist. This shall include junction boxes and disconnect switches for motors 10 hp and larger. A separate label shall be installed on each panelboard, automatic transfer switch, etc. For MCCs with a main circuit breaker(s), a minimum of two labels shall be provided (one for each main circuit breaker section and one for remaining sections in the equipment lineup). Provide labels that meet the following minimum requirements:
 - 1. Self-adhesive, vinyl, 6 inches by 4 inches minimum.
 - 2. Equipment identification corresponding to the Contract Documents.
 - 3. Study date.
 - 4. Arc-flash boundary.
 - 5. Incident Energy Working Distance.
 - 6. Nominal system voltage.
 - 7. Shock-hazard boundaries (limited approach, prohibited approach, and restricted approach).
 - 8. Site specific PPE level (Coordinate to match OWNER's existing PPE categories including glove rating).
 - 9. Available incident energy.
 - 10. Bolted fault current.

2.03 ONE-LINE DIAGRAM

- A. In each electrical room, provide a one-line diagram meeting the requirements of IEEE/ANSI Standard 141, printed on a 24-inch by 36-inch minimum sheet, framed, and covered with plexiglass.

PART 3-EXECUTION

3.01 DATA COLLECTION

- A. Third-party firm shall gather the required data from shop drawings for preparation of the power system study. The firm performing the power system study shall visit the site as

needed to properly carry out the work and meet the requirements of these Specifications.

- B. Third-party firm shall expedite collection of the data to complete the power system study within the deadlines specified herein. The following minimum information shall be collected and used:
 - 1. Available fault current from the electric utility company serving the facility.
 - 2. If applicable, existing equipment ratings including bus bracing, interrupting device ratings, and age/condition.
 - 3. Installed cable or busway lengths, along with the specific rating, type, and manufacturer.

3.02 SHORT-CIRCUIT AND COORDINATION ASSESSMENTS

- A. Include in the appropriate report sections noted above, calculation methods and assumptions, base per unit quantities selected, one-line diagrams, source impedance data including power company system characteristics, typical calculations, and recommendations. Calculations shall be provided for multiple distribution system scenarios when source equipment can provide multiple power feeds to downstream equipment (i.e., Kirk-key interlocked breakers, generators, etc.).
- B. Calculate short-circuit interrupting and momentary (when applicable) duties for an assumed three-phase bolted fault at each bus (each change of impedance), transformer primary and secondary terminals, motor control center, as well as other significant locations throughout the system, including all three phase motors 10 hp and larger. Provide a ground fault current assessment for the same system areas, including the associated zero sequence impedance data. Include in tabulations, fault impedance, X to R ratios, asymmetry factors, motor contribution, short-circuit kVA, and symmetrical and asymmetrical fault currents.
- C. In the Coordination Assessment, provide time-current curves for distribution equipment, indicating the coordination proposed for the system, centered on conventional, full-size, log-log forms. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time-delay settings.
- D. Include on the curve sheets power company relay and fuse characteristics, low-voltage equipment circuit breaker trip device characteristics, pertinent transformer characteristics, and characteristics of other system load protective devices such as protective relaying equipment and multifunction relays. Include at least all devices down to the largest three-branch or feeder circuit breakers in each piece of distribution equipment. Also include the main circuit breaker (if applicable) and upstream overcurrent protective device.
- E. Include all adjustable settings for ground fault protective devices. Include manufacturing tolerance and damage bands in plotted circuit breaker characteristics. Show transformer full load and 150, 400, or 600% currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and significant symmetrical and asymmetrical fault currents. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current to which the device is exposed.

- F. Select each primary protective device required for a Delta-Wye connected transformer so that its characteristic or operating band is within the transformer characteristics, including a point equal to 58% of the ANSI withstand point to provide secondary line-to-ground fault protection. Where the primary device characteristic is not within the transformer characteristics, show a transformer damage curve. Separate transformer primary protective device characteristic curves from associated secondary device characteristics by a 16% current margin to provide proper coordination and protection in the event of secondary line-to-line faults.
- G. Include complete fault calculations as specified herein for each source combination.
- H. Utilize equipment load data for the assessment obtained by third-party firm from Contract Documents.
- I. Include fault contribution of all motors and generators in the assessment. Motors rated 10 hp and larger shall be modeled individually and not grouped as a single load. Motors rated smaller than 10 hp shall be modeled grouped as a single load. Notify ENGINEER in writing of circuit protective devices not properly rated for fault conditions. Provide recommended settings for motor starters and note any system inadequacies or potentially hazardous conditions. Show each MCC full-load current plus symmetrical and asymmetrical of the largest motor-starting current so that protective devices will not trip major or group operation.

3.03 ARC FLASH HAZARD ASSESSMENT

- A. Include in the appropriate report sections noted above, the following minimum requirements:
 - 1. Determine and document all possible utility and generator sources and scenarios that are capable of being connected to each piece of electrical gear. Calculations shall be based on the highest possible source connection.
 - 2. Arc flash values for two normal cases to define the highest values (low short-circuit and high short-circuit).
 - 3. Arc flash values for two maintenance cases which define the arc flash values available at the equipment, which would be available if the instantaneous trip of the upstream circuit breaker is set at a minimum value. This is recommended for personnel working on live equipment.
 - 4. Recommendations to reduce the arc flash incident energy in all areas that require 8 cal/cm² and higher PPE.
 - 5. Calculations shall conform to the latest version of the National Fire Protection Association (NFPA) 70E calculation standards. All incident energy units shall be calculated in calories per square centimeter.
- B. Provide labeling as specified herein based upon the results of the assessment.

3.04 FIELD SETTINGS

- A. CONTRACTOR shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The adjustments shall be in accordance with the recommended settings described in the final power system study report.

- B. Following energizing and placement into operation of all equipment, CONTRACTOR shall include a minimum of two additional trips to the site to make modifications to the settings for proper operation of the system.

3.05 ARC FLASH SAFETY TRAINING

- A. Provide one day of arc flash safety training, travel time excluded and at jobsite or classroom designated by ENGINEER for up to five participants, that contains the requirements referenced in OSHA 1910.269, OSHA 1910 Subpart S and NFPA 70E. Training shall include, but not be limited to, the following:
 - 1. Proper use of the system analysis data.
 - 2. Interpretation of hazard labels.
 - 3. Selection and utilization of personal protective equipment.
 - 4. Safe work practices and procedures.

END OF SECTION

SECTION 26 09 10

CONTROLS AND INSTRUMENTATION DRAWINGS

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included: Applicable provisions of Division 01 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit drawings in accordance with provisions of Section 01 33 00–Submittals.

1.03 COORDINATION

- A. The requirements set forth in this section are intended to apply to the drawings provided as specified in Section 26 24 19–Motor Control and Section 40 94 23–Controls and Instrumentation.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 GENERAL REQUIREMENTS

- A. A bound set of as-built drawings shall be provided in the associated equipment enclosure.
- B. All drawings shall have the following information:
 - 1. Project information, including name of OWNER and specific project name.
 - 2. Drawing title, accurately representing what is on the drawing.
 - 3. Unique drawing identifier, consisting of a unique drawing number or drawing number with individual sheet number. If sheet numbers are used, total number of sheets must be identified on each sheet.
 - 4. System Supplier company name, address, and phone number.
 - 5. Original design information, including person responsible for design, date of original design, person responsible for checking of design, and date of design check.
 - 6. Revision block indicating revision number, date, description of revision, and person responsible for revision.
- C. All drawings shall have line numbers that can be uniquely referenced from other drawings.
- D. All drawings showing wiring shall include unique wire numbers assigned to wiring that is installed between devices in the panel. The wire number shall be shown on the Drawings.

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- E. All drawings showing relays shall include reference to the drawings where the relay contacts are shown. Spare relay contacts that are not used shall be identified.

3.02 DRAWINGS REQUIRED

- A. Index of Drawings: Index of Drawings shall list drawing number, sheet number (if applicable), and drawing title for each drawing in drawing package.
- B. Symbol Sheet: Symbol Sheet shall include:
 - 1. Explanation of all symbols used on the drawings, including, but not limited to, normally open/normally closed contacts, limit switches, selector switches, pushbuttons, timers, control relays, fuses, circuit breakers, terminal blocks, and contactors. Symbol sheet does not need to be specific to project, but must contain explanation of all symbols used on the drawings (i.e., special symbols used for a particular project must be added to standard symbol sheets).
 - 2. List of abbreviations used on the drawings.
 - 3. Explanation of continuation method for circuits that cannot be shown on a single sheet.
- C. Exterior Enclosure Layout Drawing: Exterior layout drawing shall show location of all externally-mounted equipment. Exterior layout drawing shall include:
 - 1. Enclosure dimensions, enclosure NEMA rating (i.e., NEMA 1, NEMA 4X stainless steel, NEMA 4X nonmetallic, etc.), and enclosure color or finish.
 - 2. Location and actual depiction of panel latches, hinges, mounting holes and lifting eyes.
 - 3. Location and accurate representation of equipment mounted on enclosure (i.e., switches should look like actual switches being installed; indicating lights should look like actual lights being installed).
 - 4. Equipment nameplate location.
 - 5. Description for each piece of equipment or unique identifier and parts list, or bill of materials.
 - 6. Nameplate list including nameplate wording, size, construction (i.e., lamicoid with White background and Black letters), and mounting method (i.e., stainless steel screws). Label size must include size in inches or reference to standard sizes included on symbol sheet, or elsewhere in drawing package.
 - 7. Identification of area reserved for equipment located inside enclosure, but not actually mounted on enclosure back panel, such as UPSs, and lighting packages.
- D. Interior Enclosure Layout Drawing: Interior layout drawing shall show location of all internally-mounted equipment. Interior layout drawing shall include:
 - 1. Back panel dimensions and finish.
 - 2. Location and accurate representation of equipment (i.e., terminal blocks should look like actual terminal blocks; receptacle should look like actual receptacle, etc.).
 - 3. Dimensions of internally-mounted equipment are not necessary, but equipment should be drawn to scale such that an accurate representation of the way equipment will be mounted is shown on the drawing.
 - 4. Description for each piece of equipment or unique identifier and parts list, or bill of materials.
- E. Interconnection Diagram, Network Diagram or Block Diagram: Interconnection Diagram, Network Diagram or Block Diagram shall show all cabling between system components and

identify any station addressing or node numbers that are assigned to equipment. All cables shall be identified by cable type, including specific manufacturer and model/part number. Party responsible for furnishing and installing cable shall also be included. Some examples of cables that must be shown are:

1. Antenna cables.
 2. Communications cables between system components (copper). This includes Ethernet patch cables between switches and devices.
 3. Communications cables (fiber and/or copper) between PLCs, controllers, operator interface equipment and security devices (e.g., door switches) that are not shown on the elementary schematics.
- F. Elementary Schematic: Elementary schematics shall be developed for each motor or supplied equipment and shall include:
1. Nominal voltage, AC or DC designation, number of phases (if AC), and frequency in hertz (if AC) for each source of electrical supply to the enclosure.
 2. Prospective short-circuit current available at the point of electrical supply to the enclosure.
 3. Type of power supply system grounding (e.g., wye phase midpoint grounded, delta phases corner grounded, wye phases midpoint grounded, delta phases ungrounded, etc.).
 4. Complete documentation of electrical circuit from supply to motor or supplied equipment. Documentation shall include disconnecting means, main overcurrent protection (when supplied), branch overcurrent protection (when supplied), control circuit and special purpose control protection, motor control, overload protection, local disconnect (when supplied) and motor horsepower, and full load amps from nameplate or supplied equipment full load amps.
 5. Documentation of PLC or controller inputs and outputs.
 6. Documentation of all circuit breaker/motor protector ratings, fuse sizes, control power transformer VA ratings, dip switch settings, etc.
- G. Wiring Diagram: Wiring diagrams shall show all terminations for all cables external to the enclosure. Terminations may be shown on the elementary schematics as long as the termination information is concise and easily understood by the personnel installing the field wiring. Termination information shall be shown for all devices, including devices that are not part of System Supplier's scope of supply. A box with two dots or continuation arrows indicating continuation to a piece of equipment are not acceptable. Information shown on System Supplier's wiring diagrams shall include a description of the drawings where terminations are found (i.e., drawing title), drawing number where the terminations are found, and terminal blocks referenced on the drawing. System Supplier shall coordinate with supplier of other wiring diagram to provide information on System Supplier's wiring diagrams.
- H. Calculations Summary: Calculations summary shall include calculations performed to:
1. Determine size of UPS.
 2. Determine control power transformer sizing. Control power transformer sizing calculations may be generic based on typical circuits.
- I. Functional Testing Recommendations: Testing recommendations shall include description of functional tests that must be performed by operators. Functional test description shall be

included for UPS, indicating lights, and other devices whose condition can only be determined by testing.

3.03 SAMPLE DRAWINGS

- A. Sample drawings showing an acceptable format are included in the appendix. The samples included in the appendix do not represent the only acceptable method of showing the required information.

END OF SECTION

SECTION 26 21 00

ELECTRICAL SERVICE SYSTEM

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Utility company.
 - 2. Secondary service characteristics.
 - 3. Definitions.
 - 4. Underground electrical service.
- B. Allowances: CONTRACTOR shall include in the Bid the cost of the following items specified in this Section. Refer to the individual sections listed below for a complete description of the Work required.
 - 1. Electric Utility Service Entrance, Paragraph 1.05—Underground Electrical Service.
- C. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.
- D. See Division 01 for temporary service requirements. This section applies to permanent services only.

1.02 UTILITY COMPANY

- A. The Utility Company is Commonwealth Edison Company (ComEd).

1.03 SECONDARY SERVICE CHARACTERISTICS

- A. The secondary service will be 277/480-volt, 4-wire, three-phase.

1.04 DEFINITIONS

- A. Service: As defined in the NEC, Article 100.
- B. Primary Voltage: Above 600 volts.
- C. Secondary Voltage: 600 volts and below.

1.05 UNDERGROUND ELECTRICAL SERVICE

- A. Provide complete underground electrical service except for items provided by the Utility Company.
- B. Provide electrical service system, except the Utility Company will provide:
 - 1. Transformer.

2. Primary cable as shown.
 3. Metering (meter socket by CONTRACTOR).
- C. Coordinate the new electrical service with the Utility. Pay Item 80400200 shall include cost for the work provided by the Utility.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 UTILITY COORDINATION

- A. Division 26 Contractor shall obtain all required permits and licenses, pay all charges and fees, and give all notices necessary for utilities to perform the Work. Division 26 Contractor shall comply with all permit requirements whether the permit is issued to CONTRACTOR, the state, or the maintaining authority.
- B. Division 26 Contractor shall complete all required electrical service applications and forms based on the Drawings and Division 26 Contractor's means and methods for the work required.
- C. The Drawings and Specifications indicate the general nature of work required for electric service. CONTRACTOR shall verify the service requirements, shall ascertain the installation requirements and the items of equipment, wiring, appurtenances being furnished by the utility and shall provide all other material and work required for a complete installation.
- D. All electric service work shall conform to the requirements of the electric utility and NEC.
- E. CONTRACTOR shall obtain approval of the electric utility for the electric service and metering prior to installation. Copies of approved documents and drawings shall be submitted to ENGINEER for the record prior to installation.

END OF SECTION

SECTION 26 24 19

MOTOR CONTROL

PART 1–GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Motor control devices, accessories, and general requirements.
 - 2. Manual motor starters.
 - 3. Magnetic motor starters.
 - 4. Motor control centers.
- B. Related Sections and Divisions:
 - 1. Applicable provisions of Division 01 shall govern work in this section.
 - 2. All other sections of Division 26 and Division 40.

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1.02 REFERENCES

- A. UL 845 Motor Control Centers.
- B. ANSI/NEMA ICS 6–Enclosures for Industrial Controls and Systems.
- C. NEMA AB 1–Molded Case Circuit Breakers.
- D. NEMA ICS 2–Industrial Control Devices, Controllers, and Assemblies.
- E. NEMA ICS-18–Motor Control Centers.

- F. NEMA KS 1–Enclosed Switches.
- G. NEMA PB 1–Panelboards.
- H. NEMA PB 1.1–Instruction for Safe Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

1.03 QUALITY ASSURANCE

- A. Manufacturers of Motor Control Equipment: Firms regularly engaged in the manufacture of motor control equipment of the types and capacities required whose products have been in satisfactory use in similar service for not less than 10 years.
- B. UL Labels: Provide motor control devices, manual motor controllers, magnetic motor starters, solid-state starters, variable frequency drives, combination motor starters, motor control centers, etc., which have been listed and labeled by Underwriters Laboratories.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00–Submittals.
- B. Provide product data on motor starters relays, pilot devices, and switching and overcurrent protective devices.
- C. Submittals of shop drawings and product data shall be particularly detailed and complete. Submittals shall be complete with the manufacturer's warranty. Piecemeal submittals will be returned without review.
- D. Submittal information shall include schematic diagrams, point-to-point internal wiring diagrams, point-to-point field wiring diagrams, and other necessary diagrams and installation requirements for the motor starters, motor control center, and automatic transfer switch and other components and systems that are interfaced to these systems.
- E. The manufacturer of each specified item shall provide not less than four hardcover operation and maintenance manuals for the respective equipment item furnished. The manuals shall contain final, approved shop drawings and product data sheets (including any field additions or modifications), as well as recommended installation, testing, operation and maintenance procedures.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Section 01 33 00–Submittals.
- B. Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

- C. Operation and Maintenance Data: For MCC and its components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 33 00–Submittals, Paragraph 1.13 "Operation and Maintenance Manuals," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.
 - 3. Stamped and signed approved shop drawings and catalog cuts.
 - 4. Stamped and signed O&M Manuals.
 - 5. Stamped and signed record drawings.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.07 COORDINATION

- A. To provide proper coordination between Section 40 94 23–Controls and Instrumentation, and equipment specified herein, all equipment specified in this section shall be supplied as part of the Controls and Instrumentation package described in Section 40 94 23 This shall include, but not be limited to, equipment such as MCCs, stand-alone motor controllers, and control stations. Drawings for MCCs, motor controllers, and motor control equipment shall be provided by the Section 40 94 23 System Supplier. Drawings from equipment manufacturers will not be accepted as shop drawings or O&M documents.

1.08 WARRANTY

- A. Standard One-Year Warranty of the date of Final Acceptance of the entire project by ENGINEER: Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion of the project or the date of final acceptance of the project.

PART 2–PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Motor control devices, motor starters, variable frequency drives, and motor control centers shall be as manufactured by Allen-Bradley, Square D, or Eaton as approved by ENGINEER and in accordance with substitutions under provisions of the General Conditions. All equipment specified in this section and provided by CONTRACTOR shall be by the same manufacturer.

- B. The Drawings and Specifications were prepared based on Allen-Bradley.

2.02 MOTOR CONTROL DEVICES, ACCESSORIES, AND GENERAL REQUIREMENTS

- A. Auxiliary Contacts: NEMA ICS 2; two field convertible contacts minimum, in addition to seal-in contact, or as necessary.
- B. Push buttons: NEMA ICS 2; heavy-duty, oiltight (30 mm) as specified herein and shown on the Drawings. Pushbuttons in hazardous locations shall be rated NEMA 7.
- C. Indicating Lights: NEMA ICS 2; heavy-duty, oiltight (30 mm), LED, push-to-test type as specified herein and shown on the Drawings. Indicating lights in hazardous locations shall be rated NEMA 7.
- D. Selector Switches: NEMA ICS 2; heavy-duty, oiltight, (30 mm) as specified herein and shown on the Drawings. Selector switches in hazardous locations shall be rated NEMA 7.
- E. Contactors: NEMA ICS 2. All contactors for starters specified herein shall be NEMA rated. IEC contactors are not allowed.
- F. Control Power Transformers: 240/120-volt secondary. Each motor controller shall have a dedicated control power transformer.
- G. Elapsed Time Meters: 3 inches round, flush door mounted, capable of reading up to 99,999.9 hours, nonreset type. Pump Start Counter: Flush door mounted, capable of reading up to 99,999,999 number of starts, nonreset type.
- H. Industrial control and power relays shall be installed in motor control centers, pump control panels, and motor controller enclosures where required by System Supplier. Relays used to interface with PLC I/O, motor control circuits, hard-wired control logic, and for loads less than 8 amps shall be terminal style, interposing/isolation relays. Relays for inductive loads, field wiring, or loads up to 15 amps shall be industrial, general purpose square base relays. Relays for lighting circuits or loads greater than 15 amps shall be industrial, electrically held power relays. Relays shall meet the following requirements:
1. Interposing/isolation relays:
 - a. Configuration: SPDT or DPDT as required by System Supplier.
 - b. Mounting: DIN rail with screw terminal base socket.
 - c. Voltage: 120 VAC, or as required by System Supplier.
 - d. Contact rating: 8A (DPDT), 16 A (SPDT).
 - e. Operating life: 10 million cycles.
 - f. Status: On-Off flag-type or LED indicator.
 - g. UL listed.
 2. General purpose relays:
 - a. Configuration: DPDT or 3 PDT as required by system supplier.
 - b. Mounting: DIN rail with screw terminal base socket.
 - c. Voltage: 120 VAC.
 - d. Contact rating: 15 A, minimum; 3/4 hp.

- e. Operating life: 10 million cycles.
 - f. Status: On-Off flag type or LED indicator.
 - g. UL listed.
- 3. Power relays.
 - a. Configuration: Electrically-held, 2-12 poles.
 - b. Mounting: DIN rail, square base.
 - c. Voltage: 120 VAC.
 - d. Contact rating: 20 A continuous; 1 hp.
 - e. Operating life: 10 million cycles.
 - f. UL listed.
 - g. NEMA rated.
- 4. All timing relays shall have On and timing Out LEDs.
- I. Manufacturer of Accessories:
 - 1. Terminal blocks shall meet the requirements of Section 26 05 19–Wire.
 - 2. Wire markers shall meet the requirements of Section 26 05 53–Electrical Identification.
- J. All motor control power shall be 120 volts with suitable protection (fuses or breakers). Fuse holders shall be provided with integral LEDs to indicate when the fuse is blown.
- K. All motor controllers shall be equipped with the auxiliary devices to meet the requirements of the Drawings and Specifications. Each motor controller operating at other than 120-volt, single-phase shall be equipped with a control transformer providing 120-volt secondary for control power. Transformer shall have fused primary and secondary connections and shall be sized per manufacturer's recommendations. Coils and pilot lights in all motor controllers shall be 120 volts.
- L. Enclosures for Stand-Alone Controllers, Starters, and Control Devices:
 - 1. Enclosures in indoor dry locations shall be NEMA 1 gasketed.
 - 2. Enclosures in indoor damp or wet locations, outdoor locations, or locations below grade shall be NEMA 4X, stainless steel.
 - 3. Enclosures in hazardous locations shall be NEMA 7, cast iron.
 - 4. All wiring within motor controller enclosures shall be landed on terminal blocks. This shall include internal control wiring, field wiring, and any spare or unused wiring.
 - 5. Control stations shall include devices as shown on the Drawings and specified in Section 40 94 23–Controls and Instrumentation.

2.03 MANUAL MOTOR CONTROLLERS

- A. Where noted on the Drawings, controllers for motors rated 2 hp or less, for operation at 120 V single-phase, shall be specification grade wall switches as specified in Section 26 27 26–Wiring Devices.

2.04 MAGNETIC MOTOR STARTERS

- A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower. Each magnetic starter shall be equipped with a

solid-state overload relay. Starters for submersible pumps shall include ground fault protection.

- B. Full-Voltage Starting: Nonreversing type as shown on the Drawings.
- C. Coil Operating Voltage: 120 volts, 60 Hz.
- D. Size: NEMA ICS 2; size as shown on the Drawings. Contactors shall be Allen-Bradley, Bulletin 509 (Nonreversing).
- E. Magnetic motor starters in motor control centers shall be combined with magnetic only molded case circuit breakers.
- F. Through-the-door overload reset pushbuttons shall be provided for all magnetic starters installed in motor control centers.

2.05 MOTOR CONTROL CENTERS

- A. Starters and disconnect devices for motors shall be installed in MCCs except where shown to be remote-mounted at the motor location. Starters and disconnect devices shall be NEMA rated, sized according to application as specified. The MCC and NEMA Class IIB drawings shall be supplied as part of the Controls and Instrumentation package described in Section 40 94 23—Controls and Instrumentation. MCC drawings provided by the MCC manufacturer or through any contractor will not be accepted as shop drawing submittals or O&M documents. System supplier described in Section 40 94 23—Controls and Instrumentation shall wire and test all MCCs for the functions described herein in its shop prior to shipment to the site. Provide one copy of the test report to ENGINEER.
- B. It shall be assumed that colors will be selected by OWNER and shall be nonstandard. Color shall match that specified for control enclosures specified in Section 40 94 23—Controls and Instrumentation.
- C. Auxiliary contacts shall be of quantity necessary for equipment functions.
- D. MCC design shall be in accordance with latest applicable NEMA standards, shall have been tested to prove adequate mechanical and electrical capabilities, and all major components shall have been individually tested.
- E. Structures shall be totally enclosed, dead front, free-standing vertical sections, 90 inches high and not less than 20 inches deep for front-mounted units and not more than 40 inches deep for units mounted back-to-back. Each vertical section shall have side panels extending the full height of the section to minimize fault-propagation to adjacent sections.
- F. Each structure shall contain a main horizontal bus continuously braced within each section, with rating as specified, and vertical bus feeding unit compartments with a minimum rating of 300 amperes, or as necessary for load and feeder breakers. All horizontal and vertical bus of all MCC sections shall be powered regardless of location of transfer switch, unless

otherwise noted. All motor control centers shall include a 1/4-inch by 2-inch ground bus. All bus shall be tin-plated copper and braced to withstand short-circuit currents as indicated.

- G. Structures shall contain a horizontal wireway at the top, isolated from the horizontal bus, and shall be readily accessible by removal of its cover plate. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference and accessible without disrupting service.
- H. A vertical wireway with a minimum of 28 square inches of cross-sectional area shall be adjacent to each vertical unit compartment and shall be covered by its own door. These vertical wireways shall be free of all live parts and shall contain vertical wireway tie bars.
- I. All units shall be provided with a mechanical interlock with the unit door to prevent access unless the disconnect is in the off position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect.
- J. Padlocking facilities shall be provided to positively lock the disconnect in either the on or off position with from one to three padlocks whether the door is open or closed.
- K. All disconnect operating handles located higher than 6 feet 7 inches above finished floor in the on position (including the MCC pad height) shall be provided with handle extensions. All disconnect operating handles above this height must operate in the vertical direction.
- L. All unit heights shall be of modular dimensions to allow for unit layout, in any combination, without structural interference. Drawout units shall have a tin-plated stab assembly for connection to the vertical bus; no wiring to these stabs shall extend into the bus compartments. All bus access openings shall be provided with automatic shutters that close when the unit (e.g., motor controller or breaker) is withdrawn.
- M. Terminal blocks for NEMA Type B assemblies shall be mounted within the unit and shall be factory-wired. Provide a minimum of 25% spare terminals for all terminal blocks furnished.
- N. Control centers shall be NEMA Class II.
- O. Wiring in control centers shall be Type B. All conductors supplying power from the MCC bus to frame-mounted equipment shall have the phases identified as specified in Section 26 05 53—Electrical Identification.
- P. Provide neutral landing lugs for all MCCs accepting utility service-entrance conductors. Neutral landing lugs shall be bonded to the ground bus at the utility service entrance, unless otherwise noted.
- Q. Control centers shall include NEMA 1 gasketed enclosures, unless otherwise noted.
- R. Remote-mounted controls shall be heavy-duty, oiltight (30 mm) of same quality and type furnished in starters and as shown on the Drawings. Equipment controls that require a manual reset shall be accomplished through a reset push button on the enclosure or

MCC bucket for the associated piece of equipment. All reset buttons shall be appropriately labeled, including mechanical type.

- S. MCC enclosures must be in accordance with area designations shown on the Drawings.
- T. All lighting and small power transformers shall be dry type, Class H insulation, DOE 2016 Efficiency rated, 115°C rise (kVA as indicated on Drawings). Coil windings shall be copper, glass-taped, dipped in silicone varnish, with two taps 2 1/2% above and below, 480-volt primary, Delta with 120/208-volt, three-phase, 4-wire secondary, unless indicated otherwise. Circuit breakers that feed lighting panel transformers shall be provided with electronic sensing, timing, and tripping circuits for adjustable current settings. Provide adjustable long-time pickup, long-time delay, short-time pickup, short-time delay, and instantaneous pickup settings.
- U. All lighting panelboards shall have a 22,000 amps interrupting capacity, at 120/208-volt, three-phase, 4-wire with bolt-on branch breakers as shown on the Drawings, unless indicated otherwise. All power panelboards shall have a 65,000-amp interrupting capacity, at 480-volt, three-phase, 3-wire with branch breakers as shown on the Drawings, unless indicated otherwise. Branch-mounted main circuit breakers will not be allowed. Minimum size shall be 20 inches wide by 5 3/4 inches deep. All bus shall be aluminum. Provide laminated, typewritten panel schedule for all panelboards at project final completion.
- V. All motor control centers shall be factory-assembled, wired, and tested. All internal wiring shall be numbered, and each wire shall be terminated on terminal strips, including internal spares, field wiring, and spare field wires. Schematic and wiring layout drawings following JIC Standards which show all connections to external devices, a complete bill of materials, and a detailed description of operation, shall be submitted for each piece of equipment.
- W. Arrangement and physical locations of all equipment within each motor control center shall be subject to shop drawing approval.
- X. All components shall be properly identified with laminated engraved nameplates with 3/8-inch-high letters (black characters on white background). Nameplates located outdoors shall be stainless steel screw on type. Nameplates located indoors shall be adhesive type.
- Y. Unless otherwise indicated, all conduit entrances shall be through the bottom only.
- Z. MCC interrupting rating shall be as shown on the Drawings, minimum 65,000 A.
- AA. The main lugs of the MCC shall be provided with a three-phase monitor. The three-phase monitor shall be on the load side of the main lugs. CONTRACTOR shall select voltage to match electrical service.
- BB. The MCC shall be provided with a power meter and appropriately sized metering-class current transformers (CTs) installed on the load side of the MCC main lugs. CTs shall be as required for monitoring parallel phase conductors and shall be rated for ANSI/IEEE C57.13 metering Class 0.3 or 0.6 accuracy. Provide CT cabling as specified in Section 26 05 23—Instrument and Communication Wire and Cable, for the specified

CT accuracy class, minimum 14 AWG. Power meter shall be provided with an Ethernet/IP communications module matching the SCADA System communication protocol so that all readings can be monitored at the SCADA System HMI. Power meter shall be installed in a dedicated MCC bucket as shown on the Drawings with a remote display mounted on the MCC bucket door. The MCC bucket shall be provided with a control power transformer, fused disconnects for the control power circuit and voltage sensing lines, and CT shorting blocks as specified in Section 26 05 19–Wire.

- CC. Main Breaker: Molded case circuit breaker, three-pole, amperes as shown on the Drawings with lugs for 480-volt, three-phase, 4-wire, 60-cycle entrance. Main breakers shall be service entrance rated.
- DD. Main and feeder circuit breakers shall be provided in accordance with the requirements specified in Section 26 28 00–Overcurrent Protective Devices.
- EE. Provide current transmitters where shown on the Contract Documents for 480-volt, single-phase current measurement. Current transmitters shall have a 4-20mA output and shall be 24VDC loop-powered.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Provide motor control equipment in accordance with manufacturer's instructions and Drawings.
- B. Panelboard Installation: In conformance with NEMA PB 1.1.
- C. Overloads shall be selected on the basis of nameplate horsepower and service factor. Selection of overloads based on horsepower shown on the Drawings is not acceptable. Where power factor correction capacitors are provided, overload protection shall be compensated for the lower motor running current because of improved power factor.
- D. All motor control wiring shall be installed in accordance with control wiring diagrams furnished.
- E. Wireways in MCCs shall be used only for routing of conductors. Splices are not allowed within wireways.
- F. All wiring within MCCs shall be landed on terminals inside buckets or equipment compartments and not left unterminated within wireways. This shall include all internal MCC wiring and external field wiring, including spare wires.
- G. Motor Data: Provide neatly typed label inside each motor controller enclosure identifying motor served, nameplate horsepower, full-load amperes, code letter, service factor, and voltage/phase rating.

- H. Control wiring and field wiring (120 V and below) within MCCs shall be separated from power wiring (277 V and above). Where possible, route control and field wiring in separate raceways or wireways. Provide a minimum of 2 inches separation between control wiring, field wiring, and power wiring.
- I. All motors will be provided by other divisions, ready for connections. CONTRACTOR shall be responsible for electrical connections for power and control circuit wiring, proper phase relationships, and correct motor rotation.
- J. Provide motor circuit wiring for each motor from the source of supply to the terminal box on the motor including all intermediate connections at devices such as motor starters, disconnect switches, etc.
- K. All feeder cable connections to motor leads up to 600 volts shall be insulated and sealed with factory-engineered kits, as specified in Section 26 05 19—Wire.
- L. Provide motor controllers as specified for all motors, unless shown or specified that motor controllers or control equipment will be furnished by others.
- M. Provide motor circuit disconnect devices for all motors, unless shown or specified that disconnect devices or starters are furnished with other equipment.

3.02 FIELD QUALITY CONTROL

- A. Representative of the Manufacturer:
 - 1. The services of a qualified representative of the manufacturer shall be provided to instruct on proper installation of the equipment, inspect the completed installation, make any necessary adjustments, participate in the startup of the equipment, participate in the field testing of the equipment, place the equipment in trouble-free operation, and instruct operating personnel in its operation and maintenance. This service shall include all equipment provided in this Section. Include:
 - a. Two man-days for Installation Services for Motor Control Center.
 - b. Two man-days for Instructional Services for Motor Control Center.
 - 2. The start-up services for the following equipment shall be coordinated with IDOT and IDOT shall be notified at least one week in advance: Paragraph 3.03, Adjustments.

3.03 ADJUSTMENTS

- A. Motor Control Centers: Set field-adjustable pick-up time-sensitivity ranges in accordance with Section 26 05 73—Power System Study.

3.04 FACTORY ACCEPTANCE TESTING

- A. The motor control center furnished under this Section shall be fully tested and documented by certified factory test reports, in accordance with Division 01—General Requirements.

- B. a minimum, the following tests shall be conducted:
1. The following factory standard tests shall be performed on the circuit breaker element (main breakers only) provided under this Section. All tests shall be in accordance with the latest version of ANSI standards.
 - a. One minute insulation-resistance test on each pole, phase-to-phase and phase-to-ground per ANSI standards.
 - b. Final inspections and quality checks.
 2. The following production test shall be performed on each breaker housing:
 - a. Operation of wiring, relays and other devices verified by operational sequence test.
 - b. Final inspections and quality checks.
 3. MCC/ATS system shall be simulated for correct operation on loss of voltage, under/over-voltage, overcurrent, loss of phase, phase imbalance and under/over-frequency.
 4. Verification of circuit breaker interlocks.
 5. Verification of motor starter circuits and interlocks.
 6. Energize contactors using an auxiliary source.
 7. Verification of meter readouts through application of current and voltage to each analog input.
 8. The manufacturer shall provide three certified copies of factory test reports.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Wall switches.
 - 2. Receptacles.
 - 3. Cover plates.
 - 4. Time clocks.
 - 5. Thermostats.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. NEMA WD 1—General-Color Requirements for Wiring Devices.
- B. NEMA WD 5—Specific-Purpose Wiring Devices.
- C. Drawings—Bill of Materials.

1.03 QUALITY ASSURANCE

- A. Manufacturers of switches, outlets, boxes, lamps, fuses, lugs, etc.: Firms regularly engaged in the manufacture of these products, of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that in this project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide electrical material, etc., which have been listed and labeled by Underwriters Laboratories.
- E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00–Submittals.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

PART 2–PRODUCTS

2.01 WALL SWITCHES

- A. A-C general use Industrial specification grade, snap switch, 20 amperes, 277 volts, one of the following: Eaton 122*, Leviton 122*, or Pass and Seymour PS20AC*.
- B. Class I Switches: AC general use snap switch rated for Class I, Division 1, Groups C and D locations, 20 amperes.
- C. Provide ivory-colored handles.
- D. Manual motor switches or manual motor controllers for 120 V motors on circuits 20 amps or less shall be specification grade snap switch as specified above.

*Complete catalog number for pole arrangement necessary.

2.02 RECEPTACLES

- A. Twenty ampere, 125-volt, NEMA 5-20R, Industrial specification grade, straight blade, 3-wire duplex grounded outlets, one of the following: Eaton 5362, Leviton 5362, Pass and Seymour 5362. Provide ivory color.
- B. Weather-Resistant Receptacle: Weather-resistant receptacles shall include GFCI protection and be UL 498 listed, 20 ampere, 125-volt, NEMA 5-20R, heavy-duty, commercial grade, with WR marking on the face.
- C. GFCI Receptacle: GFCI receptacles shall be UL 943 listed, Pass and Seymour 2097, Eaton TRSGF2, Legrand 2097I receptacle with integral ground fault current interrupter. Provide ivory color.
- D. Class I Receptacles: Crouse Hinds CPS-152, Appleton CPS, or Hubbel KR Series. Provide two plugs (total) to match receptacle.

2.03 COVER PLATES

- A. Surface boxes shall have plates to match cast boxes.
- B. While in use receptacle covers for exterior use shall be extra-duty, die-cast aluminum, gray color, weatherproof, while-in-use covers.

- C. Cover plates for manual motor switches, manual motor controllers, and NEC required equipment disconnects shall have provisions for locking the switch in the On or Off position.

2.04 TIME CLOCKS

- A. Unit shall be multipurpose, 24-hour electronic time switch with SPST switching configuration. Provide switching circuits for lighting control as shown on the Drawings. Controller shall be capable of programming through the use of two slide switches and four push-buttons.
- B. Unit shall include a manual control selection to override automatic control.
- C. Display shall be LED type. Unit shall include DIN-rail mounting bracket for installation in the lighting control enclosure.
- D. Time clock shall have the latest firmware update. All time clocks shall be UL listed. Time clocks shall have astronomic 7-day/365-day electronic control with 120-277 VAC, SPDT contact that is LED compatible in a NEMA 1 type metal enclosure. Time clock shall have the ability to set up to 50 holiday schedule blocks.

2.05 THERMOSTATS

- A. Line voltage thermostats for single-stage heating or single-stage cooling, and for high- and low-temperature alarms shall be rated NEMA 4X with a 40°F to 110°F temperature range and fixed 3°F deadband.
- B. Line voltage thermostats for single-stage heating or single-stage cooling in Class I locations shall be Johnson Controls A19AUC, Honeywell T6051B, Larson Electronic, or Eaton. Class I location thermostats shall be liquid filled, coiled bulb type element with SPDT contact for cooling or heating as required by application. Class I location thermostat shall be suitable for pilot duty (24 to 600 VAC) or line voltage duty up to 16-FLA at 120V. Class I location thermostat shall have a 20°F to 80°F temperature adjustment range with front of device dial. Coordinate requirements with equipment served.
- C. Analog (low voltage) temperature transmitters shall be provided to generate a 4-20 mA signal for interface with the SCADA system. Temperature transmitter shall include a temperature sensor. Provide intrinsic safety barrier for temperature transmitters located in Class I locations.
- D. Thermostats shown on the Drawings shall be single-stage unless otherwise noted.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Weather-resistant receptacles shall be provided in all damp and wet locations.
- B. GFCI receptacles shall not be series wired.

- C. Install wall switches 48 inches above floor (top of box), "Off" position down, unless otherwise noted.
- D. Install receptacles vertically with the grounding pole on the bottom and at the heights shown on the Drawings, unless otherwise noted. Heights listed on the Drawings are to the bottom of the box.
- E. Install thermostats 48 inches above floor (top of box).
- F. Install devices and cover plates flush and level.
- G. Back wiring is not allowed for switches and receptacles. Wires shall be terminated with the device screw terminal.
- H. Individual labels shall be placed on the back of all switch faceplates and receptacle faceplates indicating the lighting panel and circuit from which the switch or receptacle is fed. Labels shall be white background with black lettering no smaller than 12-point font. Provide permanently attached self-adhesive type, machine fed, and self-laminating labels. All labels must be by the same manufacturer, same size, and same font. Handwritten labels are not acceptable.

END OF SECTION

SECTION 26 28 00

OVERCURRENT PROTECTIVE DEVICES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Provide overcurrent protective devices as shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit shop Drawings and product data in accordance with provisions of Section 01 33 00—Submittals, including electrical ratings, physical size, interrupt ratings, trip curves, I²t curves, and manufacturer's detailed specifications.

1.03 QUALITY ASSURANCE

- A. Comply with the following requirements:
 - 1. NFPA 70 National Electrical Code (NEC).
 - 2. Local codes and ordinances.
 - 3. Provide overcurrent protective devices by same manufacturer for each type of device.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Comply with pertinent provisions of Section 01 60 00—Materials and Equipment.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

PART 2—PRODUCTS

2.01 CIRCUIT BREAKERS

- A. General:
 - 1. Comply with UL 489 requirements.
 - 2. Provide thermal and magnetic protection unless noted otherwise.
- B. Main and Generator Connection Enclosure Feeder Breakers:
 - 1. Circuit breakers shall have a short-circuit interrupting rating as indicated on the Drawings.

2. Provide solid-state circuit breakers with electronic sensing, timing and tripping circuits for adjustable current settings. Provide adjustable long-time pickup, long-time delay, short-time pickup, short-time delay, and instantaneous pickup settings.
 3. Main and generator connection enclosure feeder breakers shall be capable of tripping via an external ground fault relay dry contact signal.
- C. Feeder Breakers:
1. Circuit breakers shall have a short-circuit interrupting rating as indicated on the Drawings.
 2. Field-Adjustable Thermal-Magnetic Trip Circuit Breaker: NEMA AB1. Provide circuit breakers with frame sizes less than 200 amperes with mechanism for adjusting instantaneous pickup setting for automatic operation. Range of adjustment shall be three to ten times the trip rating.
 3. Field-Changeable Magnetic-Only Ampere Rating Circuit Breakers/Motor Circuit Protectors: UL 489.
- D. All lugs shall be rated to accept copper conductors.

2.02 ENCLOSURES

- A. Circuit breakers shall be installed within MCC, panelboard, etc. as shown on the Drawings.
- B. Provide circuit breaker with enclosures where required as listed below, unless noted otherwise on the Drawings. Indoor: NEMA 12, steel.

2.03 ACCESSORIES

- A. Provide accessories as scheduled as listed below:
1. Shunt trip device: 120 volts AC.
 2. Handle lock: Include provisions for padlocking.
 3. Provide mechanical trip device.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install overcurrent protective devices in accordance with manufacturer's recommendations.

3.02 ADJUSTMENT

- A. Set and record adjustable settings on circuit breakers to provide selective coordination and proper operation.

END OF SECTION

SECTION 26 28 16

DISCONNECT SWITCHES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Disconnect switches.
 - 2. Fractional hp motor switches.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. NEMA KS 1—Enclosed Switches.

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.
- B. Include outline drawings with dimensions and equipment ratings for voltage, capacity, horsepower, and short-circuit.

PART 2—PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Disconnect Switches: Square D Class 3110, Eaton Type DH, or Siemens.
- B. Substitutions: Under provisions of the General Conditions.

2.02 DISCONNECT SWITCHES

- A. Nonfusible Disconnect Switches: NEMA KS 1; heavy-duty, quick-make, quick-break, load interrupter enclosed knife switch with externally-operable handle interlocked to prevent opening front cover with switch in "On" position. A defeater shall be provided to bypass this interlock. Handle lockable in "Off" position. Provide auxiliary contacts to remove control power associated with field devices or instruments interlocked with equipment served. Auxiliary contacts shall be by the disconnect manufacturer.

2.03 SINGLE-PHASE MOTOR SWITCHES (2 HP OR LESS)

- A. Where noted on the Drawings, motors rated 2 hp or less, for operation on 120 V, single-phase, shall be provided with a specification-grade wall switch as disconnecting means. See Section 26 27 26–Wiring Devices for additional information.

2.04 ENCLOSURES

- A. Provide disconnect switch enclosures as listed below, unless noted otherwise on the Drawings:
 - 1. Indoor dry locations: NEMA 12, steel.
 - 2. Outdoor or wet locations: NEMA 4X, 316 stainless steel.
 - 3. Hazardous locations: NEMA 7, cast aluminum.

PART 3–EXECUTION

3.01 INSTALLATION

- A. Provide disconnect switches where indicated on the Drawings. Maximum mounting height shall be 42 inches above finished floor unless noted otherwise, or acceptable to ENGINEER based on field conditions.
- B. Provide wall switch for each single-phase fractional horsepower motor where indicated on the Drawings.
- C. Disconnect enclosures that house wiring powered from a source separate from the motor power wiring (e.g., MAS units, space heaters) shall have a nameplate installed on the front of the disconnect indicating that power may be present at the motor when the disconnect is in the “Off” position.
- D. Wiring within disconnects shall only be for loads or equipment served by that disconnect. Foreign wiring within disconnect enclosures is not allowed. All wiring within disconnect enclosures shall be landed on lugs or terminals provided by the disconnect manufacturer, or on dedicated terminal strips for instrumentation equipment or field devices. Splices and spring wire connectors are not allowed within disconnect enclosures.

END OF SECTION

SECTION 26 36 14

GENERATOR CONNECTION ENCLOSURES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Provide generator connection enclosures where shown on the Drawings.
 - 2. The system shall be a completely integrated assembly for manual connection of a portable generator to the electrical distribution system including all connectors as specified herein.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 QUALITY ASSURANCE

- A. The generator connection enclosure shall be listed by Underwriters Laboratories, Inc.

1.03 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.
- B. Shop drawings shall include the following:
 - 1. Detailed descriptions of equipment to be furnished, including all deviations from these specifications.
 - 2. Detailed layouts of all cubicles and equipment.
 - 3. The manufacturer shall furnish schematic and wiring diagrams for the generator connection enclosure and an interconnection wiring diagram for the entire system.

1.04 DELIVERY, STORAGE, AND HOLDING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.

1.05 WARRANTY

- A. Standard One-Year Warranty of the date of Final acceptance of the entire Project by ENGINEER. Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion or the date of final acceptance of the project.

PART 2–PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The generator connection enclosure shall be as manufactured by Trystar GDS Series, Asco Series 300, or PSI Power and Controls GTBWM Series.
- B. The Drawings and Specifications were prepared based on Trystar. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment. CONTRACTOR shall also pay additional costs necessary for revisions of Drawings and/or Specifications by ENGINEER.

2.02 GENERATOR CONNECTION ENCLOSURES

- A. Provide complete generator connection enclosures as shown on the Drawings. Generator connection enclosures shall be UL 1008 and UL 50 listed.
- B. Enclosure:
 - 1. NEMA 3R aluminum with powder coat finish, suitable for wall mounting.
 - 2. The NEMA 3R enclosure rating shall be maintained while generator cabling is connected to the connection enclosure.
 - 3. The front door shall be hinged, padlockable, and include a hinged access plate to prevent access to bottom of enclosure.
 - 4. Provide extra depth for bottom conduit access.
- C. All bussing shall be silver-plated copper.
- D. Wiring for permanently-connected wiring shall utilize mechanical lugs and be located behind a physical barrier. Provide lugs as required for permanent wiring as shown on the Drawings.
- E. Temporary cable connections shall utilize female cam connectors that are color-coded based on the system voltage. Cam connectors shall be Series 16 Cam-Lok connectors.
- F. Generator connection enclosure ratings shall be as shown on the Drawings. shall be provided with a factory-installed phase monitoring relay and have a short circuit withstand rating of 65 kAIC.
- G. Generator connection enclosures shall be provided with the following factory-installed equipment: Phase monitoring relay.

PART 3–EXECUTION

3.01 INSTALLATION

- A. The installation of this system shall comply with the directions and recommendations of authorized factory representatives. These representatives shall offer the supervision necessary for proper installation.

END OF SECTION

SECTION 26 36 23

AUTOMATIC TRANSFER SWITCHES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Provide an automatic transfer switch (ATS) control system where shown on the Drawings.
 - 2. The system shall be a completely integrated assembly for automatic, unattended operation and control of the standby power system. System operation shall be as described in the following sections.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.
- B. Shop drawings shall include the following:
 - 1. Detailed descriptions of equipment to be furnished, including all deviations from these specifications.
 - 2. Detailed layouts of all cubicles and equipment.
 - 3. The manufacturer shall furnish schematic and wiring diagrams for the ATS and an interconnection wiring diagram for the entire standby system. Test reports certified by the manufacturer shall be provided to ENGINEER for the entire system.

1.03 QUALITY ASSURANCE

- A. The transfer switch shall be listed by Underwriters Laboratories, Inc. (Std. 1008) and be approved by the Canadian Standards Association.

1.04 WARRANTY

- A. Standard One-Year Warranty of the date of Final Acceptance of the entire Project by ENGINEER. Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion or the date of final acceptance of the project.

PART 2—PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The ATS shall be as manufactured by Cummins Power Generation X-series, Kohler KCP, or

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Asco 7000-series, 200-amp, 3-pole.

- B. The Drawings and Specifications were prepared based on Cummins Power Generation. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment. CONTRACTOR shall also pay additional costs necessary for revisions of Drawings and/or Specifications by ENGINEER.

2.02 ATS

- A. Provide complete ATS as shown on the Drawings. Interlocked molded case circuit breakers or contactors are not acceptable.
- B. The transfer switch shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a nonventilated enclosure constructed in accordance with Underwriters Laboratories, Inc., UL 1008. The transfer switch shall be provided with open type and furnished to Section 40 94 23 System Supplier for installation in an MCC structure.

2.03 CONSTRUCTION AND PERFORMANCE

- A. The transfer switch shall be double-throw, actuated by a single electrical operator momentarily energized and connected to the transfer mechanism by a simple overcenter linkage, with a minimum transfer time of 400 milliseconds.
- B. The transfer switch shall have the ability to detect under and over-voltage, under and over-frequency, voltage imbalance, incorrect phase rotation, and phase loss.
- C. The time delay between the opening of the closed contacts and the closing of the open contacts shall allow for voltage decay before transfer.
- D. The transfer switch shall allow the motor and transformer loads to be reenergized after transfer with normal inrush current. The transfer switch shall be capable of transferring successfully in either direction with 70% of rated voltage applied to the switch terminals.
- E. The normal and emergency contacts shall be positively interlocked mechanically and electrically to prevent simultaneous closing. Main contacts shall be mechanically locked in position in both the normal and standby positions without the use of hooks, latches, magnets, or springs and shall be silver tungsten alloy. All contacts shall be 100% rated. Separate arcing contacts with magnetic blowouts shall be provided on all transfer switches.
- F. The transfer switch shall be equipped with a safe manual operator designed to prevent injury to operating personnel. The manual operator shall provide the same transfer speed as the electrical operator to prevent a flashover from switching the main contacts slowly.
- G. The transfer switch shall be equipped with a digital display that has the ability to monitor load power conditions, network status, review transfer switch events, and adjust transfer switch parameters. The display shall also include a bar graph display that indicates the level of power being supplied to the load as well as three-phase voltage, current, frequency, power factor, and kilowatts.

2.04 SEQUENCE OF OPERATION

- A. Provide an adjustable time delay should the voltage of the normal source drop below 80% on any phase to allow for momentary dips. After restoration of normal power on all phases to 90% of rated voltage, an adjustable time delay period of zero to 31 minutes shall delay retransfer to allow stabilization of normal power. If the standby power source should fail during this time delay period, the switch shall automatically return to the normal source. Two auxiliary contacts rated 25 amps, 120 volts shall be mounted on the main shaft; one closed on normal, the other closed on standby. All relays, timers, control wiring, and accessories shall be front accessible. In addition, one set of relay contacts shall be provided to open upon loss of the normal power supply. All control wire terminations shall be identified by tubular sleeve-type markers.
- B. The ATS shall include the following functions. Adjustable time delays and features described below shall be operator-adjustable from the front of the transfer switch and shall not require the use of a laptop, software, or external programming device.
1. Time delay to override momentary normal source power outages to delay transfer switch operation. Adjustable 0.5 to 90 seconds.
 2. Time delay relays to control contact transition time on transfer to either source, adjustable 1 to 300 seconds (Programmed Transition).
 3. Time delay on retransfer to normal. Adjustable 0 to 31 minutes.
 4. Test with load-Auto-Test without load selector switch to simulate normal power failure. (Maintained Type).*
 5. Contact to close on failure of normal source to initiate customer functions.
 6. Contact to open on failure of normal source to initiate customer functions.
 7. Green pilot light to indicate switch in normal position.*
 8. Red pilot light to indicate switch in standby position.*
 9. Auxiliary contact closed in normal position.
 10. Auxiliary contact closed in standby position.
 11. Adjustable relay to prevent transfer to standby until voltage and frequency of generating plant have reached acceptable limits.
 12. Plant exerciser with 7-day time clock, multiple test schedules, and programmable exceptions for holidays, weekends, etc.

* Front cabinet door mounted.

- C. When coordinated with circuit breakers, the ATS shall have the following short-circuit withstand capability:

Withstand Capability (RMS Amps, Symmetrical) Testing at 480 VAC	
Switch Ampere Rating	ATS Coordinated with Molded Case Circuit Breakers
200	65,000

- D. During the withstand tests, there shall be no contact welding or damage. The tests shall be performed on identical samples without the use of current limiting fuses. Oscillograph traces across the main contact shall verify that contact separation has not occurred. These procedures shall be in accordance with UL 1008 and testing shall be certified by Underwriters Laboratories or any nationally recognized independent testing laboratory.

- E. When conducting temperature rise tests to UL 1008, the manufacturer shall include postendurance temperature rise tests to verify the ability of the transfer switch to carry full-rated current after completing the overload and endurance tests.
- F. As a precondition for approval, the manufacturer of the ATS shall verify that the switches are listed by Underwriters Laboratories, Inc., UL 1008 with withstand and close-in values at least equal to the interrupting rating of the circuit breaker and/or fuse that is specified to protect the circuit.

PART 3-EXECUTION

3.01 INSTALLATION

- A. The installation of this system shall comply with the directions and recommendations of authorized factory representatives. These representatives shall offer the supervision necessary for proper installation.
- B. A final inspection and an initial start-up of the system shall be provided by the factory representatives.
- C. A Certificate of Proper Installation as specified in Section 01 91 00-Starting of Systems, shall be provided by the authorized factory representatives which states that the system is properly installed and does properly function as recommended by the factory and as described herein shall be submitted to ENGINEER.
- D. A test run shall be performed by the authorized factory representatives in the presence of CONTRACTOR and ENGINEER or their representatives; the time of this test run shall be mutually agreed upon by all persons concerned.

3.02 START-UP AND TRAINING

- A. CONTRACTOR shall include 8 hours of start-up by a certified, factory-trained engineer. Start-up services shall include, but not be limited to, inspection of CONTRACTOR installation and functional testing of the ATS assembly. On-site time shall be over and above the cost of travel and travel time to the site.
- B. CONTRACTOR shall provide a training session for up to three OWNER's representatives for one normal workday (not including start-up) at a job site location determined by OWNER. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of instruction on operation and testing of the assembly, simulated outages, and review of major components within the assembly.

END OF SECTION

SECTION 26 41 13

LIGHTNING PROTECTION FOR BUILDINGS AND STRUCTURES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: This section covers the design of a lightning protection system as well as providing the lightning protection equipment for the IDOT Pump Station 49. This shall include, but not be limited to, the following items:
 - 1. Air terminals.
 - 2. Main conductors.
 - 3. Bonding conductors.
 - 4. Down conductors.
 - 5. Ground terminals/rods.
 - 6. Connectors and fittings for interconnecting the above items to provide a complete and functional installation.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section

1.02 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals
- B. Shop drawings shall include, but not be limited to, the following:
 - 1. Detailed descriptions of equipment to be furnished, including any deviations from these specifications.
 - 2. Specialized tools, equipment, materials, and supplies necessary to perform all labor and obtain all inspections to complete the work as specified and in compliance with all codes, regulations, and standards.
 - 3. Detailed layouts of all equipment, wiring, and ancillary items.
 - 4. Schematic and wiring diagrams for the complete system, including all connections to structures, equipment, and system grounding.

1.03 QUALITY ASSURANCE

- A. UL labeling: All system components furnished under this section shall be designed in accordance with ANSI/UL 96—Lightning Protection Components. All lightning protection systems furnished under this section shall be designed and constructed in accordance with UL 96A—Installation Requirements for Lightning Protection Systems and ANSI/NFPA 780—Standard for the Installation of Lightning Protection Systems.
- B. NECA Standards: Comply with applicable portions of National Electrical Contractor's Association Standard of Installation.

- C. Workmanship and Materials: CONTRACTOR shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective materials and workmanship, and leakage, breakage or failure. Materials shall be suitable for service conditions.

PART 2-PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The system components shall be manufactured by a company specializing in the design and manufacture of UL listed lightning protection equipment for a minimum of 10 years. Acceptable product manufacturers include Thompson Lightning Protection, Harger, or nVent Erico.

2.02 MATERIALS

- A. All manufactured and fabricated components shall conform to NFPA 780 and be UL listed. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses such that repair parts can be easily installed in the field. Like parts of duplicate units shall be interchangeable. Unless required for testing purposes, equipment shall not have been in service at any time prior to delivery.
- B. Individual system components shall be provided as specified below, and shall be copper, aluminum, or bronze as specified herein. Aluminum shall be used in locations where system components are mounted to aluminum surfaces to avoid galvanic corrosion of dissimilar metals.
- C. Air terminals shall be copper or aluminum based on the installation/application, with air terminal size selected to meet the intent of the system design. Aluminum may be used only on aluminum surfaces, where system components are mounted to aluminum surfaces to avoid galvanic corrosion of dissimilar metals.
- D. Air terminal bases shall be selected based on the location of the air terminal and the component of the structure being attached to. Air terminals exceeding 24 inches in height shall have vertical mounting clips installed a minimum of half the distance from the base to the tip, or a minimum of every 24 inches, whichever is less.
- E. Conductors shall be copper and be used to interconnect all air terminals and provide a two way path to ground. Sizing shall be in accordance with UL-96 and NFPA 780. Cable holders shall be selected based on the location of the cabling and the component of the structure being attached to.
- F. Bonding and splicing components shall be provided as necessary and identified by the system design, and to form a complete installation meeting the requirements of UL 96 and NFPA 780.

- G. Ground rods shall be 3/4-inch solid copper, minimum 10 feet long. Cable connections to ground rods shall be the same material as the ground rod and be selected based on the incoming/outgoing cables connecting to each rod.
- H. Ground Connections Below Grade: Exothermic type or compression type. Compression connectors shall be prefilled with an oxide inhibitor.

PART 3-EXECUTION

3.01 INSTALLATION REQUIREMENTS

- A. The lightning protection system shall be installed in a neat, workmanlike, and inconspicuous manner so all components blend in with the appearance of the building. All conductors shall be concealed or semiconcealed during construction using methods outlined in UL 96A and NFPA 780.
- B. Installation of the lightning protection system shall include the bonding of all ladders, handrails, platforms, and other metal objects.
- C. Air terminals shall project a minimum of 10 inches above the object to be protected. Spacing and location shall be in accordance with UL 96 and NFPA 780 and shall be clearly identified in the shop drawing submittals. Air terminals exceeding 24 inches in height shall have vertical mounting clips installed a minimum of half the distance from the base to the tip, or a minimum of every 24 inches, whichever is less.
- D. Air terminal base supports shall be designed for the surface on which they are used and shall be securely anchored. All exposed metal piping, vents, and equipment shall be bonded to the lightning protection system such that two paths to ground are provided.
- E. Conductors shall be installed in accordance with UL-96 and NFPA 780, shall interconnect all air terminals, and provide a two-way path to ground from each air terminal. Conductors shall maintain a horizontal and/or downward path to the ground and shall be free of excessive splices and sharp bends. No bend shall form an included angle of more than 90 degrees or have a radius of less than 8 inches.
- F. Fasteners shall be placed on each run of exposed conductor at intervals not exceeding 3 feet. Down conductors shall be spaced at intervals averaging not more than 100 feet around the perimeter of the structure. A minimum of two down conductors shall be provided for each structure, more as necessary to meet the intent of the system design.
- G. Ground rod to cable connections shall be based on the incoming/outgoing cables connecting to each rod, and maintain a minimum of 1 1/2 inches of contact between the rod and the conductor.

3.02 FINAL INSPECTION AND UL MASTER CERTIFICATION

- A. The lightning protection system shall be inspected and tested by CONTRACTOR after installation by performing continuity and ground resistance tests, as well as visual

inspection. Inspection results and test data shall be submitted to OWNER and ENGINEER for review.

- B. Refer to Section 26 05 26—Secondary Grounding for additional testing requirements.

END OF SECTION

SECTION 26 43 13

SURGE PROTECTIVE DEVICES (SPD)

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: Service entrance devices.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. ANSI/IEEE C62.41 and C62.45.
- B. NFPA 70, and 75.
- C. UL 1449, most recent issue.

1.03 QUALITY ASSURANCE

- A. Manufacturers of SPDs. Firms regularly engaged in the manufacture of these products of the types and ratings whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that in this project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide surge protective devices which have been listed and labeled by Underwriters Laboratories.
- E. NECA Standard: Comply with applicable portions of National Electrical Contractor's Association's "Standard of Installation."

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.
- B. Shop Drawings for Equipment Panels: Include wiring schematic diagram, wiring diagram, outline drawing, and construction diagram as described in ANSI/NEMA ICS 1. Test reports

certified by the manufacturer shall be provided to ENGINEER upon request for each model submitted.

1.05 WARRANTIES

- A. The SPD system manufacturer shall warranty the entire system against defective materials and workmanship for a period of fifteen (15) years following delivery from the manufacturer.
- B. The internal SPD protection suppression system shall be protected by a fifteen year warranty following delivery from the manufacturer providing the SPD system is installed per the manufacturer's specifications.

PART 2-PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. The Drawings and Specifications were prepared based on MCG. CONTRACTOR shall include in the Bid and shall be responsible for the cost of any changes to accommodate other equipment including, but not limited to, upsizing overcurrent protective devices to meet manufacturer recommendations. CONTRACTOR shall also pay additional costs necessary for revisions of Drawings and/or Specifications by ENGINEER.

2.02 GENERAL

- A. These specifications describe the electrical and mechanical requirements for high energy SPDs.
- B. The system individual units shall be UL listed under UL1449, latest edition, Standard for Surge Protective Devices (SPD). Surge ratings shall be permanently affixed to the SPD.
- C. Operating Temperature: Operating temperature range shall be -40 to +55°C (-40 to 131°F).
- D. Storage Temperature: Storage temperature range shall be -40 to +85°C.
- E. Relative Humidity: Operation shall be reliable in an environment with 0% to 95% noncondensing relative humidity.
- F. Operating Altitude: The system shall be capable of operation up to an altitude of 13,000 feet above sea level.
- G. Design Life: >15 years.
- H. Operating Voltage: Maximum continuous operating voltage shall be no less than 115% of the nominal rated line voltage.
- I. Power Frequency: SPD power frequency shall be rated for use on 50 and 60 Hertz power systems.

- J. All SPDs shall be MOV type. Noise filtering capabilities shall be provided as an option for the devices specified herein.

2.03 SERVICE ENTRANCE DEVICES

- A. The maximum surge current capacity of the specified system, based on the standard IEEE 8/20 microsecond waveform, shall be at least 160 kA per phase. The surge life (8/20) shall be at least 6 kA for 10,000 occurrences or 10 kA at 20 kV for 16,000 occurrences. The transient suppression capability shall be bidirectional and suppress both positive and negative impulses. SPD shall have a nominal discharge rating (I_n) of 10 kA.
- B. The SPD shall have a minimum Short Circuit Rating (SCCR) of 100 KAIC. The interrupt capability must be confirmed and documented by a recognized independent testing laboratory.
- C. The suppressor shall be designed so as to minimize the internal surge path impedance. Direct point-to-point internal wiring is inherently inductive and not acceptable. Connection to the power service shall be constructed as shown in the manufacturer's installation notes for best performance.
- D. The system shall be constructed using field replaceable plug-in modules. The module shall consist of multiple fuse protected metal oxide varistors. The status of each module shall be locally monitored with a red LED that will illuminate if the module protection is reduced. Protector shall provide redundant protection within each phase module with multiple surge rated fuses per module or one fuse per MOV.
- E. Red and green solid-state LED indicators shall be provided on the hinged front cover to indicate protection status. An illuminated green LED indicates power is present at the protector on all phases, and an illuminated red LED shall indicate that one or more of the modules have reduced protection. Both front panel and internal LEDs are required to provide power and fault indications. Relay operation shall be in a failsafe operating mode, i.e., continuously energized so that power failure, reduced protection, or a break in the remote monitoring line will cause a fault indication at the remote monitor. Neon indicators are not permitted.
- F. Relay alarm contacts shall be provided for remote alarm monitoring capability of unit status. Surge protected normally open and normally closed contacts shall be provided.
- G. The system shall be equipped with an audible alarm which shall be activated when any one or more of the modules has a reduced protection condition. A mute switch shall be provided for the audible alarm.
- H. The SPD shall provide effective energy surge diversion for application in ANSI/IEEE C62.41-2002 location Category C3 environments. Testing shall be per ANSI/IEEE C62.45-2002 using ANSI/IEEE C62.41 Category C3 waveforms and amplitudes.
- I. A 14 gauge, NEMA Type 4, steel enclosure, with corrosion-resistant hardware shall be provided for the unit. Unless otherwise noted, SPDs installed within distribution or control equipment enclosures do not require a separate enclosure.

- J. Service entrance devices shall be as manufactured by MCG 160M Series, Square D EMA/IMA Series, or Eaton SPD Series.
- K. SPD shall be suitable for use in Type 2 locations.
- L. Unit shall provide maximum ANSI/UL 1449 VPRs for 480Y-volt, three-phase systems.
 - 1. L-N = N/A.
 - 2. L-G = 1800 V.
 - 3. N-G = N/A.
 - 4. L-L = 2000 V.

PART 3-EXECUTION

3.01 INSTALLATION

- A. The installation and testing of the system shall be in full accordance with the manufacturer's installation and maintenance instructions and all national and local codes.
- B. Each installed device shall be fed by an appropriately sized circuit breaker, per the manufacturer's installation notes, in the protected panel. No SPD shall be installed without an upstream overcurrent device.
- C. Units shall be installed as close as practical to the electrical panel. Low impedance cabling furnished by the manufacturer shall be utilized for installations with lead lengths greater than, or equal to, 5 feet. Low impedance cabling furnished by the manufacturer or appropriately-sized standard cable, if acceptable to ENGINEER, may be utilized for installations with lead lengths less than 5 feet. SPD leads shall be as short as possible.

3.02 SYSTEM TESTING AND INSTALLATION

- A. Factory test before shipment:
 - 1. Testing shall include, but not be limited to production-line tests, quality assurance checks, MCOV, and benchmark clamping voltage tests.
 - 2. A copy of the benchmark clamping tests for each individual SPD shall be included with each unit.
- B. Manufacturer's Field Services:
 - 1. Supplier's or manufacturer's representative for equipment specified herein shall be present at job site for minimum man-days indicated, travel time excluded, for assistance during plant construction, plant startup, and training of the Department's personnel for plant operation. Include:
 - a. 1/2 man-day for Installation and Testing Services.
 - b. 1/2 man-day for Instructional Services.
 - 2. Supplier or manufacturer shall direct services to system and equipment operation, maintenance, troubleshooting, and equipment and system-related areas other than wastewater treatment process.

3. Obtain the services of a factory-authorized local service representative to provide the following tests:
 - a. Voltage measurements from Line-to-Ground, Line-to-Neutral, Line-to-Line and Neutral-to-Ground (as applicable),
 - b. Impulse injection to verify the system suppression voltage tolerances for all suppression paths. (Note: This testing is separate from any MCC or other system tests. Completely disconnect the TVSS from the MCC prior to any MCC or other system tests, including any hi pot testing.)
 - c. Record and compare test results to factory benchmark test parameters supplied with each individual unit.
 - d. Submit a copy of the start-up test results and the factory benchmark testing results to ENGINEER and the owner for confirmation of proper system function.

END OF SECTION

SECTION 26 51 13

LIGHTING

PART 1—GENERAL

1.01 SUMMARY

- A. Work includes a complete functional lighting system.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. Underwriters Laboratories: Lighting fixtures shall be manufactured in accordance with the standards of the Underwriters Testing Laboratories and shall bear the UL label where practicable. In all cases the lighting fixtures shall be constructed with UL listed components.
- B. Applicable Codes: Fixtures shall be made and installed in accordance with the current version of the National Electrical Code, the Uniform Building Code, the Federal Occupational Safety & Health Act, and other applicable regulations.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical equipment, cable, wire, and connectors.
- D. NEMA/ANSI Compliance: Comply with National Electrical Manufacturers Association, American National Standards Institute, and other standards pertaining to material and construction and testing where applicable.
- E. Lighting Standards:
 - 1. LM-79-08 or latest—IES Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.
 - 2. LM-80-08 or latest—IES Approved Method for Measuring Lumen Maintenance of LED Light Sources.
 - 3. NEMA SSL 1-2016 or latest—Electronic Drivers for LED Devices, Arrays, or Systems.
- F. Fire Codes: Where necessary to meet Code requirements, enclosure housings shall be constructed to provide a 1-hour fire rating.

1.03 SYSTEM DESCRIPTION

- A. Intent: It is the intent of these specifications to obtain a completed lighting fixture and lighting controls installation by CONTRACTOR. Completed means cleaned, adjusted, tested, and ready for occupancy and operation in accordance with the above-indexed paragraphs and in accordance with the other sections of these Contract Documents. It is the responsibility of CONTRACTOR to point out discrepancies, errors, and other problems.

- B. All lighting fixtures are to be provided complete with all necessary accessories for a proper installation. Catalog numbers shown are basic fixture types, and additional features, accessories, and options specified, scheduled or required, are to be included for all fixtures provided.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00–Submittals. Shop drawings shall include, but not be limited to, the following:
 - 1. Manufacturer's dimensioned scale drawings showing in complete detail the fabrication of all lighting fixtures including overall and detail dimensions, finishes, prefinishes, metal thickness, fabrication methods, support method, drivers, type of shielding, reflectors, wiring sizes and insulation types, lenses, and all other information to show compliance with the Contract Documents.
 - 2. Installation instructions.
 - 3. Certified photometric test data and reports.
 - 4. Shop drawings shall not only clearly indicate the assigned fixture type, but also the equipment location.
 - 5. Submittal should include, but not be limited to, wattage, lumen output, color temperature, and CRI value.

1.05 QUALITY ASSURANCE

- A. Standards: Materials, equipment, and parts, as well as workmanship provided under this section, shall conform to the highest commercial standard as specified and as indicated on Drawings. Fixture parts and components not specifically identified or indicated shall use materials most appropriate to their intended use or function and as such be resistant to corrosion and thermal mechanical stresses encountered in the normal application and function of the fixtures.
- B. Measuring and Testing Equipment: CONTRACTOR shall have available at all times, instruments for the measurement of voltage, luminaire temperature, lighting level, and fixture brightness level.
- C. Manufacturers: Firms regularly engaged in the manufacture of lighting fixtures of the types and ratings for the project, whose products have been in satisfactory use in similar service for not less than 15 years.
- D. Installer: A firm with at least 5 years of successful installation experience on projects with electrical wiring installation work similar to that in this project.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Luminaires and lighting equipment shall be delivered to the project complete, including mounting devices and components necessary for the proper operation of the equipment.

- B. Marking: All equipment must be clearly and boldly identified as to the fixture type and, where practicable, the fixture location.
- C. Timely Purchasing: Luminaires and other appurtenances shall be ordered in a timely fashion and securely stored to be available to meet the project schedule.

1.07 WARRANTY

- A. Standard One-Year Warranty of the date of Final Acceptance of the entire Project by ENGINEER. Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion or the date of final acceptance of the project.

PART 2-PRODUCTS

2.01 LED LUMINAIRES

- A. LED Luminaires shall meet the following technical requirements:
 - 1. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
 - 2. Luminaire efficacy shall match or exceed that of the fixture model numbers shown in the fixture schedule on the Drawings.
 - 3. Luminaire Color Rendering Index (CRI) shall match or exceed that of the fixture model numbers shown in the fixture schedule on the Drawings; a minimum of 80 for interior luminaires and a minimum of 70 for exterior luminaires.
 - 4. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
 - 5. Luminaire lumen output shall match or exceed that of the fixture model numbers shown in the fixture schedule on the Drawings.
 - 6. Wattage shall be equal to that of the fixture model numbers shown in the fixture schedule on the Drawings.
 - 7. Luminaire color temperature shall match that of the fixture model numbers shown in the fixture schedule on the Drawings.
- B. Luminaire shall be mercury-free, lead-free, and RoHS compliant.
- C. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
- D. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
- E. Luminaire and driver shall be provided from a single manufacturer to promote compatibility.
- F. Luminaire shall operate normally for input voltage fluctuations of plus or minus 10%.
- G. Luminaire shall have a maximum Total Harmonic Distortion (THD) of $\leq 20\%$ at full input power and across specified voltage range.
- H. Exit Signs shall conform to UL 924 and the following:
 - 1. Sign Colors: Conform to local code.

2. Minimum height of Letters: Conform to local code.
 3. Arrows: Include as indicated.
- I. Emergency Lighting Units shall conform to UL 924 and the following:
1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
 2. Charger: Minimum 2-rate, fully automatic, solid-state type, with sealed transfer relay.
 3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80% of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. Relay disconnects lamps and battery and automatically recharges and floats on trickle charger when normal voltage is restored.
 4. Wire Guard: Where indicated, provide heavy-chrome-plated wire guard arranged to protect lamp heads or fixtures.
 5. Time-Delay Relay: Provide time-delay relay in emergency lighting unit control circuit arranged to hold unit ON for fixed interval after restoration of power after outage.

2.02 WIRING

- A. All wiring within lighting fixtures or from the splice with the building wiring shall be as specified in Section 26 05 19–Wire.
- B. Wiring within fixture construction shall be concealed, except where the fixture design or mounting dictates otherwise.
- C. Wiring channels and wireways shall be free from projections and rough or sharp edges throughout and all points or edges over which conductors must pass and may be subject to injury or wear.
- D. Insulated bushings shall be installed at points of entrance and exit of flexible wiring.

2.03 LED DRIVERS

- A. General:
1. Provide driver type (non-dimmed, step-dimmed, continuous-dimming, etc.) as indicated in the model numbers in the fixture schedule shown on the Drawings.
 2. Driver shall have a minimum rated life of 50,000 hours.
 3. Driver shall have a minimum power factor of 0.9 and a maximum crest factor of 1.5 at full input power and across the specified voltage range.
 4. Driver shall operate normally for input voltage fluctuations of plus or minus 10 percent.
 5. Driver shall have a maximum Total Harmonic Distortion (THD) of $\leq 20\%$ at full input power and across specified voltage range.
 6. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance.
 7. Fuse Protection: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC)-protected per Class 2 UL listing.
 8. All fixtures located outdoors shall be provided with surge protection.

2.04 MARKING OF FIXTURES

- A. Voltage Identification: Fixtures designed for voltages other than 110- to 125-volt circuits shall be clearly marked.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Install fixtures, lenses, etc., after building is enclosed, weathertight, and environmental conditions are nominally the same as expected for the complete spaces. All glassware, reflectors, and refractors shall be clean and free of chips, cracks, and scratches.
- B. All wall-mounted fixtures and all ceiling-mounted surface fixtures including exit lights, shall be fed through a fixture Stud/Hickey/Nipple assembly and with provisions to prevent fixture turning.
- C. All exterior wall-mounted fixtures shown over doorways shall be mounted centered, 6 inches above doorway, unless otherwise noted.
- D. All fixtures shall be securely and adequately supported and installed.
- E. Surface-mounted fixtures shall be attached to and supported from structural part of the building in a manner acceptable to ENGINEER. Fixtures shall be supported by not fewer than two supports for each fixture. Any fixture which has an individual fixture weight of greater than 25 pounds shall have safety cable installed, in addition to other support means. Cable shall be 3/16-inch airplane cable. All fittings and connectors shall be compression type. Cables must be secured to the building structure and to a point or points on the fixture to protect against falling parts.
- F. Provide inscription for exit signs to conform to codes.
- G. Metal decking shall not be pierced for fixture support.
- H. All fixture whips shall be constructed of minimum No. 12 AWG conductors.

3.02 SUPPORTS

- A. Mounting Frames: Provide mounting frames (plaster frames for example), as necessary, for installation and as required under other sections. Frames shall be finished matte white baked enamel unless otherwise noted.
- B. Mounting Accessories: Provide bars, angles, or other supporting devices for all recessed fixtures. Fixtures shall be securely attached to prevent movement up, down, or sideways. Fixtures shall be mounted to permit access to wiring. Fastening devices shall be of a positive, locking type, and shall not require the use of special tools to apply or remove. Tie wires shall not be used in place of fastening devices.

- C. **CONTRACTOR Responsibility:** CONTRACTOR shall verify all ceiling conditions from the Drawings and provide appropriate mounting accessories for each lighting fixture.
- D. **Surface Mounting:** Provide surface-mounted fixtures with required mounting accessories, including hickey, stud extensions, ball aligners, canopies, and stems. Coordinate locations of fixtures in mechanical areas.
- E. Adequate rigid, sturdy support shall be provided to prevent the possibility of fixture falling. Surface fixtures must be supported with two supports per 4-foot section. Support surface-mounted fixtures from structural members other than ceiling tees by providing Unistrut members spanning main ceiling tees or by mounting directly to structure.

3.03 ADJUSTMENT

- A. **Focusing/Adjustment:** After the installation of lighting fixtures is completed, fixtures so requiring (both interior and exterior units), shall be adjusted after dark under the observation of OWNER.

3.04 CLEANING

- A. **Installation Sequence:** Lighting fixture mounting frames, plaster rings, etc., shall be installed prior to the finishing assembly which shall not be installed until the Project is at Final Completion. When the fixture location or construction prevents sequential installation, CONTRACTOR shall carefully protect all reflectors, lenses, flanges, and other visible surfaces.
- B. **Cleaning:** Before final acceptance by OWNER, all protective (strippable) coatings, dust, finger marks, paint spots, and any other materials deleterious to the appearance or functioning of the lighting fixtures must be removed. Abrasive cleaners are not permitted.

3.05 FINAL INSPECTION

- A. Upon completion of the installation, lighting equipment must be in first-class operating order and free from defects in condition and finish:
 - 1. Fixtures shall be completely clean and free from finger marks, dust, plaster, or paint spots.
 - 2. Any reflectors, lenses, diffusers, side panels, or other parts damaged prior to the final inspection, shall be replaced at no expense to OWNER.
 - 3. Housing shall be rigidly installed and adjusted to a neat flush fit with the ceiling.
 - 4. Provide advance notice of dates and times for field tests.
 - 5. Provide instruments to make and record test results.
 - 6. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include following information in tests of emergency lighting equipment:
 - a. Duration of supply.
 - b. Low battery voltage shutdown.
 - c. Normal transfer to battery source and retransfer to normal.
 - d. Low supply voltage transfer.
 - e. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

- f. Report results of tests.
- 7. Replace fixtures that show evidence or corrosion during Project warranty period.
- B. Connections: Ground lighting units. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A.

END OF SECTION

SECTION 27 10 00

STRUCTURED CABLING

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: This specification contains the requirements for telecommunications and data cabling, enclosures, termination components, and related subsystems as part of a structured cabling system.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern Work in this Section.

1.02 SYSTEM DESCRIPTION

- A. CONTRACTOR shall provide and test all cabling and components necessary for a complete and functional structured cabling system as specified herein and shown on the Drawings.
- B. Provide all equipment racks, equipment trays, and all other items necessary for voice and computer connections at all specified data locations.

1.03 REGULATORY REFERENCES

- A. All Work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the National Electrical Code and present manufacturing standards.
- B. All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.
- C. The cabling system shall comply with the following standards:
 - 1. ANSI/IEEE C2—National Electrical Safety Code.
 - 2. NFPA 70—National Electrical Code (currently-adopted edition).
 - 3. TIA/EIA Standards 526-14A (OFSPT-14A), 526-7 (OFSPT-7), TIA-568-C.0, TIA-568-C.1, TIA-568-C.2, TIA-568.3-D, TIA-569-B-1, TIA-606-A-1, and TIA J-STD-607-A.
 - 4. IEEE/ANSI 142—Recommended Practice for Grounding of Industrial and Commercial Power Systems.

1.04 SUBMITTALS

- A. Submit shop drawings and product data in accordance with provisions of Section 01 33 00—Submittals.

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- B. Provide load calculations showing battery runtimes and UPS sizing, including all equipment specified herein.
- C. Provide scaled network rack and network cabinet elevation drawings showing all installed equipment.
- D. Record Drawings:
 - 1. Three complete sets of drawings shall be provided by CONTRACTOR prior to final acceptance.
 - 2. These drawings shall contain the following:
 - a. Any changes made to the system during installation.
 - b. Scaled network rack and network cabinet elevation drawings showing all installed equipment.
- E. Installation Reports:
 - 1. Cable pulling tension reports.
 - 2. Telecommunications grounding busbar resistance test reports.
 - 3. Copper cable acceptance test reports.
- F. Technical Manual: CONTRACTOR shall furnish three complete technical service manuals containing the following:
 - 1. Description of maintenance/programming procedures for all equipment and systems.
 - 2. All warranty information required by manufacturers for submission of warranty claims for all equipment installed.
 - 3. All testing reports according to Paragraph 3.03.

1.05 QUALIFICATIONS

- A. CONTRACTOR shall have at least 10 years of experience in the installation of similar systems. CONTRACTOR shall provide documentation upon request to certify that all assigned staff have attended training courses corresponding to the type of cabling and equipment specified herein.
- B. CONTRACTOR shall currently be licensed to install low voltage electronic cabling systems in the state of the project.
- C. CONTRACTOR shall currently meet all manufacturer's requirements for the provision and installation of all equipment specified herein.
- D. CONTRACTOR shall utilize and have technicians trained in the utilization of the following test equipment: Copper cable certification equipment.

1.06 WARRANTY

- A. Standard one-year warranty of the date of Final Acceptance of the entire Project by ENGINEER. Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion of the date of final acceptance of the project.

PART 2—PRODUCTS

2.01 GENERAL

- A. CONTRACTOR shall provide all necessary power supplies, mounting hardware, and accessories required to install the materials specified herein.

2.02 NETWORK CABINETS

- A. Specification Section 40 94 23 System Supplier shall provide network cabinets as specified herein.
- B. Network equipment shown on the Drawings and specified herein to be provided in a network cabinet shall be installed in a double-hinged, tri-fold rack enclosure suitable for wall mounting. The cabinet shall have a hinged front door with scratch-resistant, tinted, safety-glass window. The cabinet shall be minimum 28 inches wide with integral vertical cable management and 19-inch rack mounting rails per EIA universal spacing. Rack-mounted equipment shall be accessible through the front door and through the hinged tri-fold center section for rear access. Rack spaces above or below each network switch and patch panel shall be provided with horizontal cable management as specified herein. The rear-wall section of the cabinet shall include cable management and conduit entries with knockouts. The hinged center cabinet section shall be able to swing open in either direction. The center cabinet section shall also latch to the rear wall section in two locations and unlatch using hand-operated levers located inside the cabinet.
- C. The front door of the cabinet shall include a keyed lock. Provide minimum two keys to OWNER.
- D. Provide DIN rail, terminal blocks, wireway, circuit breakers, and other devices specified in Section 26 05 19—Wire and Section 40 94 23—Controls and Instrumentation as required for equipment mounted to the rear-wall section of the cabinet (e.g., power strip/surge suppressor receptacle, etc.)
- E. The cabinet height shall be sized as required to accommodate all equipment specified herein and shown on the Drawings to be located in the cabinet, plus a minimum of 25% spare rack mounting space.
- F. All non-rack mounted components not requiring regular access shall be mounted to the rear-wall section of the cabinet (e.g., receptacles, power supplies, etc.). Provide blank RU plates and shelves, sized as required, to rack mount equipment that is not provided with rack-mounting flanges (e.g., IP gateway, tone generator, etc.). Non-rack mounted equipment shall be located to avoid conflicts with space reserved for future rack-mounted equipment and shall not be mounted on the floor of the cabinet.
- G. Provide two rack-mounted, true-online UPS backup as specified herein in each cabinet that will allow for continuous operation of all installed equipment in the network cabinet and equipment in SP-49 for at least 30 minutes. All power connections to UPS shall be plug connected.

- H. Provide rack-mounted power conditioner and distribution units as specified herein in each cabinet. Provide quantity in each rack required to serve the installed equipment.
- I. The cabinet shall be constructed of welded, 14-gauge steel with lightly textured, low-gloss polyester powder paint. Provide two enclosure fan kits both mounted on one side of the enclosure and directed to positively pressurize the cabinet. Provide washable fan filter kit for each fan. Provide vertical cable management.

2.03 COPPER CABLE

- A. Industrial Ethernet Cable:
 - 1. 600-Volt Rated Shielded Cable:
 - a. For communication with plant SCADA Systems and equipment in supervisory control centers, motor control centers, control panels, etc., over 300 volts, and other areas or raceways with power wiring over 300 volts, provide 600-volt-rated, 4-pair, shielded (F/UTP), twisted-pair cables. Transmission characteristics of the cables shall meet full Category 6 performance criteria as defined by the ANSI/TIA-568-C.2 standard.
 - b. Cable conductors shall be minimum 23 AWG with PVC jacket and aluminum foil shield with 100% coverage. The cable outer jacket shall be industrial-grade PVC with a maximum overall cable diameter of 0.34 inch. Cable shall be CMR rated, UL listed, and 600 V UL AWM rated.
 - c. Cable jacket color shall be red.
 - d. Provide a shielded RJ45 connector on one end of each cable and an unshielded RJ45 connector on the other end of each cable.
 - 2. 300-Volt Rated Shielded Cable:
 - a. For communication with plant SCADA Systems and equipment in supervisory control centers, motor control centers, control panels, etc., under 300 volts, and other areas or raceways with power wiring under 300 volts, provide 300 volt-rated, 4-pair, shielded (F/UTP), twisted-pair cables. Transmission characteristics of the cables shall meet full Category 6 performance criteria as defined by the ANSI/TIA-568-C.2 standard.
 - b. Cable conductors shall be minimum 23 AWG with PVC jacket and aluminum foil shield with 100% coverage. The cable outer jacket shall be industrial-grade PVC with a maximum overall cable diameter of 0.29 inch. Cable shall be CMR rated and UL listed.
 - c. Cable jacket color shall be slate.
 - d. Provide a shielded RJ45 connector on one end of each cable and an unshielded RJ45 connector on the other end of each cable.
- B. Category 6 Ethernet patch cables shall be provided premanufactured by the cable manufacturer or connector manufacturer in sufficient length to connect the associated equipment to any port on the equipment, or switch. Field-attached plugs shall be insulation displacement type and shall be by the same manufacturer as the cable.

2.04 POWER DISTRIBUTION AND GROUNDING

- A. Specification Section 40 94 23 System Supplier shall provide power distribution equipment and grounding bus bars as specified herein.
- B. Rack-Mounted Uninterruptible Power Supplies:
 - 1. UPS shall be 120-volt AC and true on-line type. UPS batteries shall be sized to provide continuous communication for at least 30 minutes for equipment in the network cabinet and equipment in SP-49 following a power failure.
 - 2. UPS power shall be provided to all rack-mounted equipment, unless noted otherwise.
 - 3. UPS and shall be plug connected to a line power receptacle and all power connections to the UPS shall be plug connected.
 - 4. Each UPS shall be provided with a relay card that provides a dry contact output to the SCADA System to indicate a common alarm, include when the UPS batteries need replacement.
 - 5. The UPS and associated batteries shall be located at the bottom of the rack.
 - 6. The UPS shall be APC with relay I/O module, Liebert GXT5 with relay card, or Eaton 9SX.
- C. Rack-Mounted Power Conditioner and Distribution Unit:
 - 1. Provide power conditioner and distribution units in all network cabinets. Provide quantity required to serve the installed equipment. Power conditioners shall be rack mountable and include 8 rear-panel outlets and 1 front-panel outlet with integral 20-amp circuit breaker protection.
 - 2. The power conditioner shall provide voltage regulation, under/over-voltage protection, and transient protection for line-to-neutral and line-to-ground leakage.
 - 3. The power conditioner shall have a front panel-mounted digital voltmeter/ammeter display to indicate RMS line voltage and current.
- D. Provide a telecommunications grounding bus bar (TGB) in the rear cable section of each network cabinet. The TGB shall be a pre-drilled copper bus bar provided with standard NEMA bolt-hole sizing and spacing and have minimum dimensions of 6 mm thick by 50 mm wide. The connection of the isolated grounding conductor to the TGB shall utilize UL-listed two-hole compression connections.

PART 3-EXECUTION

3.01 GENERAL

- A. Install all equipment and components in accordance with manufacturer's written instructions, in compliance with NEC, ANSI/TIA/EIA-569-B-1 and with recognized industry practices so that all items comply with these Specifications and serve the intended purposes.
- B. Refer to Section 26 05 53-Electrical Identification for cable and equipment label requirements.
- C. All cabling shall be installed in accordance with good engineering practices as established by the TIA/EIA and the NEC. Cabling shall meet all applicable local, state, and federal

building codes. Voice and Data Cables shall be terminated according to the TIA-568B standard.

- D. Record serial numbers of all items provided that are serialized prior to final acceptance.
- E. All items must be complete as specified prior to final acceptance.

3.02 INSTALLATION

- A. Grounding:
 - 1. Ground all equipment according to manufacturer's instructions, NEC requirements, EIA/TIA 568B, and EIA/TIA 607.
 - 2. Telecommunications system shall be installed with an isolated grounding system which has only one ground point. That ground point shall be connected to the common grounding electrode via the ground bar in the Electrical Room. Provide an isolated grounding conductor installed in conduit from the ground bar in the Electrical Room to the telecommunications grounding busbar (TGB) located in the network cabinet. This conductor shall be insulated copper with a minimum conductor size of 6 AWG.
 - 3. Telecommunications Equipment Rack Grounding: Bond the TGB to the ground bar on the equipment racks, cabinets, and network cable trays. Use a 6-AWG or larger insulated-copper conductor in conduit from all network cabinets, racks, and cable trays to the TGB.
 - 4. CONTRACTOR shall perform grounding resistance testing on the complete grounding path from the TGB to the service entrance ground. Ground resistance shall not exceed 5 ohms between the TGB and service entrance ground. If the ground resistance test indicates the resistance to be greater than 5 ohms, CONTRACTOR shall provide a larger dedicated, insulated-copper grounding conductor as specified above in conduit from the TGB to the service entrance grounding point.

3.03 TESTING AND ACCEPTANCE

- A. General:
 - 1. CONTRACTOR is responsible to perform certification tests as indicated below for each subsystem as it is completed.
 - 2. CONTRACTOR is responsible for supplying all equipment and personnel necessary to conduct the certification tests. Prior to testing, CONTRACTOR shall provide a summary of the proposed test plan for each cable type, including equipment to be used, set-up, test frequencies or wavelengths, results format, etc. The method of testing shall be subject to review by ENGINEER.
 - 3. CONTRACTOR shall visually inspect all cabling and termination points to verify that they are complete and conform to the wiring pattern specified herein. CONTRACTOR shall provide ENGINEER with a written certification that this inspection has been made.
 - 4. CONTRACTOR shall conduct certification testing according to a schedule coordinated with OWNER. Representatives of OWNER may be in attendance to witness the test procedures. CONTRACTOR shall provide a minimum of one week advance notice to ENGINEER to allow for such participation. The notification shall include a written description of the proposed tests, including copies of blank test result sheets to be used.

5. Failure to provide the above information shall be grounds for OWNER/ENGINEER to reject any and all Documentation of Results on related testing, and to require a repeat of the affected test.
6. Tests related to connected equipment of others shall only be done with the permission and presence of CONTRACTOR involved. CONTRACTOR shall ascertain that testing only as required to prove the wiring connections are correct.
7. CONTRACTOR shall provide test results and describe the method of the tests, including the date of the tests, the equipment used, and the procedures followed. At the request of ENGINEER, CONTRACTOR shall provide copies of the original test results.
8. All cabling shall be 100% fault-free. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the expense of CONTRACTOR. The applicable tests shall then be repeated.
9. Should it be found by ENGINEER that the materials or any portion thereof provided under this Contract fail to comply with the Specifications and Drawings, with respect or regard to the quality, amount or value of materials, appliances, or labor used in the Work, it shall be rejected and replaced by CONTRACTOR, and all Work disturbed by changes necessitated in consequence of said defects or imperfections shall be made good at CONTRACTOR's expense.

B. Copper Data Cabling:

1. Testing shall be from the network switch to the equipment or device on which the cables are terminated.
2. Cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and compliance with termination standards. Any defective, split or mispositioned pairs must be identified and corrected.
3. In addition to the above, Certification Testing shall be performed on all cables. Testing of the Transmission Performance of station cables (Category 6 and above) shall include the following:
 - a. Length.
 - b. Attenuation.
 - c. Pair to Pair NEXT Loss (new limits).
 - d. PSNEXT Loss.
 - e. Return Loss.
 - f. Pair to Pair ELFEXT Loss (Equal Level Far End Cross talk).
 - g. PSEFEXT Loss.
 - h. Propagation Delay.
 - i. Delay Skew.
 - j. Return Loss.
4. Cables shall be tested to the maximum frequency defined by the standards covering their performance category. Transmission performance testing shall be performed using a test instrument designed for testing to the specified frequencies. Test records shall verify "PASS" on each cable and display the specified parameters—comparing test values with standards based "templates" integral to the unit.
5. Testing shall be per ANSI/TIA/EIA 568-C.2 Basic Link test configurations.
6. In order to establish testing baselines, cable samples of known length and of the cable type and lot installed shall be tested. The cable may be terminated with an 8-position Category 6 Modular plug (8-pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal attenuation values shall be calculated based on this test and be utilized during

the testing of the installed cable. This requirement can be waived if NPV data is available from the cable manufacturer for the exact cable type under test.

7. In the event results of the tests are not satisfactory, CONTRACTOR shall make the necessary adjustments, replacement, and changes, and then repeat the test or tests which disclosed faulty or defective material, equipment, or installation method, and shall perform additional tests as required by ENGINEER at no additional cost to OWNER.

END OF SECTION

SECTION 28 46 00

FIRE ALARM SYSTEM

PART 1-GENERAL

1.01 SUMMARY

- A. Work includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the Fire Alarm System as shown on the Drawings and as specified herein to meet the requirements of a complete Fire Alarm System.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 REFERENCES

- A. NFPA 72 National Fire Alarm Code.
- B. NFPA 70 National Electrical Code.
- C. ADA.
- D. Underwriters Laboratories.
- E. NFPA 101 Life Safety Code.
- F. NFPA 90.
- G. International Building Code.
- H. International Fire Code.
- I. International Mechanical Code.

1.03 SCOPE

- A. Furnish and install a complete Fire Alarm System to be wired, connected, and left in first class operating condition. The system shall be UL listed, cross-listed, and compatible for use with individual zone supervision, individual NAC supervision, and incoming and standby power supervision. The project includes furnishing a system which includes manual stations, smoke detectors, heat detectors, audible/visual devices, all wiring, connections to devices, outlet boxes, junction boxes, and all other necessary material for a complete operating system.
- B. Furnish and install a complete fire alarm system for the station including an emergency power supply consisting of a battery, minimum 10 year nominal life expectancy and sized to operate complete alarm system for period of 24 hours, charger, solid-state, fully automatic,

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variable-charging-rate type that will completely charge fully discharged batteries in 4 hours or less, automatic transfer switch, that transfers load to battery without loss of signals or status indications when normal power fails, heat detectors, smoke detectors, pull stations, horn and strobe devices, wiring to all fire alarm system devices and wall mounted control panel with 120 VAC power supply.

- C. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Fire Alarm System as shown on the Drawings and as herein specified.
- D. The system shall be complete with three zones: Electrical Room, Dry Well, and Wet Well. All appliances shall meet the NFPA requirements.

1.04 QUALITY ASSURANCE

- A. System Supplier shall be a nationally-recognized company specializing in smoke detection and fire alarm systems. This organization shall employ factory-trained and NICET-certified technicians, and shall maintain a service organization within 100 miles of this project location. The System Supplier and service organization shall have a minimum of 10 years' experience in the fire protective signaling systems industry.
- B. The System Supplier shall supply the final checkout, contractual service, and testing.
- C. The complete installation is to conform to the applicable sections of NFPA-72, NFPA-101 Local Code Requirements and National Electrical Code with particular attention to Article 760.
- D. Each and all items of the complete Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer unless the primary equipment provider or manufacturer provides written documentation of compatibility, and assumes responsibility for compatibility with the control equipment.
- E. Each and all items of the complete Fire Alarm System shall be listed under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the UL label.

1.05 MANUFACTURER PROVIDED SERVICES

- A. A manufacturer-trained service technician shall provide the following installation supervision. This technician shall be certified by the equipment manufacturer and shall have a minimum of two years of service experience in the fire alarm industry.
- B. The technician's name shall appear on equipment submittals and a letter of certification from the fire alarm manufacturer shall be sent to ENGINEER. The manufacturer's service technician shall be responsible for the following items:
 - 1. Pre installation visit to the job site to review equipment submittals and verify method by which the system should be wired.
 - 2. Periodic job site visits to verify installation and wiring of system, and to perform any partial system programming.

3. Upon completion of wiring, final connections shall be made under the supervision of this technician, and final checkout and certification of the system.
4. At the time of final checkout, technician shall give operational instructions to OWNER and/or its representative on the system.
5. All job site visits shall be dated and documented in writing and signed by the Division 26 Contractor. Any discrepancy shall be noted on this document and a copy kept in the system job folder that shall be available to ENGINEER any time during the project.

1.06 QUALIFICATIONS

- A. All equipment shall be supplied by a firm, which specializes in fire alarm and smoke/heat detection systems with a minimum of five years-documented experience. The company shall be an authorized distributor of the proposed equipment.
- B. All work shall be performed by a licensed contractor, who is regularly engaged in the installation and servicing of fire alarm systems.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

- A. Receive equipment at job site; verify applicable components and quantity delivered.
- B. Handle equipment to prevent internal components' damage and breakage, as well as denting and scoring of enclosure finish.
- C. Do not install damaged equipment.
- D. Store equipment in a clean, dry space and protect from dirt, fumes, water, and construction debris and physical damage. Make arrangements with OWNER at the pre-construction conference for storage of equipment on the premises.

1.08 SUBMITTALS

- A. Submit shop drawings and product data sheets in accordance with provisions of Section 01 33 00–Submittals.
- B. Submittals shall be sent to and approved by the Authority Having Jurisdiction prior to submitting to ENGINEER. Include copy of approval letters in submittal to ENGINEER.
- C. Provide wiring diagrams, equipment ratings, dimensions, and finishes for all proposed devices and equipment.
- D. Provide battery calculations to indicate both the Standby and Alarm loads because of various field devices and panel components/module. Battery calculations shall illustrate the minimum battery capacity required and the capacity actually provided. Battery shall contain date of installation and not the manufactured date.
- E. Provide a complete Fire Alarm System plan and riser diagram including: Point of origin of each circuit (usually a Panel, or a Module within a panel), circuit type and labeling, area

served by each circuit, wire/cable type and size, locations of panelboards where primary system power is obtained and the device type circuit(s) to which device is connected, and locations of any End-Of-Line Resistor for each field device. Include room name and number for each device.

- F. Provide "worst-case" notification appliance circuit voltage drop calculation.

1.09 RECORD DRAWINGS

- A. Record Drawings shall include the location of all Fire Alarm System devices with their respective labels and the location of all end-of-line device locations.
- B. Upon completion of the work, and final acceptance by the local authority, CONTRACTOR shall submit Record Drawings to OWNER and ENGINEER under the provisions of Division 01.
- C. CONTRACTOR shall submit a copy of the Fire Alarm System; Record of Completion documentation to OWNER, ENGINEER, and AUTHORITY HAVING JURISDICTION. Included with the Record of Completion documentation shall be a copy of final acceptance testing results.
- D. Record Drawings shall be provided to OWNER on a USB flash drive or DVD. Site-specific fire alarm system program shall be included on a USB flash drive or DVD.

1.10 OPERATION AND MAINTENANCE DATA

- A. Submit Manufacturer data sheets for all equipment installed.
- B. Include operating, installation, and routine maintenance instructions.
- C. Submit a record copy of site-specific computer software for software-based Fire Alarm Systems.
- D. Include manufacturer letter stating the date of installation on which the system is operational.
- E. Operating instructions shall be mounted in a frame next to the FACP.

1.11 WARRANTY

- A. Standard one-year warranty of the date of Final Acceptance of the entire Project by ENGINEER. Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion or the date of final acceptance of the project.

PART 2–PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Fire Alarm System: Provide a complete, supervised, power-limited, fire detection and evacuation system.
- B. System Supervision: The fire protective signaling system shall be an electrically-supervised, power-limited system which shall monitor the integrity of circuit conductors and power supplies.
- C. Central Monitoring: Fire alarm system shall be remotely supervised by OWNER via the Abnormal Event Guidance and Information System (AEGIS system) and the SCADA Panel SP-49 as specified in Section 40 94 23–Controls and Instrumentation. CONTRACTOR shall coordinate supervision and monitoring of the fire alarm system with OWNER. The new Fire Alarm System shall be interfaced with the AEGIS system and SCADA System using dedicated dry contacts as shown on the Drawings for remote reporting of the various conditions listed below:
 - 1. Required relay (contact) outputs:
 - a. FIRE Alarm: The alarm contact shall actuate in response to any FIRE Alarm status condition.
 - b. Supervisory: The alarm contact shall actuate in response to actuation of any initiating device programed as Supervisory.
 - c. System Trouble: The alarm contact shall actuate in response to the occurrence of any Trouble status condition on the Fire Alarm System.
 - 2. CONTRACTOR installing the new Fire Alarm Systems shall be responsible for coordination of the Fire Alarm System connections to the AEGIS and SCADA systems, for all wiring and conduit between the systems, and for all terminations at the Fire Alarm end of such interface wiring. All such wiring, raceway, and terminations shall be included in the Base Bid.
- D. Equipment of another manufacturer may be submitted as an alternate, however, CONTRACTOR must provide a complete system.

2.02 ENCLOSURES

- A. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.
- B. Provide cabinets of sufficient size to accommodate the aforementioned equipment.
- C. Cabinet shall be equipped with locks and transparent door panel providing tamperproof enclosure, yet allowing full view of the various lights and controls as required.

2.03 INTELLIGENT FIRE ALARM CONTROL PANEL (FACP)

- A. Intelligent fire alarm systems shall be installed where shown on the Drawings.
- B. FACP shall be UL 864, latest edition, manufactured by Fire-Lite, Gamewell, or Silent Knight.

- C. The FACP shall allow for loading or editing special instructions and operating sequences as required. The system is to be capable of on-site programming to accommodate facility expansion, building parameter changes, or changes as required by local codes. All software operations are to be stored in a nonvolatile, programmable memory resident within the FACP. Loss of power shall not erase the instructions stored in memory.
- D. The ability for selective input/output control functions based on ANDing, ORing, NOTing, and special coded operations is to also be incorporated in the resident software programming of the system.
- E. To accommodate and facilitate jobsite changes, initiation circuits shall be individually configurable on-site to provide either alarm/trouble operation, alarm only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a nonlatching circuit, or an alarm verification circuit.
- F. FACP shall be modular, expandable with solid-state, microprocessor-based electronics. It shall display through the front viewing window only those primary controls and displays essential to operation during a fire alarm condition.
- G. The FACP shall provide the following features as standards:
 - 1. Support intelligent detection devices.
 - 2. The number of initiating device loops required for the specified quantity of initiating devices, plus one spare loop for each five active loops. Each active loop shall include 5% spare capacity.
 - 3. The number of indicating appliance (horn) circuits required for the specified quantity horns, plus one spare circuit for each ten active circuits. Each active circuit shall include 25% spare capacity.
 - 4. The number of indicating appliance (strobe) circuits required for the specified quantity of strobes, plus one spare circuit for each ten active circuits. Each active circuit shall include 25% spare capacity.
 - 5. 80-character liquid crystal display.
 - 6. Printer interface.
 - 7. History log file with a minimum of 1,000 events.
 - 8. Field programmable.
 - 9. Drift compensation.
 - 10. Sensitivity display in percent.
 - 11. Sensitivity adjustment.
 - 12. Day/night sensitivity adjustment.
 - 13. Auto detector test to meet NFPA 72.
 - 14. Alarm verification with tally counter.
 - 15. Silent walk test.
 - 16. Maintenance alerts.
 - 17. AC fail delay.
 - 18. Other features as described below.
- H. The FACP shall provide the ability to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history.

- I. The FACP LCD shall have the capability of displaying the following information relative to the abnormal condition of a point in the system prior to acknowledgement:
 - 1. 40 characters for:
 - a. Point address and loop number (i.e., 555-L5).
 - b. Type of device (i.e., smoke, pull station, water flow).
 - c. Point status (i.e., alarm, trouble).
 - 2. 40 characters for: Custom location label (i.e., 4th Floor–Room 444).
- J. FACP keyboards or keypads shall not be required to operate the system during fire alarm conditions.
- K. FACP shall have the following software functions:
 - 1. Setting of time and date.
 - 2. LED testing.
 - 3. Alarm, trouble, and abnormal condition listing.
 - 4. Enabling and disabling of each monitor point separately.
 - 5. Activation and deactivation of each control point separately.
 - 6. Changing operator access levels.
 - 7. Walk Test enable.
 - 8. Running diagnostic functions.
 - 9. Displaying historical logs.
 - 10. Point listing.
- L. FACP shall have the following hardware functions:
 - 1. Acknowledge alarm or trouble.
 - 2. Silence alarm or trouble.
 - 3. Reset system after alarm.
 - 4. Provide manual evacuation (drill).
 - 5. Supervise system.
 - 6. Allow computer interface.
- M. FACP shall have the following Status Indicators and Displays:
 - 1. Local audible device shall sound during Alarm, Trouble or Supervisory conditions. This audible device shall also sound during each key-press to provide an audible feedback when the key has been pressed properly. The visual display shall distinguish between alarm, trouble and supervisory conditions.
 - 2. The following indicators and displays shall be visible through the front viewing window:
 - a. One red system alarm LED.
 - b. One yellow supervisory service LED.
 - c. One yellow trouble LED.
 - d. Green “power on” LED.
 - e. Eighty-character liquid crystal display.
 - 3. The 2-line by 40-character liquid crystal display shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is keypad activity.
 - 4. The display shall support both upper and lowercase letters. Lowercase letters shall be used for soft-key titles and prompting the user. Uppercase letters shall be used for system status information. A cursor shall be visible when entering information.

5. Scrolling through menu options or lists shall be accomplished in a self-directing manner in which prompting messages shall direct the user. These controls shall be located behind an access door. The following status data shall be available on this display:
 - a. Initiating device circuits.
 - b. Indicating appliance circuits.
 - c. Auxiliary relays.
 - d. Feedback points.
 - e. Primary state of point.
 - f. Zone information.
 - g. Class "A" status.
 - h. Current priority of outputs.
 - i. Disable/Enable status.
 - j. Verification tallies of initiating devices.
 - k. Automatic/Manual control status of output points.
 - l. Acknowledge status.
- N. Controls:
 1. The following controls (one switch per function per system) shall be visible through the front viewing window:
 - a. Alarm Acknowledge key.
 - b. Trouble Acknowledge key.
 - c. Alarm Silence key.
 - d. System Reset key.
 2. The following controls shall be accessible with the front door open, though not visible, through the front viewing window:
 - a. Supervising Station disconnect/switch.
 - b. Manual evacuation (drill).
 - c. Fan shutdown override/bypass switches.
 - d. Key pad for data input and microprocessor control.
- O. FACP shall have the capability of supervising all slave modules LEDs for burnout or disarrangement.
- P. Acknowledgement:
 1. All events shall have a global acknowledgement.
 2. Acknowledge one event at a time from an unacknowledged list of events.
 3. Pressing the appropriate acknowledge button shall display the first unacknowledged condition in the appropriate list (either alarm, supervisory, or trouble) and require another acknowledge button. Press to acknowledge only the displayed point.
 4. After all points have been acknowledged, the LEDs shall glow steadily and the Sonalert will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated by an end of list message "END of LIST."
 5. Systems not capable of password-protected manual command operations shall provide key-operated switches for these functions. Function key switches shall be keyed differently from any other keyed switches or locks used within the system.
 6. All acknowledge functions shall be behind locked door or pass-code protected. In pass-code protection, if the user has insufficient privilege to acknowledge such conditions, a message shall indicate insufficient privilege, but allow the user to view the

points without acknowledging them. Should the user have sufficient privilege to acknowledge, a message will be displayed informing the user that the condition has been acknowledged.

Q. Silencing:

1. If an alarm condition exists and the "Alarm Silence" button is pressed, all alarm signals shall cease operation. The strobes shall remain active until the system is reset.
2. If trouble conditions exist in the system and the "Trouble Silence" button has been pressed, the audible trouble signal shall cease, but shall resound at time intervals to act as a reminder that the fire alarm system is not in a normal operating mode. Both the time interval and the trouble reminder signal shall be programmable to suit OWNER's application.
3. Panel shall be equipped with an alarm silence inhibit function.

R. Reset:

1. The SYSTEM RESET button shall be used to return the system to its normal state after an alarm condition has been remedied. The display shall step the user through the reset process with simple English language messages. Messages shall provide operator assurance of sequential steps (i.e., "IN PROGRESS," RESET COMPLETED," and "SYSTEM NORMAL") as they occur, should all alarms conditions be cleared.
2. Should an alarm condition continue to exist, the system shall provide indications that resetting cannot be completed and shall remain in an abnormal state. The Sonalert and the Alarm LED shall remain activated. The display shall indicate the total number of alarms and troubles present in the system along with a prompt to use the ACK keys to review the points. These points shall not require acknowledgment if they were previously acknowledged.

S. Access Levels:

1. There shall be three access levels with Level 4 being the highest level. Level 1 actions shall not require a passcode. Passcodes shall consist of up to five digits. Changes to passcodes shall only be made by authorized personnel.
2. In order to maintain security when entering a passcode, the digits entered shall not be displayed, but a cursor shall move along filling the position with an X to indicate that the digit has been accepted. All key presses shall be acknowledged by a local audible sound.
3. When a correct passcode is entered, the system shall indicate "Access Granted" to the operator. The new access level shall be in effect until the operator manually logs out or the keypad has been inactive for 5 minutes.
4. Operator entering an invalid code shall be notified with the message "Incorrect Pass-Code" and shall be allowed up to three chances to enter a valid code. After three unsuccessful tries, the message "Access Denied" shall be displayed. The level shall not be altered, and the operator shall no longer be in the menu option.
5. Access to a level shall allow the operator to perform all actions within that level plus all actions of lower levels but no actions of higher levels.
6. The following keys/switches shall have access levels associated with them:
 - a. Alarm Silence.
 - b. System Reset.
 - c. Set Time/Date.
 - d. Manual Control.

- e. On/Off/Auto Control.
 - f. Disable/Enable.
 - g. Programming functions.
 - h. Clear Historical Alarm Log.
 - i. Clear Historical Trouble Log.
 - j. Walk Test.
 - k. Change Alarm Verification.
 - 7. Acknowledge keys shall also require privileged access to acknowledge points. If the operator presses an ACK key with insufficient access, an error message shall be displayed. The points shall scroll with ACK key presses to view the points on the list, but the points shall not get acknowledged in the database.
- T. For maintenance purposes, the following lists shall be available from the point lists menu:
- 1. All points list by address.
 - 2. Monitor point list.
 - 3. Signal/speaker list.
 - 4. Auxiliary control list.
 - 5. Feedback point list.
- U. History Logging:
- 1. The system shall be capable of logging and storing the last 400 events (alarm and trouble) in a history log. These events shall be stored in a battery-protected random access memory. Each recorded event shall include the time and date of that event's occurrence. Systems not having discrete alarm and trouble logging memory shall include an alternative supervised (e.g., USB drive, compact disk) historic recording method with battery backup. Real time and date shall accompany all history event recording.
 - 2. History logs shall be capable of being viewed separately or shall be selectable for viewing as a combined history log that displays both alarm and trouble events in chronological order.
 - 3. The following historical alarm log events shall be stored:
 - a. Alarms.
 - b. Alarm Acknowledgment.
 - c. Alarm Silence.
 - d. System Reset.
 - e. Alarm Historical log cleared.
 - 4. The following historical trouble log events shall be stored:
 - a. Trouble conditions.
 - b. Supervisory alarms.
 - c. Trouble acknowledgment.
 - d. Supervisory acknowledgment.
 - e. Alarm Verification tallies.
 - f. Walk Test results.
 - g. Trouble Historical log cleared.
- V. FACP shall have Silent Walk Test Function With History Logging:
- 1. The system shall be capable of being tested by one person.
 - 2. The panel shall have the capability of dividing the system into distinctive walk test groups, a minimum of 8 groups.

3. Should an alarm condition occur from an active point, not in walk test mode, it shall perform operations described above.
 4. After testing is considered complete, testing data may be retrieved from the system in chronological order to verify device/circuit activation.
 5. Suppliers of systems not having this feature as functionally specified above shall include a testing agreement meeting the requirements of NFPA-72 in their Base Bid quotation. As a minimum, 2 years of scheduled testing shall be included.
- W. Field Programming:
1. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools or PROM programmers and shall not require replacement of memory ICs. All programming may be accomplished through the standard control panel keyboard, or a keyboard at the printer, or the use of a PC. All programs shall be stored in nonvolatile memory.
 2. All programming or reprogramming shall be done by the supplier at no charge until the system is accepted by OWNER.
- X. Terminal/Printer Interface:
1. FACP shall be capable of operating remote monitors and/or printers.
 2. The output shall be ASCII from an EIA RS-232-C connection with an adjustable baud rate.
 3. Each RS-232-C port shall be capable of supporting and supervising up to four remote LCDs and Printers.
 4. Data amplifiers shall be used to increase LCD or printer line distance, if required.
 5. Each RS-232-C port shall only communicate with one keyboard. The FACP shall support up to five RS-232-C ports.
- Y. Intelligent Network:
1. The system must provide communications with intelligent initiating and control devices individually. These devices shall be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:
 - a. Alarm.
 - b. Trouble.
 - c. Open.
 - d. Short.
 - e. Device missing/failed.
 2. All intelligent devices shall have the capability of being disabled or enabled individually.
 3. There shall be no limit to the number of detectors, stations, or addressable modules which may be activated or "in alarm" simultaneously.
 4. Multiple intelligent devices shall be connected to a single pair of wires. Systems that require factory preprogramming to add or delete devices are unacceptable.
 5. The communication format must be a completely digital poll/response protocol to allow T-tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol. Systems that do not utilize full digital transmission protocol are not acceptable.
- Z. The FACP shall provide a minimum of 6 amps for notification appliances and auxiliary devices. Provisions shall be available to provide additional signal expansion.

2.04 INTELLIGENT PERIPHERAL DEVICES

- A. All devices shall be supervised for trouble conditions. The system control panel shall be capable of displaying the type of trouble condition (open, short, device missing/failed). Failure of a device shall not hinder the operation of other system devices.

2.05 DEVICE IDENTIFICATION

- A. Each intelligent device shall be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address shall not be acceptable. This address, along with the loop number, shall be indicated and be visible from the ground on the device in the field using machine-generated marking.
- B. Location of the end-of-line (EOL) device shall be indicated on the fire alarm system device containing the EOL device.
- C. Device identification schemes that do not use uniquely set addresses, but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate T-tapping, and the addition of an intelligent device between existing devices requires reprogramming all existing devices beyond the added device.
- D. The system must verify that the proper type device is in place and matches the desired software configuration.

2.06 INTELLIGENT DETECTOR BASES

- A. Either the base or the head shall contain electronic circuits that communicate the detector's status (normal, alarm, sensitivity status, trouble, etc.) to the control panel over two wires. The same two wires shall also provide power to the base and detector.
- B. The base shall be lockable. The locking feature must be field-removable when not required.
- C. Upon removal of the detector's head, a trouble signal shall be transmitted to the control panel.
- D. The detector base shall be sealed against rear airflow entry.
- E. Each detector's base or head shall contain LED(s) which shall flash when the detector is being scanned by the control panel. The LED(s) shall turn on steady when the detector is in an alarm condition.
- F. Each base shall provide means to allow for function testing of the detector at the detector's location.
- G. The base shall be common with heat detector and smoke-type detectors and shall be compatible with other intelligent detectors, addressable manual stations, and addressable modules on the same circuit.

- H. The detectors shall be plugin units which mount to a common base, and shall be UL 268 approved.
- I. The detector shall be a 24 VDC type, which is compatible with the fire alarm panel and obtains its operating power from the supervisory current in the fire alarm detection loop. The 24 VDC detector shall be reset by actuating the control panel reset switch.
- J. To minimize false alarms, voltage and RF transient suppression techniques shall be employed.
- K. Detectors shall be installed on circuits with alarm verification modules.

2.07 INTELLIGENT PHOTOELECTRIC SMOKE DETECTORS

- A. The detectors shall contain no radioactive material.
- B. Detectors shall be of the solid-state photoelectric type and shall operate on the light-scattering photodiode principle using a pulsed infrared LED light.
- C. Smoke detectors shall be listed for sensitivity testing from the control panel. Sensitivity test results shall be logged.
- D. Smoke detectors shall communicate the actual smoke chamber values to the system control panel.
- E. Smoke detectors shall be smoke density measuring devices having no self-contained alarm setpoint (fixed threshold). The alarm decision for each detector shall be determined by the control panel. The control panel shall determine the condition of each detector by comparing the detector's value to the stored value.

2.08 INTELLIGENT THERMAL DETECTORS

- A. The detectors shall be a combination rate-of-rise and fixed temperature (135°F unless noted).
- B. Detectors shall sense within a temperature range of 32°F to 158°F. The control panel shall be capable of sensing either a setpoint of 135°F, or a rate-of-rise of 15°F per minute for fire sensing. For utility sensing, a setpoint may be chosen within the stated range, and the control panel programming shall be capable of using that information to determine specific response such as warning of failure of local temperature controls.

2.09 PULL STATIONS

- A. Pull stations shall contain circuits that communicate the station's status (alarm, normal) to the control panel over two wires, which also provide power to the pull station. The address shall be field programmable at the station.
- B. Manual stations shall be double-action, constructed of high-impact red polycarbonate with raised white lettering, and a smooth high-gloss finish.

- C. Station shall mechanically latch upon operation and remain so until manually reset by a master key common to all system locks. Stations which use Allen wrenches or special tools to reset will not be accepted.
- D. The manual station shall be fitted with screw terminals for field wire attachment.

2.10 ADDRESSABLE INTERFACE MODULES—GENERAL

- A. Addressable Interface Modules shall receive their 24 VDC power from a separate two-wire circuit provided by an appropriate power supply.
- B. The module shall be available in either a Class B or Class A supervision version.
- C. In the Class B version, the wiring shall be supervised by an end-of-line device.
- D. In the Class A version, the wiring shall be looped back and connected to the module to allow continual operation of the controlled devices even if the wiring sustains a single break.
- E. The interface modules shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions.
- F. Should the interface modules become nonoperational, tampered with, or removed, a discrete trouble signal unique to the device shall be transmitted to and annunciated at the control panel.
- G. The interface modules shall be capable of being programmed for its “address” location on the intelligent device initiating circuit. The interface modules shall be compatible with addressable manual stations and intelligent detectors on the same intelligent initiating circuit.

2.11 ADDRESSABLE INTERFACE MODULES—SUPERVISED CONTROL

- A. Interface Modules shall be suited for control of indicating appliances and HVAC systems.
- B. For signals, firefighter phone jacks, and other device control with Class B or Class A wiring supervision, the interface module shall provide double-pole/double-throw relay switching that can be used to connect any of the following through easily replaceable 2-amp fuses:
 - 1. A zone of signals to a power source.
 - 2. Speakers to an audio source.
 - 3. Firefighter phone jacks to a communications channel.
 - 4. A variety of controlled devices to the appropriate controlling circuits.
- C. These interface modules shall communicate the supervised wiring status (normal, trouble) to the fire alarm control panel and shall receive from the fire alarm control panel a command to transfer the relay.

2.12 FAULT ISOLATOR MODULE

- A. The system shall have a Fault Isolator Module (FIM) on the initiating device circuits in the following situations:
 - 1. Loop extends to another floor.
 - 2. Loop has more than 25 devices.
- B. Isolated Loop Circuit Protectors (ILCP) shall be located as close as practical to the point where these conditions occur.
- C. FIM shall automatically reconnect the isolated section of the loop upon correction of the fault conditions. The FIM shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an FIM after its normal operation.
- D. FIM shall include an LED, which shall flash under normal operation and illuminate steady to indicate a short circuit.

2.13 HORN/STROBE UNITS

- A. Horns shall have Lexan housing with field-adjustable output taps, three taps minimum. Sound pressure level output shall be 87 dB at 10 feet. Horns shall have vandal-resistant Lexan grills and sealed backs to protect the phenolic impregnated cone.
- B. The unit shall be complete with a tamper-resistant Lexan lens with "FIRE" lettering visible from a 180 degree field of view. Strobes installed in open areas such as hallways, open office spaces, and assembly areas shall have an adjustable candela rating range from 15-75 candela. Strobes installed in mechanical areas shall have a peak candela rating of 110 candela. All strobes shall be in compliance with ADA requirements.
- C. Horn device shall be powered through the FAS. Provide addressable relay modules and supervisory relays to activate this device from the FACP.

2.14 EXPLOSION PROOF HORNS AND STROBES

- A. Horns:
 - 1. Horns installed in areas rated as Class I, Division 2, Groups C and D, shall be rated for installation in that space.
 - 2. Horns shall be vibratory type, producing a distinctive tone by electromechanical vibration of a stainless steel diaphragm. The horn mechanism shall be contained in a corrosion-resistant, copper-free, cast-aluminum, explosion proof housing. Horn shall produce a minimum of 94 dB(A) at 10 feet.
 - 3. Wire leads to the horn shall be factory sealed. Horn shall be equipped with a conduit/junction box with 3/4-inch conduit connection.
 - 4. Horn shall operate using 24 VDC and be polarized for use in supervised alarm circuits.
 - 5. Horns shall be red in color and suitable for surface mounting.
- B. Strobes:
 - 1. Strobes installed in areas rated as Class I, Division 2, Groups C and D, shall be rated for installation in that space.

2. Strobes shall have a clear polycarbonate Fresnel lens and glass dome. Strobes shall flash approximately 80 times per minute and provide 15 candelas. Housing shall be corrosion-resistant, copper-free cast aluminum.
3. Wire leads to the strobe shall be factory sealed. Strobe shall be equipped with a conduit/junction box with 3/4-inch conduit connection.
4. Strobe shall operate using 24 VDC and be polarized for use in supervised alarm circuits.
5. Strobes shall be red in color. Provide wall mounting hardware.

PART 3-EXECUTION

3.01 INSTALLATION

- A. The complete installation shall be done in a neat, workmanlike manner in accordance with the applicable requirements of NFPA 70-Article 760 and the manufacturer's recommendations.
- B. If field conditions require, cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness.

3.02 FIRE ALARM SYSTEM CONFIGURATION

- A. The FACP in the pump station electrical room shall function as the main panel for the building. All alarms and supervisory messages for the entire site shall be annunciated through this panel. Notification of alarms to the AEGIS system shall be through this panel.

3.03 FIRE ALARM SYSTEM OPERATION

- A. FACP:
 1. Under normal condition, the front panel shall display a "SYSTEM NORMAL" message with current time and date.
 2. Should an abnormal condition be detected, the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steadily for trouble and supervisory conditions.
 3. In the event of an abnormal condition, the following three characteristics relative to the condition shall be displayed simultaneously in alphanumeric format. Systems not capable of such a display on the panel faceplate shall include a LCD display meeting the above requirements and must provide a secondary power supply to maintain LCD operation for the duration of the standby requirements of the panel. Information shall include:
 - a. Custom location label (40 characters minimum).
 - b. Type of device (i.e., smoke, heat, pull station).
 - c. Status (i.e., alarm, trouble).
 4. Pressing the appropriate acknowledge button shall acknowledge the alarm or trouble condition.
 5. After all points in alarm have been acknowledged, associated LEDs shall glow steady and the panel audible signal shall be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list

chronologically. The end of the list shall be indicated. The first 10 fire alarm zones shall be displayed simultaneously in chronological order.

6. Alarm Silencing:
 - a. Pressing the "Alarm Silence" button shall cause all notification appliances programmed for "On-Until-Silenced" to be deactivated. A separate panel-mounted yellow LED shall illuminate to indicate the alarm silenced mode.
 - b. All NACs programmed for "On-Until-Reset" shall remain activated until the system is Reset.
7. System Reset:
 - a. The "System Reset" button shall be used to return the system to its normal state after an alarm condition has been remedied.
 - b. In the event an alarm condition continues to exist following system reset, the system shall remain in an abnormal state. System control relays shall not reset. The panel audible signal and the Alarm LED shall remain on. The display shall indicate the total number of alarms and troubles present in the system along with a prompting to review the points. These points shall not require acknowledgment if they were previously acknowledged.
 - c. In the event the Alarm Silence inhibit function is active, the system shall ignore all Key presses. An indication of enabling and disabling the inhibit stator shall be provided as a feedback to the operation.
8. Walk Test System Testing:
 - a. While in the test mode, the system shall display a trouble condition.
 - (1) While in the walk test mode, the activation of an initiating device shall be silently logged as an alarm in the historical log. The panel shall automatically reset after logging the alarm.
 - (2) The momentary disconnection of an initiating device or notification appliance shall be silently logged as a trouble condition in the historical log. The panel shall automatically reset itself after logging of the trouble condition.
 - (3) Integrity of the installation conductors of IDCs and NACs shall be verified by momentarily opening any circuit.
 - (4) Walk Test of ground fault circuit testing shall be verified by operating the Notification Appliances for 4 seconds.
 - b. As an option, the Walk Test sequence shall have the capability of activating NACs to signal with a code associated with the alarmed zone. If this option is selected, any momentary opening of initiating or NAC wiring shall cause the notification appliances to sound for 4 seconds to indicate the trouble condition. The Walk Test feature shall automatically revert to the normal operating mode after 8 hours if it is not manually activated.
9. LED Supervision: All slave module LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the panel shall display the module and the LED location numbers to facilitate location of that LED.
10. Active Status Reminder: Should any Alarm, Supervisory, or Trouble condition be present within the system and the audible signal silenced, the local tone alert shall resound every 8 hours as a reminder that the fire alarm system is not 100% operational.
11. Access Levels:
 - a. There shall be a minimum of four access levels. Passcodes shall consist of up to four digits. Changes to passcodes shall be only by authorized personnel. Systems not capable of password-protected manual command operations shall provide

key-operated switches for these functions. Function-key switches shall be keyed differently from any other keyed switches or locks used within the system.

- b. In order to maintain security when entering a passcode, the entered digits shall not be displayed.
- c. When a correct passcode is entered, a message indicating acceptance shall be displayed. The new access level shall be in effect until the operator manually logs out or leaves the keypad inactive for 10 minutes.
- d. When an incorrect passcode is entered, a message shall be displayed indicating that the passcode was invalid.
- e. Access to a level shall only allow the operator to perform all actions within that level and all actions of lower levels, not higher levels.
- f. The following keys/switches shall have access levels associated with them: Alarm Acknowledge—Supervisory Acknowledge—Trouble Acknowledge—Alarm Silence—System Reset.

B. Smoke and Heat Detection Operation:

1. The activation of any system smoke or heat detector shall initiate an alarm verification operation whereby the FACP will reset the activated detector and wait for a second alarm activation. If after 20 seconds and within 1 minute after resetting a second alarm is reported from the same or any other smoke or heat detector, the system shall process the alarm as described previously. If no second alarm occurs within 1 minute, the system shall resume normal operation. The alarm verification shall operate only on single smoke or heat detector alarm. Other activated initiating devices or multiple smoke or heat detector alarms shall be processed and reported immediately. The alarm verification operation shall be selectable by device or zone.
2. The intelligent system shall have the capability of displaying the number of times (tally) a detector has gone into a verification mode.
3. The FACP shall maintain a moving average of the detector's smoke chamber value to automatically compensate (move the threshold) for dust and dirty conditions that could affect detection operations. The system shall automatically maintain a constant smoke obscuration sensitivity for each detector (via the floating threshold) by compensating for environmental factors. Photoelectric detector's smoke obscuration sensitivity shall be adjustable to within 0.3% of either limit of the UL window (0.5% to 4.0%) to compensate for any environment.
4. The system shall automatically indicate when an individual detector needs cleaning. When a detector's average value reaches a predetermined level, a trouble MESSAGE shall be audibly and visibly indicated at the FACP for the individual detector. Additionally, the LED on the detector base shall glow steady giving a visible indication at the detector's location. If the trouble condition is left unattended and the detector's average value increases to a second predetermined value, another trouble MESSAGE shall be indicated at the FACP for the individual detector. To prevent false alarms, these TROUBLE conditions shall in no way decrease the amount of smoke obscuration necessary for system activation. For scheduling of maintenance, the control panel shall be able to generate a MESSAGE indication for any detector approaching a trouble condition because of dirt or contamination.

C. HVAC System Interface:

1. Smoke Detectors, Heat Detectors, and Addressable Control Modules, or Supervised Remote Relays shall be provided as specified below. Detectors shall be installed in

compliance with the manufacturer's recommendations. The division contractor shall provide all wiring and terminations required for shutdown of the specified fans.

2. The Addressable Control Modules or Supervised Remote Relays provided for this purpose shall be provided by DPDT output contacts. One SPDT set of the DPDT contacts shall be utilized for the specified shutdown function.
3. Operation: The fans shall be shut down upon a Fire Alarm. All fans shall remain shut down until a valid System Reset occurs.

3.04 ALARM SEQUENCE

- A. The system alarm operation subsequent to the alarm activation of any manual station or automatic detection device shall be as follows:
 1. All audible alarm notification appliances shall sound with the following characteristics: Temporal code pattern until silenced by the alarm silence switch at the FACP.
 2. All visible alarm notification appliances: Strobes shall display a continuous (synchronized where indicated on the Drawings) pattern until system is reset. Strobe intensities are indicated on the Drawings for adherence with ADA.
 3. Alarm horns and strobes shall be wired and operate independently.
 4. A supervised signal to notify the AEGIS and SCADA systems is to be activated.
- B. The FACP shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.
- C. Activation of an auxiliary bypass means shall override the automatic functions either selectively or throughout the system.
- D. The system shall have an alarm list means that shall allow the operator to display all alarms, troubles, and supervisory service conditions with the time of occurrence. This shall allow for the determination of the most recent alarm and may also indicate the path that the fire is taking.

3.05 POWER REQUIREMENTS

- A. The FACP shall receive 120 VAC (as noted on the Drawings) from a dedicated circuit. This branch circuit shall have a "breaker lock" to prevent accidentally deenergizing of the power to the fire alarm panel. Circuit breakers shall be painted red and labeled "FIRE ALARM."
- B. The FACP shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC main's power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.
- C. The FACP shall include a disconnect switch for the AC power inside an enclosure near the panel or within the panel itself. This switch shall be labeled "Fire Alarm Power Disconnect."
- D. Isolated Loop Circuit Protectors (ILCP):
 1. The FACP shall include Isolated Loop Circuit Protector (ILCP) on all circuits which extends beyond the building. These circuits include, but are not limited to, the initiating

device circuits, alarm notification appliance circuits, and signaling line circuits. ILCP shall be located as close as practical to the point where the circuits leave or enter a building.

2. The ILCP grounding conductor shall be a No. 12 AWG wire having a maximum length of 25 feet. It shall be run in a straight line and connected to the building grounding electrode system.
3. The ILCP shall have a line-to-line response time of less than one nanosecond. Spark gap devices or devices incorporated in or installed within the control panel in lieu of the ILCP are not acceptable.

3.06 SUPERVISION

- A. The system shall contain independently supervised initiating device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.
- B. Auxiliary manual controls shall be supervised so that an "off normal" position of any switch shall cause an "off normal" system trouble.
- C. Auxiliary circuits for addressable relays shall be supervised so that a blown fuse or an open in the circuit shall be visibly and audibly annunciated.
- D. Each independently supervised circuit shall include a discrete visible amber "Trouble" LED to indicate disarrangement conditions per circuit.
- E. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel. A green "power on" LED shall be displayed continuously while incoming power is present.
- F. The system's batteries shall be supervised so that a low battery condition or disconnection of any battery shall be audibly and visually indicated at the control panel.
- G. The System Modules shall be electrically supervised for module placement. Should a module become disconnected, the system trouble indicator shall illuminate and the audible trouble signal shall sound.
- H. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

3.07 RACEWAYS

- A. All wiring shall be in a conduit system separate from all other building wiring. Conduit and boxes shall be painted red. See Section 26 05 33—Conduit for specifications.
- B. All wiring shall be installed in minimum 3/4-inch conduit.
- C. Surface access to existing alarm initiating circuits in public areas shall be via UL listed surface metal raceways (minimum equivalent to 3/4-inch conduit) and box extensions.

- D. There shall be no sharp edges with installed materials.

3.08 CONDUCTORS

- A. All cable shall be installed according to NEC Article 760.
- B. All cables and wires shall be No. 14 AWG and larger and shall be stranded.
- C. All initiation and notification circuit cabling shall be listed Type FPL.
- D. All wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, disarrangement of any components, any open circuits or grounds in the system, an audible and visual trouble signal shall be activated until the system is restored to normal.
- E. All conductors shall be color-coded. Coding shall be consistent throughout the facility. Green wire shall be used only for equipment ground.
- F. FACP shall be connected to separate dedicated branch circuit from the building emergency panel, maximum 20 amperes. Circuit breaker shall be red and labeled as "FIRE ALARM."
- G. Power wiring for FACP shall be No. 12 AWG.
- H. FACP shall have No. 12 AWG green equipment ground wire. Where fire alarm circuits enter or leave a building, additional transient 75 to 90-volt gas tube protection shall be provided for each conductor.
- I. Leave 8-inch wire tails at each device box and 36-inch wire tails at the FACP.
- J. Cable for Intelligent Detector Loops shall be 18 to 12 AWG twisted pair with a shield jacket installed in 3/4-inch conduit. Shield continuity must be maintained and connected to earth ground only at the control panel. Intelligent detector wiring must not be in the same conduit with 120/240 VAC power wiring or other high current circuits. T-taps or branch circuit connections are allowed for all class B intelligent loop circuits.
- K. Cable for RS 485 devices shall be twisted shielded pair for the data signal. Power wiring shall be 12 or 14 AWG.
- L. Wiring of alarm horn circuits and alarm strobe circuits shall be No. 14 AWG minimum.
- M. Fire alarm cables shall be held in place at the device box by means of a two-screw connector (do not use squeeze- or crimp-type connectors).
- N. All splices or connections shall be made within approved junction boxes and with approved fittings. Boxes shall be red and/or labeled "FIRE ALARM SYSTEM" by decal or other approved markings.
- O. Horn and strobe circuits shall have separate conductors and shall operate independently of each other.

- P. Horn wiring shall be 18 AWG twisted shielded cable or as recommend by manufacturer.
- Q. Strobe wiring shall be 14 AWG minimum or as recommend by manufacturer.
- R. Tray cable is not acceptable for use as fire alarm systems wiring.

3.09 DEVICE MOUNTING

- A. Unless otherwise noted on the Drawings, the recommended mounting heights and requirements are as follows:
 - 1. FACP: Mount control panels so all visual indicators and controls are at 60 inches above floor level. Cabinet shall be grounded to either a cold water pipe or grounding rod.
 - 2. Audio-Visual Devices:
 - a. Install flush, semiflush, or surface mount at 6 inches below finished ceiling or at 80 inches from the bottom of the device to the highest level of the finished floor. No devices protruding 4 inches or more shall be installed lower than 80 inches.
 - b. All audio/visual devices shall be installed at the same height throughout the facility.
 - c. For surface mounting, use manufacturer-supplied back boxes and trim plates. Mark each device with its circuit number.
 - 3. Manual Stations:
 - a. The operable part of the manual stations shall be installed not less than 3 1/2 feet (42 inches) and not more than 4 feet (48 inches) above finished floor. All Manual Stations shall be in unobstructed locations. Mark the unit's address on the inside and outside of housing. For surface mounting, use manufacturer-supplied backboxes and trim plates
 - b. All pull stations shall be installed at the same height throughout the facility.
 - 4. Heat And Smoke Detectors:
 - a. The location of detectors shown on the Drawings is schematic only. The detectors must be located according to code requirements.
 - b. Surface mounted detectors shall be installed using backboxes equal to the base's size. Standard octagon and square boxes are not acceptable.
 - c. Detectors shall be located on the highest part of a smooth ceiling so that the edge of the detector is no closer than 4 inches from a sidewall. Ceilings with beams, joists, or soffits that exceed 8 inches in depth require special planning and closer spacing. Verify with manufacturer.
 - d. If it is necessary to mount a detector upon a sidewall, the top of the detector shall be located no closer than 4 inches from the ceiling and no further away than 12 inches.
 - e. Smoke detectors shall be installed to favor the air flow towards return openings and not located closer than 3 feet from air supply diffusers which could dilute smoke before it reaches the detector. No detectors shall be installed in direct airflow.
 - f. Heat and smoke detectors should be located near the center of the open area which they are protecting, thus providing coverage generally for 15-foot radius for smoke detectors and a 25-foot radius for heat detectors. Verify location with ENGINEER.
 - g. Mark the address and loop number on each detector's base.

3.10 IDENTIFICATION

- A. Attach the label containing the address and SLC designation to:
 - 1. Each addressable detector. Label shall be visible and readable from the floor, 3/16-inch minimum character size (1/4 inch is recommended).
 - 2. Each manual pull station. Label shall be placed on the top part.
 - 3. Each addressable module. Label shall be attached to the faceplate.
- B. Label shall consist of black writing on white or clear background.
- C. All fire alarm boxes shall be painted red and labeled "Fire Alarm" or "FA". When red conduit is used for the fire alarm system installation, there is no need to paint the boxes. Non-factory device boxes shall also be painted red.
- D. All circuits must be labeled with the name of circuit and the area being served by the circuit.
- E. Wire/cable splices in junction boxes shall be labeled indicating where the wire/cable is coming from and where it is going.
- F. All conductors terminated in control panels, annunciator panels, and extension panels shall be labeled.
- G. All audio-visual devices shall be labeled by each circuit and the order of the device on that circuit such as "Circuit No. 2, strobe No. 05 of 10."
- H. All labels shall be permanent and machine generated. No handwritten or non-permanent labels shall be allowed. Submit a sample for approval before using any labeling schemes.

3.11 FIELD START-UP AND COMMISSIONING

- A. Provide the services of a manufacturer's qualified NICET-certified technician to assist CONTRACTOR in installation and start-up of the equipment specified in this section. The manufacturer's representative shall provide technical direction and assistance to CONTRACTOR in general operation of the equipment, connections and adjustments, and testing of the assembly and components contained therein.
- B. The manufacturer's representative shall provide inspection of the final installation. The manufacturer's representative shall perform site start-up and functional checkout of the equipment. Upon completion of the manufacturer's start-up and checkout, the manufacturer shall generate a site start-up and functional checkout report, documenting all systems checked as well as any incomplete work remaining and operational deficiencies. CONTRACTOR shall provide three copies of the manufacturer's site start-up and functional checkout report to ENGINEER for review.
- C. CONTRACTOR shall be responsible for all costs required to check operation of the system.
- D. The completed fire alarm system shall be fully tested by the manufacturer in accordance with the Illinois Building Code, and all applicable local building codes in the presence of

OWNER's representative and the local Fire Marshal. Upon completion of a successful test, a certification shall be issued in writing to OWNER and CONTRACTOR.

- E. CONTRACTOR shall provide a fire alarm control panel that is communicating properly between FACP and OWNER'S AEGIS and SCADA systems.
- F. Verify location and layout of AEGIS/Intrusion alarm equipment and fire alarm equipment.
- G. Verify that electrical power is available and of correct characteristics.
- H. Verify the interface with the gas monitoring system functions as specified and detailed on the Drawings.
- I. Install system and components in accordance with manufacturer's specifications.
- J. The installer shall provide all labor and perform all work to install and make operable all mechanical and electrical equipment necessary to assure safe and reliable operation.

3.12 TRAINING

- A. Upon successful completion of checkout by ENGINEER, a manufacturer's representative shall provide a demonstration of the automated sequences of operation. After this demonstration and acceptance by OWNER, the manufacturer shall provide 4 hours of "hands-on" training for OWNER's operating personnel which shall cover the following topics:
 - 1. Overall System Description and Theory of Operation.
 - 2. Automatic Operation.
 - 3. Manual Operation and Testing of System Devices.
 - 4. Recommended System Check Lists and Log Sheets.
 - 5. Recommended Preventative Maintenance.
- B. Two 4-hour training session for two operators shall be provided. The training session shall be conducted by a manufacturer's qualified representative. Training program shall include instructions on the assembly, controls, protective devices, and other major components. Travel time and expenses to the jobsite shall be over and above the time required to perform the training and shall be included in the Bid.

END OF SECTION

SECTION 31 23 00

EXCAVATION, FILL, BACKFILL, AND GRADING

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included: Excavating, filling, backfilling, and grading for this work includes, but is not necessarily limited to:
 - 1. Excavating for footings, foundations, and miscellaneous areas.
 - 2. Furnishing and placing all fill and backfill.
 - 3. Provide compaction of all fill and backfill.
 - 4. Furnishing and placing of crushed stone mat below structures where required.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.
- C. Payment: Common excavation shall include all excavation specified, undercutting, fill, backfill and grading, including rock excavation but not including unsuitable foundation material, as hereinafter described.

1.02 REFERENCED STANDARDS

- A. Standard Specifications: Unless otherwise indicated, Standard Specifications within this section shall refer to the State of Illinois Department of Transportation, Standard Specifications for Road and Bridge Construction, current edition, including all issued supplemental specifications.
- B. ASTM C33-Standard Specification for Concrete Aggregates.
- C. ASTM D698-Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- D. ASTM D1557-Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).

1.03 SUBMITTALS

- A. Submit sources and gradations for materials proposed for use as compacted fill, utility trench backfill, trench bedding and cover material, crushed stone mat, and granular cushion.
- B. Submit samples of materials proposed for use in Paragraph 1.03.A to a soils testing laboratory for analysis of its suitability and for recommendations on moisture content during compaction, compaction methods, or other appropriate information.
- C. Submit sufficient samples of each different type or classification of soil to obtain representative values.

1.04 JOB CONDITIONS

- A. The elevations shown for existing work and ground are reasonably correct, but are not guaranteed to be absolutely accurate. No extras will be allowed because of variations between drawings and actual grades.
- B. Soil borings were made and the soils information is included in an appendix to these Specifications. The information contained is not guaranteed to be indicative of conditions to be encountered during construction. It is CONTRACTOR's responsibility to make its own investigations to determine physical conditions at the site, which may affect the work.

PART 2-PRODUCTS

2.01 COMPACTED FILL

- A. All fill and backfill material designated to be compacted fill shall be granular with no stones larger than 4 inches and shall be reasonably well-graded throughout the particle size range. A minimum 65% of the material shall pass the 3/4-inch sieve, and the material shall be capable of being compaction tested in accordance with ASTM D1557, as determined by the Project Soils Engineer. Of that portion of the material passing the No. 4 sieve, not more than 25% shall pass the No. 200 sieve, and material shall have less than 5% clay content. When placing fill during wet weather or in wet areas, this requirement shall be modified to not more than 5% passing the No. 200 sieve. Adequately dewatered areas are not defined as wet areas.
- B. Native material may be used as compacted fill if it meets the above specification. CONTRACTOR shall determine whether native material meets the above specification. CONTRACTOR shall provide all needed fill material whether from on-site or off-site at no additional cost to OWNER.

2.02 CRUSHED STONE MAT

- A. Crushed stone mat below tank slabs, manholes, vault slabs and basement floors shall be 3/4-inch clear crushed stone and shall meet all requirements of Illinois DOT Article 351, gradation CA7/11.

2.03 GRANULAR CUSHION

- A. Granular cushion beneath floor slabs-on-grade shall meet requirements of Illinois DOT Article 351, gradation CA6.

2.04 EMBANKMENT FILL

- A. Embankment fill shall contain no stumps, brush, rubbish, or other perishable material. The top 12 inches of the earth embankment shall be earthy material free from large stones.

2.05 CONCRETE FILL

- A. Concrete fill shall be Class X concrete as defined Section 03 30 00–Cast-In-Place Concrete or flowable fill as defined in this section.

PART 3–EXECUTION

3.01 GENERAL

- A. Prior to all excavating, CONTRACTOR shall become thoroughly familiar with the site and site conditions.

3.02 PROTECTION

- A. CONTRACTOR shall provide all necessary sheeting, shoring, or other soil retention systems including all labor, material, equipment, and tools required, or as necessary to maintain the excavation in a condition to provide safe working conditions, to permit the safe and efficient installation of all items of Contract work, and to protect adjacent property. CONTRACTOR shall be held liable for any damage which may result to property from excavation or construction operations. Sheeting, shoring, and other soil retainage systems shall be withdrawn or removed in a manner so as to prevent subsequent settlement of structures, utilities, and other improvements.
- B. Design of sheet piling and other soil retaining systems shall be the sole responsibility of CONTRACTOR. Where such systems are shown on the Drawings, no parameters such as embedment depth, section profile, presence or lack of walers, etc., nor system type or suitability shall be inferred. CONTRACTOR is responsible for designing and providing a fully functional system compatible with construction and site requirements.
- C. Nothing in this specification shall be deemed to allow the use of protective systems less effective than those required by the Occupational Safety and Health Administration (OSHA) and other applicable code requirements.

3.03 FINISH ELEVATIONS AND LINES

- A. CONTRACTOR is responsible for establishing finish elevations and lines.
- B. Where lasers are used, CONTRACTOR shall check the Work against intermediate grade stakes. Prior to initial use of the laser, CONTRACTOR shall set up laser on ground surface and check line and gradient controls. Lasers not functioning properly shall be immediately removed.
- C. If existing property stakes, not within the limits of the trench or street slope limits, are removed or damaged by CONTRACTOR, CONTRACTOR shall bear the cost of replacement. Replacement shall be made by a legal survey performed by a licensed Land Surveyor hired by OWNER. Cost for survey shall be deducted from the Contract Price.

3.04 COMMON EXCAVATION

- A. After the site has been cleared and stripped, the site shall be cut and filled to the indicated subgrade as shown or specified.
- B. All excavated material that does not meet the specification for compacted fill or embankment fill or meets the specification but is not required for backfill or fill shall be classified as excess material and shall be removed from the site and disposed of at CONTRACTOR's expense.
- C. All material other than suitable bearing soil or bedrock, as determined by the Project Soils Engineer, shall be removed from under concrete to be poured on ground.
- D. Excavation for all footings, foundation walls, pits, etc., shall be large enough to provide adequate clearance for the proper execution for the work within them.
- E. Excavations scheduled to extend below groundwater shall not be started until the area has been dewatered. See Section 31 23 19—Dewatering.
- F. When excavations reach subgrade elevations as shown on the Drawings or as specified herein, the Project Soils Engineer will observe the bottom material. Where, in the opinion of the Project Soils Engineer, unsuitable foundation material is found at the level of the subgrade, unsuitable foundation material shall be removed and replaced with material and placing methods as specified under compacted fill and backfill.
- G. Excavations that are undercut beneath the foundation shall extend beyond the perimeter of the foundation 1 foot plus a distance at least equal to the depth of undercut below footing grade.
- H. CONTRACTOR shall backfill and compact all overexcavated areas.

3.05 PREPARATION OF SUBGRADE

- A. After the site has been cleared, stripped, and excavated to subgrade, thoroughly compact subgrade to the requirements specified for compacted fill below. Scarify and moisture condition the subgrade as recommended by the Project Soils Engineer.
- B. Remove all ruts, hummocks, and other uneven surfaces by surface grading prior to placement of fill.
- C. All slab-on-grade and road subgrades shall be proofrolled with a heavy rubber-tired construction vehicle (such as a fully loaded tandem-axle dump truck) in the presence of the Project Soils Engineer.

3.06 COMPACTED FILL AND BACKFILL

- A. All fill and backfill, except as otherwise specified, shall be compacted fill placed to within 4 inches of the bottom of the topsoil or to the bottom of the structure or other improvement.

- B. Unless otherwise noted, structures with a top slab shall not be backfilled until the slab is in place and has reached its specified 28-day strength.
- C. In fill areas above existing grade around structures, compacted fill shall be placed within a minimum of 10 feet from the structure.
- D. No fill shall be placed under water or over unsuitable subgrade conditions.
- E. All fill and backfill, except embankment fill and clay fill, shall be compacted as follows:
 - 1. Class 1 Compaction: This class of compaction shall apply to all fill areas under buildings, structures, piping, bituminous roadway and parking areas, curb and gutter, and backfill within 10 feet of structure walls. All compacted material shall be placed in uniform layers not exceeding 8 inches in loose thickness prior to compaction. Each layer shall be uniformly compacted to a dry density at least 95% of the maximum dry density as determined by a laboratory compaction test at the optimum moisture content (ASTM Test Designation D1557). Compaction shall be obtained by compaction equipment appropriate for the conditions.
 - 2. Class 2 Compaction: This class of compaction shall be used in excavated areas beyond 10 feet of structures without any piping or adjacent foundations. Material for backfill shall be granular material as specified above. The material shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer of the fill shall be compacted to at least 90% of the maximum dry density (testing same as Class 1). Compaction shall be obtained by compaction equipment appropriate for the conditions.
- F. No frozen material shall be placed nor shall any material be placed on frozen ground.
- G. Four inches of clay fill shall be placed and compacted to at least a firm consistency in areas to be seeded or sodded prior to placement of topsoil.

3.07 PLACING CRUSHED STONE AND GEOTEXTILE FABRIC

- A. The same day that the subgrade is exposed, place geotextile fabric on subgrade, and place 12 inches of crushed stone mat below base slab. Compact in place.
- B. Geotechnical fabric shall extend up the side edge of the stone mat and extend across the top of the stone to a minimum of 12 inches past the edge of base slab.

3.08 GRADING

- A. CONTRACTOR shall perform all rough and finish grading required to attain the elevations shown on the Drawings.
- B. Grading Tolerances:
 - 1. Rough Grade: Buildings, parking areas, and sidewalks— ± 0.1 feet.
 - 2. Finish Grade: Granular cushion or crushed stone mat under concrete slabs— ± 0.03 feet.
 - 3. Lawn areas away from buildings, parking areas, and sidewalks— ± 0.25 feet.

3.09 MAINTENANCE OF SURFACE

- A. CONTRACTOR shall maintain all backfilling, resurfacing, repaving, and other surface improvements constructed under this Contract. CONTRACTOR shall, upon proper notice from OWNER, make all repairs in surfaces of trenches and excavations. All expenses incurred by OWNER and/or CONTRACTOR in making repairs and all expenses in maintaining trench and excavation surfaces shall be at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. OWNER reserves the right to make all emergency repairs necessary to make safe all streets and walks at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. A maintenance guarantee fund, if specified, will be withheld from the final amount due CONTRACTOR for a period of 6 months, after acceptance of the Work, to provide such maintenance.
- B. CONTRACTOR shall be responsible for controlling dust dispersion during utility and street construction. Remedial actions required as a result of inadequate dust control shall be CONTRACTOR's responsibility. To control dust, CONTRACTOR shall apply calcium chloride or ammonium lignin sulfonate in 12 to 14% solution or other dust control palliative acceptable to OWNER. Prior to application of dust palliative, the street shall be graded smooth.

3.10 COMPACTION TESTING

- A. Compaction tests shall be done by the Project Soils Engineer. Location and frequency of the tests shall be as recommended by the Project Soils Engineer.

END OF SECTION

SECTION 31 23 19

DEWATERING

PART 1-GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Removal of groundwater to allow belowgrade construction.
 - 2. Site grading to prevent surface water from entering the excavation.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.
- C. Payment:
 - 1. The expense for making all extra excavations necessary to prevent water from interfering with the proper construction of the work and for forming all dams or diversions, digging of sumps or pump wells, bailing, and installation and pumping of wells shall be borne by CONTRACTOR.
 - 2. The cost for removal of groundwater and surface water shall be included in the prices bid for the work. No separate payment will be made for dewatering whether accomplished by use of sumps and pumps, well point systems, deep wells, or any other method.
 - 3. Any permits necessary for the dewatering operations shall be obtained and paid for by CONTRACTOR.

1.02 REFERENCES

- A. Illinois Urban Manual.
- B. See Division 01, Regulatory Requirements for permit requirements and water, erosion, and sediment control.

1.03 SYSTEM REQUIREMENTS

- A. CONTRACTOR shall, at its own expense, keep the excavation clear of water while structures, mains, and appurtenances are being built, utilities are being installed, and fill and backfill are being compacted. Under no conditions shall the work be laid in or under water. No water shall flow over the work until the joints are complete or the concrete has set.
- B. Wherever necessary, CONTRACTOR shall excavate in advance of the completed work, lead the water into sumps or pump wells, and provide erosion control measures to prevent water or sediment damage.
- C. CONTRACTOR's dewatering system shall perform so that the soils within the trench will not be destabilized by hydrostatic uplift pressures from adjacent groundwater. If conditions warrant, CONTRACTOR shall furnish and install well point systems or deep wells.

- D. Dewatering shall be sufficient to lower the piezometric level to at least 2 feet below the bottom of the excavation. Additional lowering shall be provided as necessary to create a stable subgrade.
- E. In areas where rock is encountered, the water level shall be kept at or below top of rock, but at least 6 inches below bottom of concrete. Additional rock shall be removed as needed to provide clearances.
- F. The control of groundwater shall be such that softening or heaving of the bottom of excavations or formation of "quick" conditions or "boils" shall be prevented.
- G. Dewatering systems shall be designed and operated so as to prevent the migration or removal of soils.

1.04 QUALITY ASSURANCE

- A. All dewatering shall be done in accordance with Illinois Urban Manual Code 813 and with all other applicable federal, state, and local code requirements.
- B. In particular, groundwater observation wells shall be provided and subsequently abandoned in accordance with the Illinois Urban Manual Code 996. CONTRACTOR shall complete all observation well construction and abandonment forms as required and shall submit the forms to OWNER within 15 days of construction or abandonment activities.

PART 2-PRODUCTS

NOT APPLICABLE

PART 3-EXECUTION

3.01 DEWATERING

- A. Dewatering shall be started, and the water level shall be lowered as specified herein prior to beginning excavation and shall be continued until structure, main, or appurtenance has been completed and fill has been placed and compacted to final grade.
- B. CONTRACTOR shall provide at least two groundwater observation wells near each area to be excavated to aid CONTRACTOR in determining whether the minimum specified requirements have been met prior to excavation. The observation well shall be a minimum 2-inch-diameter slotted PVC pipe. The observation well shall be installed and backfilled in such a way as to allow an accurate determination of actual groundwater levels. The observation well shall be properly abandoned after use unless specified otherwise.
- C. CONTRACTOR shall provide all necessary materials and equipment to keep the excavation free from water during construction. CONTRACTOR shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies,

including power outages, and shall have available at all times competent workers for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or weekends, or during the work stoppages.

- D. CONTRACTOR shall meet all requirements of applicable IEPA permits for construction pit or trench dewatering.
- E. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted fill or backfill, and prevent floatation or movement of all structures and pipelines.

3.02 PROTECTION

- A. CONTRACTOR shall take all necessary precautions during the dewatering operation to protect adjacent structures against subsidence, flooding, or other damage. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property. Any such facilities and structures damaged shall be repaired or replaced to the satisfaction of their owner.
- B. Prior to dewatering, CONTRACTOR shall take into account the effect of its proposed dewatering operation on existing private water supply systems and shall make arrangements with property owners for protecting their supplies or providing alternative means of supply.
- C. In the event that CONTRACTOR's dewatering operation adversely affects private water supply systems, CONTRACTOR shall provide property owners with alternative potable and nonpotable supplies until dewatering operations are ceased and groundwater levels return to normal. If the water in private water supply wells is contaminated, through no fault of CONTRACTOR after restoration of original groundwater levels, OWNER will provide measures to restore water potability. CONTRACTOR is responsible for restoration of the water supply, not its potability after restoration.
- D. In areas where continuous operation of dewatering pumps is required, CONTRACTOR shall avoid noise disturbance to nearby residences to the greatest extent possible by using electric-driven pumps, or intake and exhaust silencers or housing to minimize noise from engine-driven generators or engine-driven pumps.

END OF SECTION

SECTION 40 05 00

PIPING AND APPURTENANCES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. All piping, valves, and appurtenances of every description except for pipe as specified in Division 22.
 - 2. Concrete foundations and anchor bolts for all equipment furnished under this section.
 - 3. Piping connections to all equipment, whether furnished under this section or not.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.02 SUBMITTALS

- A. Applicable provisions of Section 01 33 00—Submittals cover requirements for shop drawings and Operation and Maintenance Manuals.
- B. General arrangement drawings, including support system of 3 inches or larger interior and 3 inches or larger exterior (aboveground) ductile iron, and PVC piping shall be submitted to ENGINEER for approval. Shop drawings for all interior and aboveground exterior piping shall be two-line drawings drawn to scale. Drawings shall include proposed materials, length, location, and elevation of pipe, fittings, supports, and valves and appurtenances. Plug valve orientation, including operator and plug orientation, shall be shown on Drawings.
- C. Grooved joint couplings and fittings shall be referred to on arrangement drawings and product submittals, and be identified by the manufacturer's listed model or series designation.

PART 2—PRODUCTS

2.01 MATERIALS OF CONSTRUCTION

- A. Materials of Construction: All materials used in the manufacture, assembly, and painting of piping and valves in contact with water shall be compatible with potable water supplies and in contact with chemical feed systems shall be compatible with the chemicals being used. All glues, solvents, solders, etc., shall likewise be compatible. For instance, no lead-base solders shall be used.
- B. Size and Type:
 - 1. All materials shall conform to the size and type shown on the Drawings or called for in the specifications.

2. In joining two dissimilar types of pipe, standard fittings shall be used when available. In the event standard fittings are not available, the method of joining shall be selected by CONTRACTOR and submitted for review by ENGINEER.
- C. Piping appurtenances shall be made of the materials specified. All appurtenances not designated as to type shall be subject to approval of ENGINEER. All grooved joint couplings and fittings shall be of the same manufacturer.

2.02 PIPE AND PIPE FITTINGS

- A. Ductile Iron Piping and Fittings:
1. Unless otherwise shown or specified, all interior piping 4 inches in diameter or larger shall be ductile iron conforming to AWWA C151.
 2. Interior piping shall be minimum Thickness Class 53 with a minimum rated working pressure of 250 psi.
 3. Except where shown, interior pipe joints shall be flanged. Flanged joints shall conform to applicable flanged joint sections of AWWA C110, C111, and C115 and shall be compatible with ANSI B16.1 Class 125. Flanges shall be ductile iron.
 4. Gaps between flanges and all locations where a gap exists at flange hub/pipe intersection shall be caulked prior to finish painting. CONTRACTOR shall verify compatibility of caulk with finish painting system specified in Division 09. Caulking shall be completed following installation and testing. Trim back excess edge of rubber gasket between flanges as necessary to achieve a uniform and flush caulk joint, but no more than 1/8-inch from outside edge of flange. Caulking shall be done and fully cured as required prior to painting of piping.
 5. Flanged gaskets shall be minimum 1/8-inch-thick, styrene butadiene rubber (SBR), full-face, Toruseal, Flange-Tyte, Maloney gaskets. Thicker gaskets shall be provided as recommended by the manufacturer to meet joint tolerance.
 6. Flanged bolts shall be standard zinc plated steel with hex head and hex nuts for the rated working pressure and installation conditions specified or shown. Flanged bolts and nuts installed in wet wells and other submerged locations shall be 316 stainless steel.
 7. Flanged fittings shall be of ductile iron with ductile iron flanges. Flanged fittings shall conform to AWWA C110 and ANSI B16.1, as applicable, with a minimum rated working pressure of 150 psi.
 8. All ductile iron fittings shall be American Ductile Iron Pipe, Griffin, Tyler Union, or U.S. Pipe.
 9. All flanged sections of pipe shall be made up in accordance with AWWA C115 specifications. No field makeup flanges will be allowed unless strictly conforming to AWWA C115, with facing done after turning pipe through flange.
 10. Unless otherwise specified, all ductile iron piping and fittings shall be cement mortar lined and asphaltic-coated inside. Cement mortar lining shall be in accordance with AWWA C104. Asphaltic coating shall conform to applicable standards herein for the pipe and fittings. Exterior exposed, submerged, and interior piping shall be furnished with outside surfaces prepared by abrasive blasting in accordance with NAPF 500C-03. Cleaned surfaces shall then be shop-primed. Factory shop prime with one coat of Tnemec N69 or N140 or Sherwin Williams Duraplate 235 or Macropoxy 646PW applied at a minimum 5.0 mils dry film thickness. Primer color shall be beige. Primer used shall be compatible with proposed finish coats; CONTRACTOR shall verify. It is the intent of this specification that all piping, supports, and appurtenances shall be furnished

shop-primed, clean, and ready to accept finish painting by CONTRACTOR with a minimal amount of surface preparation. Preparation and painting shall conform to all requirements and provisions specified in Division 09.

11. Grooved Piping System: Fittings shall be ductile, ASTM A536, conforming to the requirements of AWWA C110/ANSI A21.10 for center to end dimensions, and AWWA C110/ANSI A21.10 or AWWA C153 for wall thickness, and AWWA C606 rigid radius grooving dimensions for end preparation.

2.03 VALVES

A. Gate Valves:

1. Shutoff valves in ductile iron lines 4-inch diameter and larger shall be AWWA C515, ductile iron, resilient seat, nonrising stem, 150 psi working pressure with O-ring packing box, Kennedy, American, or American AVK.
2. Underground valves shall have extended stem, cast iron telescopic valve box, and key. Exposed valves not in reach of the floor (7 feet to centerline, or greater) shall have chain wheel operator. All other valves shall have handwheels. Right angle operators shall be provided, if required, because of valve position.
3. Asphaltic varnish and coal tar coating are not allowed on interior valves. Interior and exterior exposed valves shall be furnished with all surfaces (except galvanized or stainless steel) prepared in accordance with near white grade SSPC Specification No. 10 removing all dirt, rust scale, and foreign materials. Surface preparation shall be done at such time during the assembly process as to preclude damage to the valve once assembled. Cleaned surfaces shall then be shop-primed. It is the intent of this specification that all valves, supports, and appurtenances shall be furnished shop primed, clean, and ready to accept finish painting by CONTRACTOR with a minimal amount of surface preparation. Preparation and painting shall conform to all requirements and provisions specified in Division 09.

2.04 PIPING APPURTENANCES AND MISCELLANEOUS MATERIALS

- A. General: Piping appurtenances shall be made of the materials specified. All appurtenances not designated as to type shall be subject to approval of ENGINEER.
- B. Pipe Coupling: CONTRACTOR shall provide tie ears and tension ties where necessary to restrain pipe.
- C. Tension Ties: All tension ties and rod ties shall be provided to resist a minimum 250 psi pressure in the pipe line. CONTRACTOR shall provide tie ears to secure tension rods to flanges where necessary. Rods shall be provided with nuts and washers on both sides of tie ears. All nuts, washers, and rods shall be Type 304 stainless steel. Rods shall be Type 304 stainless steel at a minimum. Tie rods shall be equally spaced around pipe. The following table lists the minimum number and diameter in inches for the tie rods for various sizes of pipe.

Pipe Size (inches)	250 psi Pressure	
	Minimum Number	Minimum Size (inches)
4-10	4	5/8
12	4	3/4

- D. Mechanical Seals: Mechanical seals shall be 316 stainless steel Link Seal, Innerlynx by APS. Link seals shall be provided with 316 stainless steel bolts, nuts, and fasteners. Sleeve diameter shall be provided and mechanical seals installed as recommended by the manufacturer.
- E. Pressure Gauges: Provide new pressure gauge on each new pump discharge and suction piping (total of 8) in the dry well. Pressure gauges shall have scale in feet of wc with a maximum range equal to twice the normal operating pressure indicated in the submersible pump equipment specifications. Gauges shall have 4-inch minimum diameter stainless steel case, shall be connected to a mineral-oil filled diaphragm housing to separate the gauge from liquid in discharge line, and shall have accuracy of $\pm 1\%$. Provide 1/2-inch stainless steel isolation valve and union at connection to pipe to allow the gauges to be removed while the line is under pressure.

PART 3-EXECUTION

3.01 GENERAL

- A. Refer to requirements specified in Division 01 for equipment installation, quality control, testing, supervision, start-up, and operator training.

3.02 INSTALLATION

- A. Interior or Exposed Piping:
1. Provide pipe supports for all piping. Pipe support spacing and type shall, at a minimum, conform to manufacturer's recommendations unless more restrictive requirements are specified or shown on the Drawings. All interior or exposed pipelines shall be securely supported by adjustable saddles, brackets, or adjustable hangers supported directly by concrete, masonry work, or tile. Strap hangers, tin clips, or U-hooks will not be acceptable. Piping shall be supported, even though not shown on the Drawings, using base fittings and concrete pads to 6 inches above the floor, adjustable pipe saddle stand with floor flange to 6 feet above the floor, and supporting clamps or inserts more than 6 feet above the floor. In general, the maximum spacing of supports shall not exceed 10 feet on centers. Except as specified for plumbing system, all PVC piping shall be supported using galvanized supports for flexible piping except as indicated. Type 316 stainless steel supports and fasteners shall be used in submerged locations, tanks, wet wells, dry wells or as indicated. Piping shall be adequately supported and braced to resist thrust at bends, rubber expansion joints, and joints. Insulation saddles shall be used at supports of insulated piping. CONTRACTOR shall furnish and place hangers, supports, wall pipes, and sleeves in the forms before concrete is poured where needed or shown on the Drawings.

2. All piping shall be adequately supported and braced to resist thrust at bends and joints. Use base elbows, poured concrete, or rod ties. The weight of the piping shall be supported independently of connected equipment.
3. All supports and parts shall conform to the latest requirements of ASME B31 and shall have a structural safety factor of 5. Accurate weight balance calculation shall be made by CONTRACTOR to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection. CONTRACTOR shall be responsible for the installation and application of the supports. Pipe hangers shall be capable of supporting the pipe weight load in all conditions of operation. The hangers shall allow free expansion and contraction of the piping to prevent excessive stress in the piping. Where vertical movement up to 1/8 inch is anticipated, a precompressed variable spring support shall be used. Rigid hangers shall be provided with a means of vertical adjustment after erection. Where horizontal piping movements are greater than 1/2 inch, or where the hanger rod angularity from vertical is greater than 4 degrees from hot to cold position of the pipe, the hanger pipe and structural attachments shall be offset in a manner that the rod is vertical in the hot position. Hangers and supports shall be spaced in accordance with ASME B31 and as indicated in this specification. Pipe supports shall be placed before and after a valve, expansion joint, or equipment so stress will not be transferred to them.
4. CONTRACTOR shall provide calculations of pipe supports if requested by ENGINEER.
5. All carbon steel parts shall be furnished with all surfaces (except galvanized or stainless steel) prepared in accordance with near white grade SSPC Specification No. 10 removing all dirt, rust scale, and foreign materials. Surface preparation of all carbon steel parts shall be performed at such time during the assembly process as to preclude damage to the equipment once installed and assembled. Cleaned surfaces shall then be shop-primed. Factory shop prime with one coat of Tnemec N69 or N140 or Sherwin Williams Duraplate 235 or Macropoxy 646PW, applied at a minimum 5.0 mils dry film thickness. Primer color shall be beige. Primer used shall be compatible with proposed finish coats; CONTRACTOR shall verify. It is the intent of this specification that all equipment, supports, and appurtenances shall be furnished shop primed, clean, and ready to accept finish painting by CONTRACTOR with a minimal amount of surface preparation. Preparation and painting shall conform to all requirements and provisions specified in Division 09.
6. The following maximum spacings shall be provided for supports:

MAXIMUM HORIZONTAL PIPE HANGER AND SUPPORT SPACING

Nominal Pipe or Tube Size	Ductile Iron (See Note 1) ft	PVC/CPVC Pipe (See Note 2) ft
2		4
2 1/2		4
3		4
4	10	4
5	10	4
6	10	9
8	10	9
10	10	10
12	10	10

Note 1: Provide at least one hanger per pipe length located as close to the flange or joint on barrel as possible.

Note 2: Spacing is based on Schedule 80 at 100°F. For Schedule 40 or higher temperatures, provide shorter span. Consult local plumbing code and manufacturer's recommendations as required. Minimum spacing requirements shall govern.

7. The length of hanger span and support spacing in the above table refers to straight lengths of pipe. When there are changes of direction in pipe, two supports shall be placed less than three-fourths the full span in the table. When practical, a hanger shall be located immediately adjacent to a change in direction of piping. Where there are concentrated loads between supports such as valves, spacing shall be based on load calculations rather than this table.
8. Provide saddles or shields under or around piping between hanger and supports for all insulated piping to prevent crushing of insulation. Provide stainless steel pipe shields under aeration stainless steel piping to prevent indentation of piping from the support or clamp.
9. Anchored supports shall include a stainless steel U-bolt and nuts bolted to the wall bracket.
10. Exposed piping shall run straight, in neat parallel lines, and shall be located far enough from walls, ceilings, and floors to permit access for covering of pipe and painting work. Care shall be taken in laying out piping so that there is no interference with the proper location of piping for other purposes or other equipment and shall be run with regard to the requirements of each service.
11. Piping shall not interfere with headroom or clear floor space. Unless otherwise shown, piping shall run exposed in buildings, except in finished areas. Unless otherwise shown, small water piping in finished areas shall be concealed in interior walls, above suspended ceilings, or under floors where possible. Water piping shall not be installed in exterior walls, unless otherwise shown or noted on the Drawings. Joints shall not be used under floor slabs. Unless otherwise shown, piping under floor slabs shall clear floor slabs or footings by a minimum of 6 inches. Pipes under floors shall have a minimum of 6 inches of sand cover. Plates shall be provided on all uncovered pipes passing through floors, walls, and ceilings constructed of materials other than poured concrete. Plates shall be on exposed sides and shall be chrome-plated, spring and snap type.
12. Except for flanged piping, an ample number of standard weight ground joint unions and a shutoff valve shall be provided in all pipelines and at all equipment. CONTRACTOR shall provide 3/8-inch tapped and plugged connections in suction and discharge of all pumps for testing.
13. Valves shall be located on all branches of water supply lines where shown on the Drawings. Position valves to facilitate access and operation.
14. The appropriate number, size, and lengths of spool pieces and flange fillers needed for plumbing and leveling any existing piping shall be included in the price bid.
15. The locations and elevations of existing piping are approximate. Any changes in the pipe location or elevation shall be reviewed by ENGINEER.
16. CONTRACTOR shall submit shop drawings showing new pipe routing and existing pipe removal. CONTRACTOR shall be responsible for final pipe routing and shall route new piping as required to minimize conflicts. Piping shown on the Drawings is approximate only. Not all existing piping, conduit, equipment, etc., are shown on the Drawings.

CONTRACTOR shall field-verify locations. CONTRACTOR shall reroute existing piping, conduit, etc., as indicated or as required to install new piping or equipment. CONTRACTOR shall remove and relocate existing pipe supports as required to install new piping. CONTRACTOR shall provide all piping, fittings, flange fillers, and other appurtenances as required to provide functional system at no additional cost to OWNER.

B. Wall and Other Pipe Penetrations:

1. CONTRACTOR shall furnish and place hangers, supports, wall pipes, sleeves, and floor boxes in the forms before concrete is poured wherever needed or shown on the Drawings.
2. Where pipes pass through concrete members without wall fittings shown, CONTRACTOR shall provide sleeves in the forms for the piping, unless otherwise shown on the Drawings. The sleeve diameter shall not exceed the pipe o.d. plus 2 inches (or the pipe flange o.d. plus 1 inch, as applicable), unless otherwise shown on Drawings. If the concrete members are to be watertight, the annular space around the pipe shall be sealed with a mechanical seal. Sleeves shall be steel unless noted otherwise and shall include minimum 1-inch waterstop. Steel sleeves shall be prepared, primed, and painted in accordance with Division 09 prior to placement in between concrete forms. Steel sleeves shall receive touch-up paint prior to placing forms. For copper pipe, provide an elastomeric sleeve on pipe where it passes through walls or slabs.
3. Where plain wall pipes are shown or indicated on the Drawings, CONTRACTOR may substitute a flanged end wall pipe, if desired, for the purposes of pressure testing specified herein.
4. Where pipe passes through nonwatertight walls, the annular space shall be grouted full. Where pipes pass through nonwatertight floors, the sleeve shall extend 1 inch above the finished floor elevation. The annular space shall remain open, except the annular space between a rated space (example—Class I, Division 1, Group D hazardous location) and a nonrated space shall be sealed with a mechanical seal.
5. Where pipes pass through a roof, they shall be run through an approved roof penetration with flashing and counter flashing.
6. Where new pipes go through existing watertight concrete members, CONTRACTOR shall core a hole through the member, unless otherwise shown on the Drawings. The annular space between the concrete and pipe shall be sealed with a mechanical seal. Where new pipes go through existing nonwatertight concrete or masonry members, holes shall be cored and annular space between the concrete and the pipe shall be grouted full (walls or floors at rated spaces) or remain open (floors at nonrated spaces). Prior to any coring, CONTRACTOR shall locate reinforcing steel in the member and shall consult with ENGINEER to determine optimal location for the core. Plug abandoned pipes and wall pipes, after pipe and fittings removal flush to the concrete surface, with nonshrink grout, to achieve a watertight seal.
7. Where pipes pass through fire-rated walls, floors, ceilings, or other assemblies, the required firestopping materials shall be provided.
8. Nonshrink grout shall be as specified in Division 03.
9. No chases or recesses shall be made in poured concrete for pipe installation, and no pipe shall run in poured concrete unless called for in the Drawings or specifications or permitted by ENGINEER. The cutting or core drilling of concrete for pipe shall be avoided wherever possible, and in no case where such cutting or core drilling is

necessary shall reinforcing rods be cut or disturbed without notifying ENGINEER. All openings for pipe work shall be neatly patched in a workmanlike manner.

3.03 FIELD QUALITY CONTROL

- A. CONTRACTOR shall include the cost of all testing, cleaning, and disinfection in the price Bid.
- B. Work shall be tested as specified in this section. Unless indicated by ENGINEER in writing before testing begins, tests shall be witnessed by ENGINEER and others as necessary. Test results shall be recorded, and reports or appropriate certificates shall be submitted to ENGINEER in triplicate.
- C. New piping shall be tested. Piping, interior or exposed, shall be subject to test before being covered with insulation or paint or before caulking of any gaps at flanges of ductile iron piping. Piping and appurtenances shall be watertight or airtight and free from visible leaks.
- D. Piping shall be flushed or blown out after installation and prior to testing. CONTRACTOR shall provide all necessary piping connections, water, air, test pumping equipment, water meter, bulkheads, valves, pressure gauge and other equipment, materials, and facilities necessary to complete the specified tests. CONTRACTOR shall provide all temporary sectionalizing devices and vents for testing.
- E. Gauges used for testing shall have increments as follows:
 - 1. Tests requiring a pressure of 10 psi or less shall use a testing gauge having increments of 0.10 psi or less.
 - 2. Tests requiring a pressure of greater than 10 psi but less than or equal to 100 psi shall use a testing gauge having increments of 1 psi or less.
 - 3. Tests requiring a pressure of greater than 100 psi shall use a testing gauge having increments of 2 psi or less.
- F. Pressure Tests: The test pressure in all lines shall be held for one hour during which time the leakage allowance shall not exceed that specified. In case repairs are required, the pressure test shall be repeated until the pipeline installation conforms to the specified requirements. Pumps, air compressors, instrumentation, and similar equipment shall not be subjected to the pressure tests.

Fluid Abbreviation or Name	Minimum Test Pressure in psi	Test Medium	Leakage Allowance Designation
Stormwater (Pump Suction and Discharge Piping)	35	Water	"A" ⁽¹⁾

⁽¹⁾ Leakage allowance Designation "A" shall mean zero leakage.

3.04 CLEANING AND DISINFECTION

- A. All equipment and materials shall be clean before installation.

- B. Broken concrete, rubble fill, and other excess material shall be removed from the site and wasted.
- C. All surplus material, tools, and equipment shall be removed and the premises shall be left free of everything of the kind.

END OF SECTION

SECTION 40 94 23

CONTROLS AND INSTRUMENTATION

PART 1–GENERAL

1.01 SUMMARY

A. Related Sections and Divisions:

1. Applicable provisions of Division 01 shall govern work in this section.
2. Section 26 09 10–Controls and Instrumentation Drawings.
3. All other sections of Division 26.
4. Section 27 10 00–Structured Cabling.

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1.02 SYSTEM DESCRIPTION

- A. The work includes furnishing, delivering, installing all items furnished, and placing in operation the Supervisory Control and Data Acquisition (SCADA) System for IDOT Pump Station 49.
- B. System Supplier shall be defined as the fabricator, assembler, installer, and supplier of all system components. This shall include, but not be limited to, all instrumentation as specified, all PLC cabinets and required interface hardware and internal wiring, the SCADA System computers, hardware, system drawings, system software, new MCC at the pump station and MCC drawings as necessary. System Supplier shall be an organization whose principle function is to design, program, configure, manufacture, provide, install, and service the pumping control system. System Supplier shall be retained by and under the direction of CONTRACTOR, who shall assume complete responsibility for: detail design, manufacture, installation, configuration, technically advising on, and certifying correctness of installation, testing and adjusting, documenting and starting-up, and training of the complete pumping control system (PCS). System Supplier shall be responsible for the operational testing of the HMI, and PLC software programs.
- C. System Supplier shall be responsible for development of the SCADA System computer HMI graphics as specified herein.
- D. CONTRACTOR shall inspect all work. The Bid shall include everything necessary to obtain a complete installation operating in accordance with these specifications and the Bidder's proposal, whether necessary items and equipment are contained in, or are remote from the enclosures furnished under this Contract. All responsibility for this system ultimately lies with CONTRACTOR.
- E. CONTRACTOR shall be responsible for the placing of circuits and making of electrical connections in accordance with System Supplier-furnished drawings, instructions, and field supervision to provide proper connection. CONTRACTOR shall include the services of a System Supplier factory engineer to supervise making of connections to power supplies, motor leads, communication circuits, control equipment, and any other connections external

to the new control equipment; adjust the equipment; initiate and check operation; instruct OWNER's electrician on operation and maintenance of the equipment; and place the equipment in operation in an acceptable manner. This shall include on-site review of software/hardware controls from the central control point.

- F. Any auxiliary interface relays and controls needed for completion of this project, if not specifically called for, shall be by System Supplier.

1.03 QUALITY ASSURANCE

- A. System Suppliers: Firms regularly engaged in the design and manufacture of SCADA systems of the size and complexity specified herein, and whose systems have been in satisfactory use in similar service for not less than 10 years.
- B. Installer: A firm with at least 10 years of successful installation experience on projects with SCADA System design and installation work similar to that required for the project.
- C. Code Compliance: Comply with National Electrical Code (NFPA 70) and any and all local codes as applicable to construction and installation of electrical wiring devices, material, and equipment herein specified.
- D. UL Labels: Provide control panels, power supplies, controllers, relays, wire, and connectors that have been listed and labeled by Underwriters Laboratories.
- E. NECA Standards: Comply with applicable portions of National Electrical Contractor's Association's Standard of Installation.

1.04 SUBMITTALS

- A. Manufacturer's Data: Submit manufacturer's data, specifications, and installation recommendations for each item specified herein.
- B. Submit shop drawings and product data in accordance with provisions of Section 01 33 00-Submittals.
- C. Provide product data on all equipment and devices specified herein as well as wiring schematics for all systems.
- D. Shop drawing submittals shall be assembled in phases.
 - 1. The first submittal shall include the following:
 - a. Detailed catalog information, descriptive literature, and specifications of hardware and software. All items being provided must be specifically noted on this literature, including all field devices and instruments. List all the materials and equipment to be furnished. Tag number, manufacturer's complete catalog number, technical descriptions, service, location, and cross-reference numbers of instruction sheet, specification data sheet and wiring diagram shall be included under each item.
 - b. Project implementation plan, including information on project organization, project management, engineering, programming, configuration, training, startup, and

- maintenance services. Plan shall include key personnel on project, point of contact, and communication protocol.
- c. Overall network schematic showing all controllers, cellular modems, network switches, and hardware addresses applicable to the system.
 - d. Wiring diagrams for all control panels and MCCs. Drawings shall be completed using electronic CAD software. Handwritten or PDF markups of any kind will not be allowed.
 - e. Specification Data and Drawings: Furnish instrument specification data sheet as per ISA standard instrument specification form, if applicable, wiring and/or connection diagram, outline dimensions, installation diagram and manufacturer's project specific catalog number for each instrument. A common set of drawings with setting and/or scale individually listed may be furnished for instruments with identical specification except setting and/or scale.
2. Subsequent submittals shall include the following:
 - a. Control narratives.
 - b. HMI graphic displays (graphics shall be submitted with adequate time for review and addressing of review comments prior to factory acceptance testing: minimum of four weeks).
 - c. Database with PLC addresses.
 - d. SCADA system software, I/O point data base listing, programming ladder diagrams, and graphic pages in print. Software, application programs, ladder diagrams and control logics shall also be submitted in CD format.
- E. System Diagrams:
1. Panel Layout Drawings: Furnish panel drawings for each instrument/control panel/control station. Drawings shall show all panel mounted devices to scale, dimensioned and shall include legend. List bill of materials including manufacturer's part numbers, show panel or cabinet structure, outline dimension, internal and external device/equipment arrangements, devices, cutouts and mounting details of instruments, protection and control devices, terminal blocks, wire ways and piping. Prepare in general accordance with NFPA 79, Annex D. A detailed terminal block blowup section shall also be included showing terminal block number for each terminal block.
 2. Elementary Schematic Diagrams: Furnish ladder type circuit diagrams prepared to facilitate the understanding of the system functionality, maintenance and fault detection.
 - a. Control devices shall be shown between vertical lines that represent control power wiring, with the left line representing control circuits common and right representing operating coils common except where permitted by Clause 9 of NFPA 79.
 - b. Control devices shall be shown on numbered horizontal lines (rungs) between the vertical lines.
 - c. Drawings shall include a cross referencing scheme used in conjunction with each relay, output device, limit switch, and other devices so that any contact related to a device can be readily located on the drawings.
 - d. Component designations shall be included for all devices, with the same designations used on Panel Layout Drawings.
 - e. All depictions of devices shall be specific for selected manufacturer included with submittal, and shall include detailed terminal numbering scheme as specified by manufacturer of said device.

- f. Each panel terminal within a terminal strip shall be numbered. When multiple terminal strips exist, each shall be given a unique identification. Terminal strip identification shall be included on Panel Layout Drawings.
- g. All wires shall be numbered; wire numbers shall be applied to labels in accordance with Section 26 05 53. Wiring and devices external to panel shall be clearly identified
- h. Control devices shall utilize the symbology depicted in NFPA 79 and IEEE 315.
- i. Switch symbols shall be shown with utilities turned off and devices in their normal starting condition. Include control settings on the diagrams when available (timer settings, trip current, etc.).
- j. Drawings shall indicate source of control circuit power (lighting panel circuit number, etc.).
- k. Drawings shall be prepared on a per-panel basis.
3. Instrument Loop Diagram: Furnish all analog and digital loops for all instrument sensors, secondary instruments, I/O functions, alarms, control and displays using ISA standard symbols per ISA Standard S5.4.
4. SCADA System Block Diagram: Furnish system hardware configuration and identify model numbers of each system component.
5. PLC Equipment Layout Drawing: Furnish system hardware layout for each individual component (module, rack, power supply, etc.), and their relative location to one another. This shall be a scaled drawing whereby each component manufacturer's number is easily readable.
6. Interconnecting Wiring and/or Piping Diagrams (to/from): Show schematically the wiring and conduit runs for each instrumentation and control system. The diagram shall show and identify, with location noted, all instruments, piping and appurtenances furnished under this Section and related electrical equipment furnished under other Sections. All terminal blocks and pipe taps shall be identified.
7. SCADA System Block Diagram: Furnish system hardware configuration and identify model numbers of each system component.
8. I/O List segregated by PLC module and module type. Include detailed description of each I/O point with respect to function (i.e.: Pump 1 Running, etc.).
9. Process Control Network Drawings: Furnish Drawings showing connections between Process Control System devices including computers, HMI's, PLC's, radios, power monitors, and network devices. Drawings shall indicate network domain and device addresses, subnet masks, gateways, and other pertinent network address information.
10. Detailed Pump Control system descriptions of floats and SCADA control and associated communications with remote facilities.
11. SCADA screen shots.

1.05 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provision of Section 01 33 00–Submittals.
- B. Include spare parts data listing, source and current prices of replacement parts and supplies, and recommended maintenance procedures and intervals.
- C. Submit Operation and Maintenance Manuals in accordance with Division 01. The following additional information shall apply:
 1. Manuals shall contain, but not be limited to, the following:
 - a. System Hardware.

- b. System Software.
- c. Testing and Certification.
- 2. Hardware section shall include:
 - a. Safety precautions, physical description, functional description, operating procedures, theory of operation, maintenance instructions, checkout procedures, troubleshooting procedures, servicing, and removal and replacement procedures.
 - b. Wiring schematic and logic diagrams, parts list, and point-to-point wiring.
 - c. Listing of all hardware timers installed in MCCs and SCADA Panels as well as the ranges set on each timer. Listing shall also include actual timer setting after completion of startup.
- 3. Software section shall include:
 - a. Software manual shall describe system techniques, general philosophies, list, and description of all standard software. System techniques description shall include a detailed screen-by-screen description explaining where the various signals originate, how to change equipment setpoints and control modes, how alarms are acknowledged, and how to go from screen to screen. All menu selections and their functions shall also be described in detail.
 - b. Program documentation (i.e., PLCs, cellular modems) shall include programs, documentation files, database and configuration as installed. Provide two USB flash drives with this information. Usernames and passwords for all programmable devices (i.e., PLCs, cellular modems) shall be turned over to OWNER at the time of final completion.
- 4. Testing and Certification section shall include:
 - a. Detailed field test procedure for SCADA Panel and for Combustible Gas Monitor and associated alarms and circuits.
 - b. Provide certified factory test reports for all tested equipment and components to depict proper functionality in accordance with Specifications.
 - c. Accurately record actual calibration setting and scales of instruments.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to SP components, enclosure, and finish.

1.07 SYSTEM ENGINEERING

- A. System Supplier shall provide all engineering necessary to accomplish and document the requirements of this specification and be in accordance with the system configuration. The engineering to be performed by System Supplier on this project shall include, but not be limited to, the following categories:
 - 1. PLC system layouts.
 - 2. Panel layouts.
 - 3. I/O configuration and wiring diagrams.
 - 4. PLC programming.
 - 5. Network configuration.

- B. Installation: CONTRACTOR shall install all the system equipment including PLCs and interconnecting cabling as required. This work shall include all interconnection wiring as required for the completion of the system.
- C. It shall be the responsibility of System Supplier to ascertain that all field devices are compatible and consistent with the system design. This includes reviewing drawings and data to ascertain the compatibility and consistency of the system with the field devices on such considerations as:
 - 1. Equipment size and available space.
 - 2. Power levels.
 - 3. Power sources.
 - 4. Logic schemes.
 - 5. Signal types and levels.
 - 6. Interface devices where required.
 - 7. All other aspects of field devices impacting the design of the system.
- D. The system shall be programmed to implement the control sequences and to provide the monitoring according to this specification. It shall be the responsibility of System Supplier to include all the inputs and outputs required to meet all aspects of this specification, regardless of whether they are specifically included as shown on the Drawings.
- E. System Supplier shall provide a complete list of spare parts required and where they may be obtained for operating the system for 3 years from startup.

1.08 CONTRACTOR AND SYSTEM SUPPLIER GENERAL REQUIREMENTS

- A. This specification, along with the Contract Drawings, defines the requirements of a PLC-based process monitoring and control system. System Supplier shall construct a process monitoring and control system specifically for the demanding requirements of a real-time municipal storm water pump station.
- B. It is the intent of this specification to define a fully integrated open-type process monitoring and control system, with all new equipment, factory-tested, delivered to the site, ready to function upon connection of power source and field instrument wiring. Components, peripherals, interconnections, cabling, power supplies, software, and services necessary to form a complete, integrated system shall be identified and provided by CONTRACTOR. CONTRACTOR shall be responsible for reviewing the wiring diagrams and control sequences for equipment provided under other divisions of these specifications and coordinating all interface requirements. CONTRACTOR shall submit to ENGINEER, in writing, any deficiencies noted during this review. Any changes required by CONTRACTOR because of failure to complete this review shall be the responsibility of CONTRACTOR, at no increase in cost to OWNER.
- C. CONTRACTOR shall be responsible for complete coordination in providing all equipment, sensors, and meters supplied with input and output signals, and contacts that are compatible with the systems as specified herein. CONTRACTOR shall also be responsible for complete coordination with manufacturers of other systems specified in other divisions of these specifications with which an interface is required. The Contract Drawings are symbolic representatives of the required work. It is not intended that the Drawings show all

appurtenances. CONTRACTOR shall provide a complete and working system according to the true intent and meaning of the Drawings, Specifications, and standard industry practices.

- D. To provide a complete and totally integrated system, a single manufacturer who has experience in furnishing similar networked PLC-based monitoring and control systems of the same complexity and size for municipal storm water pump station facilities shall provide the specified equipment and services. The system proposed to meet this specification shall be of field-proven design, incorporating manufacturer's standard equipment and software. Service of all peripheral devices shall be provided by the manufacturer of the process monitoring and control system.
- E. Design and specification of devices and completed system shall conform to applicable portions of the latest edition of the National Electrical Code (NEC).
- F. Control panels shall bear a serialized UL label indicating that it is UL approved as an assembled unit. Panels that have individual components that are UL labeled, but do not have UL approval as an assembled unit are not acceptable.
- G. Training Program:
 - 1. Submit training plan including course syllabus, personnel who will be conducting the training, and schedule.
 - 2. Provide materials, instructors, and workbooks to complete the training.
 - 3. Training courses shall include:
 - a. Operator training. Two courses. Course length shall be a minimum three days (8-hour day) length. Training shall utilize equipment specified herein following installation and field testing. (Six 8-hour sessions shall be provided at the pump station for two people in each session.) Operator training shall include operation of the SCADA system, changes of control logic and set-points, initiation of diagnostic routine, set up and revisions of graphic and report format, how to perform system shutdown and restart, etc. It shall also include care and maintenance of the equipment. Upon completion of training, the Operators shall be capable of operating the processor equipment, peripherals and I/O equipment to monitor and control the process, system shutdown and restart, diagnose system failure and to initiate routine switch over procedures and component replacement.
 - b. Maintenance training. Two courses. Course length minimum 8 hours. Two 8-hour sessions for five people in each session shall be provided at the pump station. Maintenance training may be combined with operator training.
 - 4. Manufacturer's training shall be directed to system and equipment operation, maintenance, troubleshooting, and equipment and system-related areas other than the process itself.
- H. System Supplier shall meet the following minimum requirements:
 - 1. System Supplier shall have a full-time staff of qualified programmers who are knowledgeable in the configuration of networked computer systems and the PLCs being provided.
 - 2. System Supplier shall have a minimum of one Microsoft-certified engineer.
 - 3. System Supplier shall have training capabilities and shall have conducted training courses in programming and maintenance.
 - 4. System Supplier shall have an adequate inventory of spare parts.

5. System Supplier shall have a full-time staff of qualified service technicians.
 6. System Supplier shall be responsible for the programming and documentation of the system.
 7. System Supplier shall be responsible for all details that may be necessary to properly install, wire, adjust, and place in operation a complete and working system.
 8. System Supplier shall be responsible for all coordination between the system and the field devices, instrumentation equipment, motor control centers, and equipment furnished with other divisions of this specification. This shall include interface with existing equipment.
 9. System Supplier shall have a UL panel shop located inside the System Supplier's own facilities.
 10. System Supplier shall have experience with the specified HMI and historian software on past projects of similar size and complexity.
 11. System Supplier shall be regularly engaged in the design, installation, and servicing of wastewater and stormwater collection and treatment PCS.
 12. System Supplier shall demonstrate the ability to produce electrical and control logic diagrams in the level of detail required by this specification.
 13. System Supplier shall have previously executed a minimum of five wastewater and/or stormwater collection treatment PCS projects of similar size and complexity to this Project incorporating PLCs and HMI platforms included in this Project.
 14. Systems Supplier shall have previously successfully executed Ethernet wired networked projects of comparable size and complexity to this Project.
 15. The person(s) performing the field Instrumentation and Controls work as required by the Contract Documents shall have a minimum of five years of experience on PLC-based systems.
 16. System Supplier shall provide, on-site, a Control Systems Engineer to commission the functional testing, start-up and training as required by the Contract Documents. The individual shall have authored and commissioned control logic for no fewer than three projects of similar or greater complexity and shall have a demonstrated proficiency in authoring logic in PLC ladder logic.
 17. Upon request of ENGINEER and in addition to other specified requirements, CONTRACTOR shall provide a minimum of five System Supplier references to confirm compliance with these requirements.
 18. Upon written approval of ENGINEER, additional System Supplier's that meet all requirements may be considered by CONTRACTOR.
- I. All components shall be standard make acceptable to OWNER, with one manufacturer to provide all similar components. The Base Bid System Supplier shall be Frakes Engineering, (317) 577-3000; Integrated Process Solutions, (608) 849-4375; Wunderlich-Malec (952) 933-3222; Complete Integration & Services; or Meade Electric. See General Conditions and Supplementary Conditions regarding substitutions to the Base Bid system suppliers.

1.09 FACTORY ACCEPTANCE TESTING, SYSTEM STARTUP, AND SUPPORT SERVICES

- A. Permit ENGINEER and OWNER to observe vendor's staging records or other quality assurance records relating to system(s) supplied. System Supplier shall assemble the system components as a complete process monitoring and control system and demonstrate that the system is operational before shipment from System Supplier factory to the job site.

This testing shall be as an integrated assembly by simulating each of the specified I/O points and all specified algorithms.

- B. This test shall be witnessed by up to three of IDOT's representatives. Factory acceptance test shall be two days as a minimum, but may require additional time depending on the results of the testing.
- C. On-Site Functional Acceptance Testing:
 - 1. After all equipment has been installed and is placed in full-time operation CONTRACTOR and System Supplier shall demonstrate that all equipment and controls operate in compliance with the Contract Documents. For each piece of equipment being tested, all systems associated with the operation of the equipment (e.g., controls, supply/discharge piping, etc.) shall be installed and be in full operating condition so that all equipment functions are able to be completely tested without delay using real-time process I/O.
 - 2. All control wiring, hardwired interlocks, HMI screens, control programming, etc., shall be checked out and functionally tested by System Supplier prior to ENGINEER's on-site functional acceptance testing. All functional errors shall be corrected prior to ENGINEER's on-site functional acceptance testing.
 - 3. CONTRACTOR shall submit updated versions of all HMI screens developed by this System Supplier to ENGINEER for review at least 1 month prior to the functional acceptance testing of equipment controlled through the associated HMI screens.
 - 4. Coordination Videoconferences:
 - a. CONTRACTOR shall schedule and conduct an initial functional acceptance testing coordination videoconference at least two months prior to the anticipated functional acceptance testing. The videoconference shall include CONTRACTOR, System Supplier, Division 26 contractor, OWNER, and ENGINEER, and all other parties responsible for the equipment and controls scheduled for functional acceptance testing.
 - b. CONTRACTOR shall schedule and conduct additional functional acceptance testing coordination videoconferences one month prior to the date for functional acceptance testing to confirm status of equipment installation and System Supplier checkouts, and updates to the functional acceptance testing schedule, after which ENGINEER will finalize reservations for travel and accommodations. All parties shall agree on a date for functional acceptance testing at this videoconference, or schedule an additional videoconference to establish a testing date one month prior to the delayed testing date. If the functional acceptance testing is rescheduled within one month of the agreed upon date, there will be deducted from payments due to CONTRACTOR the amount of penalties paid by ENGINEER for travel and accommodation cancellations. OWNER will deduct the amount of these charges from payments made to CONTRACTOR.
 - c. CONTRACTOR shall provide the following information in written form at each videoconference. All information shall be updated prior to each videoconference.
 - (1) Equipment installation and manufacturer's startup schedule.
 - (2) Status of all power and control system wiring for the equipment scheduled for functional acceptance testing.
 - (3) Schedule and status of System Supplier's on-site checkout and functional testing.
 - (4) Anticipated delays and the cause of each delay.

- (5) Conflicts with OWNER's operation of the facility.
 - (6) Proposed dates for acceptance testing of all equipment and controls.
 - (7) Proposed dates for future acceptance testing coordination videoconferences.
- 5. After being notified by CONTRACTOR that the equipment has been installed and is in full operating condition and ready for ENGINEER's functional acceptance testing, ENGINEER will make one 2-day trip to check operation. CONTRACTOR, System Supplier, and Division 26 Contractor shall be on-site during testing to adjust equipment, correct erroneous wiring, and make modifications to control system and HMI programming, as necessary.
- 6. System Supplier shall provide functional acceptance testing support through one or more on-site field service engineers and the project control system programmer. Time for the on-site field service engineers and programmer scheduled for functional acceptance testing shall be dedicated to the functional acceptance testing process and shall not be interrupted for other construction-related activities.
- D. Final acceptance and payment will not be made until the system has operated satisfactorily for a minimum of 30 consecutive days. CONTRACTOR shall include in Bid field follow-up to provide proper adjustments and operation during the first year following project final completion. Prior to beginning the 30-day test, the following criteria shall be met:
 - 1. Satisfactory operation of I/O control loops.
 - 2. Satisfactory operation of software.
 - 3. Satisfactory operation of control program.
 - 4. Satisfactory operation of peripheral equipment.
 - 5. The necessary debugging programs have been performed.
 - 6. Data output is reliable.
 - 7. Control loops are operational.
 - 8. Checking and calibrating of systems have been completed.
 - 9. Wired and wireless communication systems are reliable.
- E. CONTRACTOR, through System Supplier, shall provide the following support services:
 - 1. Field Service Engineer: Field service engineer shall be responsible for programming of system PLCs in the factory and at the site. Field service engineer shall be present at the factory acceptance test and be present for startup of all systems and available throughout the entire construction process until final completion. Service technicians sent for system startup will not be acceptable. Support shall include on-site time. Services shall include, but not be limited to:
 - a. Commissioning, installation, startup, and testing of equipment.
 - b. Revising or rewriting manuals to incorporate an installed and accepted system.
 - c. On-site training.
 - d. Software modifications.
 - 2. In-factory support shall include consultation following the acceptance testing and shipment. Services shall include, but not be limited to:
 - a. Researching and answering questions related to the system operation, documentation, and system use and functions.
 - b. Program modifications.
 - c. Revising or rewriting manuals.
- F. CONTRACTOR shall not install any hardware or software to enable remote access or control without written permission from OWNER and ENGINEER.

1.10 SYSTEM TESTING

A. System Shop Tests:

1. The System Supplier shall be able to simulate the SCADA system within their shop. Shop testing shall include, but not necessarily be limited to, the following:
 - a. Manually fill-in required additions to PLC data base.
 - b. Manual forcing of outputs.
 - c. Operation of the control programs.
 - d. Forcing redundant transfer from primary PLC to secondary as a bump-less transfer.
 - e. Recall of simulated data points on the HMI display.
 - f. Recall of all reports with partial fill-in data and manual fill-in data at time of testing.
 - g. Routing testing of logger, AEGIS alarm, and HMI display based upon manual input data.
 - h. Change of alarm and limit set-points, etc., and observation of results.
 - i. Any additional testing which may be found to be necessary at the time the above is observed.
 - j. All necessary contact and analog inputs must be provided to permit satisfactory testing of the above. If analog instrument switch over from one test to another is required, it shall be done in a most expeditious predetermined manner so as to permit nearly continuous testing during final shop acceptance.
 - k. Prior to such acceptance tests, the System Integrator shall submit the detailed procedures of the proposed shop tests and a time schedule within which such tests can be run, both subject to acceptance and approval by ENGINEER. The System Supplier will be expected to do all necessary pretrial testing and debugging to ascertain that the system is in running order. After the System Supplier has confirmed that the proper responses can be achieved, the date for final shop test may be established.
 - l. During shop testing, the System Supplier shall generate hard copy printouts of all reports and graphics, indexes and point I.D.'s on both printer and LCD monitor for submittal, review and correction. A certified letter that the listed shop tests have been performed, and all panels meet contract requirements shall be submitted. The Department reserves the right to be present when shop tests are run as described below.
2. CONTRACTOR shall notify the Department, in writing, with the System Shop Test date(s). CONTRACTOR shall submit an itinerary to the Department, for review and acceptance, a minimum of four (4) weeks prior to the scheduled travel.

B. System Field Tests: The pre-acceptance test procedures, as outlined in the preceding paragraphs, shall apply. Acceptance testing shall include the following:

1. Acknowledge receipt of all analog and contact inputs, their reliability value and range.
2. Transmission of contact and analog signals to perform their intended tasks.
3. Any additional testing which may be found necessary at the time the above is observed.

C. Start-up and Operational Testing:

1. The start-up services and Operational Test for the following equipment shall be coordinated with IDOT and IDOT shall be notified at least two weeks in advance:
 - a. SCADA System complete.
 - b. Float Control System.

- c. Pumping System.
- d. Gas Detection and Monitoring System.
- e. Outside Communications.
- 2. Shall include detailed written description of each test performed, parameters for each test, interlocks and prerequisites for each test, and results of each test performed and room for initials and date for each witness of test. Testing procedures shall be made available in hardcopy two weeks prior, and also during Operational Testing.
- 3. The Department and ENGINEER shall both be given the opportunity to witness all Operational Testing. CONTRACTOR shall coordinate schedules of all parties.

1.11 OPERATIONAL TESTING

- A. Pump operational testing shall verify both manual and automatic modes of operation of equipment confirming flow rates, and electrical characteristics are within equipment manufacturer's recommendations.
- B. Automatic pump operational testing under both modes of control shall be performed based on the rising water and falling water conditions.
- C. Operational testing shall include verification of local indication, HMI indication, and District 1, IDOT TSC, and at Maintenance Contractor's facility indication.
- D. Prior to Operational Testing, CONTRACTOR shall coordinate with the IDOT Maintenance Contractor and complete all work at remote locations at District 1, IDOT TSC, and at Maintenance Contractor's facility.
- E. With the H-O-A switch at the MCC in "Hand", each pump shall be started, stopped, and bumped from the Local Control Station and the MCC individually. Pump time delays shall be tested for accuracy. Pump motor current shall be documented during running. All associated pump pilot lights shall be tested for function. All pump interlocks (leak, overtemp, overload, etc.) shall be tested on each pump (this may require jumpers installed/removed in electrical circuits or manually initiating the fault condition). Motor protection relays and intended functionality shall be tested during this time. Elapsed time meters, number of starts, voltage meter, and motor current shall be confirmed. Two pumps shall be run concurrently for testing. Testing shall utilize all power sources (two utility and generator power), assuring functional testing of the ATS and generator docking station. During testing, CONTRACTOR shall verify minimum pump submergence is observed at all times.
- F. With the H-O-A switch at the MCC in "Auto", pump operational testing shall include SCADA system with analog level element signals as control variable, and also the float system using hardwired control circuitry. These tests shall be performed separately, then concurrently.
- G. SCADA Pump testing shall be performed as follows:
 - 1. Confirm wet well level is above Low Level Alarm Float Switch, and no pumps are running.
 - 2. Fill water in the wet well. CONTRACTOR shall be responsible for providing water.
 - 3. For each rising water level benchmark shown on Drawings, verify operation of respective pump. Verify on/off operation. Verify a maximum of two pumps running at a time. Verify pump sequencer operation. Verify Lead/Lag/Standby configuration for all

- possible scenarios of pump sequencer. Verify pilot light functionality and SCADA HMI operation for each signal and respective status of equipment.
4. Place Lead Pump in "under maintenance" mode and verify Standby Pump Operation. Repeat operation with Lag Pump "under maintenance".
 5. Force Lead Pump into alarm (this may require an electrical jumper) and verify Standby Pump Operation. Force Lag Pump into alarm and verify continued operation.
 6. Verify analog level sensor accuracy and functionality. Intentionally fail primary level signal and verify SCADA system seamlessly transfers control of pumps to secondary analog level element as level control variable. Repeat in reverse with at least one pump running.
 7. Verify wet well High Level alarm. It is recommended to immediately perform Float System Operational Testing, and then return to this point.
 8. For each falling water level benchmark shown on Drawings, verify operation of respective pump. Verify pilot light functionality and SCADA HMI operation for each signal and respective status of equipment.
 9. Verify wet well Low Level alarm. This may require the use of temporary portable pumping equipment, and shall be provided by CONTRACTOR.
 10. Verify and document all equipment changes of state with respect to water level during functional testing and submit.
 11. Verify all alarms at District 1, IDOT TSC, and at Maintenance Contractor's facility.
 12. During testing, CONTRACTOR shall verify minimum pump submergence is observed during pump operation.
- H. Float System Pump testing shall be performed as follows:
1. Wet well Float switch trip levels shall be tested /confirmed during SCADA test (see above) and adjusted to elevations shown on Drawings as required prior to beginning this test.
 2. Fill water in the wet well. CONTRACTOR shall be responsible for providing water.
 3. For each rising water level benchmark shown on Drawings, verify operation of respective pump. Verify on/off operation. Verify a maximum of two pumps running at a time. Verify pilot light functionality for each signal and respective status of equipment.
 4. Put Lead Pump in Fail mode (may require jumper of electrical circuit) and verify Standby Pump Operates at LS-008E elevation. Repeat test with Lag Pump in Fail mode.
 5. Verify wet well High Level Float alarm.
 6. For each falling water level benchmark shown on Drawings, verify operation of respective pump. Verify pilot light functionality for each signal and respective status of equipment.
 7. Verify wet well Low Level Float alarm. This may require the use of temporary portable pumping equipment, and shall be provided by CONTRACTOR.
 8. Verify and document all equipment changes of state with respect to water level during functional testing and submit.
 9. Verify all alarms at District 1, IDOT TSC, and at Maintenance Contractor's facility.
 10. During testing, CONTRACTOR shall verify that the required minimum pump submergence is observed during pump operation.
- I. Analog Level sensors shall be performed as follows:
1. Verify 4-20mA output and respective wet well level at HMI from empty to full wet well conditions.

2. Verify Operator adjustable level differential between upstream and downstream Screen Chamber causes SCADA system to give a "Bar Screen Blockage" alarm. Verify Operator adjustable HMI differential level functionality for this alarm.
 3. Demonstrate failure of primary level element with bump-less transfer of control to the secondary.
- J. Gas System shall be tested in accordance with manufacturer's written procedures on testing and calibration.
1. Analog outputs shall be verified for operation at specified gas testing levels.
 2. Pump Station alarms verified.
 3. System reset verified.
 4. Ventilation System coordinated and tested for functionality (all supply and exhaust fans shall operate during a Gas System alarm plus an additional 15 minutes via an off-delay timer – exception is the Electrical Room ventilation equipment.
 5. Verify all alarms at HMI, and District 1, IDOT TSC, and at Maintenance Contractor's facilities.
- K. Communications: Verify each alarm represented on Drawings at AEGIS panel is transmitted and received at District 1, IDOT TSC, and at Maintenance Contractor's facilities.
- L. Additional Testing:
1. Each of the testing requirements shall include formal written test procedure, test verification, commentary on discovered anomalies and formal submittal in accordance with submittal procedures.
 2. Verify each SCADA input and output is tested and verified for functionality, document and submit.
 3. PLCs shall be tested for bumpless transfer on primary processor failure.
 4. PLC I/O rack redundant power supplies shall be tested for bumpless transfer upon failure.
 5. PLC I/O rack shall be tested for ring topology redundancy with the processors.
 6. Demonstrate a complete SCADA computer failure (by removing power from computer), with PLC maintaining control of the Pump Station. Resumption of power shall bring each HMI back to their respective "Home" screens.
 7. Demonstrate UPS failure for each UPS, alarming, and bypass contactors.
 8. Demonstrate power failure for each 120Vac power circuit to SCADA panel, and alarming.
 9. Demonstrate 24Vdc power supply failure and alarming.
 10. Demonstrate "Float Failure" when a float fails to activate. Verify for each wet well float.
 11. Electrical Systems in accordance with procedures as described in relevant Sections (Fire/smoke detection, AEGIS, Intrusion Switches, Generator, ATS, Surge Protection, Grounding, etc.).
 12. Mechanical Systems in accordance with procedures as described in relevant Sections (Supply fans, exhaust fans, dampers, heating, air conditioning, etc.).
 13. Fiber testing. Testing shall be in accordance with Illinois Department of Transportation Standard Specifications for Road and Bridge Construction (latest edition) Article 801.13 (d).

M. Final Acceptance

1. Satisfactory operation of the work by IDOT shall be interpreted to mean that the work is sufficiently advanced to form a reliable system for system operation; the I/O control loops, software, control programs and peripheral equipment are operating properly; the necessary debugging programs have been performed; data output is reliable and control loops are operational. Equipment which was found to be ineffective or inoperable has been returned or replaced, and checking and calibrating of systems has been completed, and complete training of all systems has been accomplished.
2. All punch list items have been resolved to the satisfaction of IDOT.
3. All O&M manuals, Record Drawings, and record documents shall be delivered to and approved by IDOT.
4. All contractual spare parts delivered to IDOT.
5. All training completed or scheduled.
6. Final acceptance test will be run for 30 days within which cumulative major component down time, consisting of the computer systems and the PLC's does not exceed 4 hours. Repeat test if 4-hour limit is exceeded.
7. Written acceptance by IDOT shall be the start date of the warranty period. Warranty shall commence from the Final Acceptance of the Pump Station.

1.12 COMMON REQUIREMENTS ALL EQUIPMENT

- A. All indicating and recording devices shall be electric or electronic.
- B. All indicating and control devices mounted on control panel and MCC enclosure doors (e.g., meters, gauges, electronic indicators, pilot lights, selector switches, VFD HIMs, etc.) shall be located at eye level, minimum 48 inches, maximum 60 inches, from floor to bottom of device. Indicating devices on MCC enclosure doors located in the bottom half of an MCC section shall be mounted as high as possible.
- C. All motor control power shall be 120 volts with suitable circuit protection (fuses or breakers). Fuse holders shall be provided with integral LEDs to indicate when the fuse is blown.
- D. Devices powered at 120 volts from supervisory control panels shall be fused. This shall include, but not be limited to, transmitters.
- E. Provide lightning protection, isolation transformers, and fused disconnects at each end of each power circuit, supervisory circuit, and local supervisory circuit with transformers and relays, if necessary, to obtain supervisory power. 120-volt power shall be available at all control points. Lightning protection shall be completely solid-state and self-healing and shall not require the use of fuses. Provide a single switch with an indicating light to deenergize the control power for each location. Each panel shall have a GFI, duplex, 15 ampere, 120-volt receptacle.
- F. Where equipment is necessary to perform a function as called for in one part of this specification, it shall be provided, even though the detailed enumeration at various control points may omit listing that equipment.
- G. Where a certain accuracy of sensing and transmitting levels and controlling operations are called for, means must be provided to read or determine that the levels or flows are within

the limits or accuracy specified of the sensing, transmitting, and controlling devices. Where no accuracy is specified, but a knowledge of levels is necessary to set operating points, an indicating device of accuracy consistent with the operation of the system is required.

- H. All control and auxiliary relays shall have indicating LEDs. All timing relays shall have On and timing Out LEDs.
- I. Hardwired Motor Controls:
 - 1. Equipment and wiring specified to be hardwired shall be physically wired independent of controllers, programmable relays, and communication systems to allow manual operation in the event of an emergency.
 - 2. Motor control wiring and logic shall be set up such that in the event of a power failure, equipment shall automatically restart if previously running, or remain off if previously off. A manual reset shall not be required to restart equipment following a power failure.

1.13 GENERAL CONTROL ALGORITHMS

- A. Coordination:
 - 1. The PLC shall send and receive information as required by IDOT to and from all SCADA Systems located at the IDOT District 1 Headquarters in Schaumburg, IL, the electrical Maintenance Contractor (EMC) Dispatch Center in Oak Park, IL, and the IDOT Traffic Systems Center (TSC) in Oak Park, IL. This PLC shall send and receive information to and from all remote SCADA Systems via cellular telemetry. System Supplier shall coordinate with all the above entities to make all information available to the other SCADA Systems.
- B. Programming algorithms described herein and in Part 3—Execution shall reside within the PLC at the pump station.
- C. All analog and digital inputs shall be monitored in the PLC. The following analog signals shall have minimum, maximum, and running average calculated values: all kilowatts, levels, and temperatures. Instantaneous values, totals, maximum, minimum, and average values shall be read by the HMI software and be reset on a daily basis as described below. Minimum, maximum, and average values shall be stored in the PLC for the current day and previous day.
- D. PLCs shall calculate equipment runtimes and number of starts for all equipment where run signals are monitored. Runtimes and number of starts shall be read by the HMI software and be reset on a daily basis as described below.
- E. Totalized electrical values (kilowatt-hours) and equipment runtimes as described above shall be stored in the PLC for a period of 7 days. The PLC shall indicate the specific date for each of the 7 previous days.
- F. Daily runtimes, number of starts, and electrical values (kilowatt-hours) as described above shall be reset on a daily basis.
- G. In addition to the totalizers described above, the PLC shall also calculate cumulative totals for all runtimes, number of starts, and electrical values (kilowatt-hours). Maximum, minimum,

and running average for all analog inputs shall also be included as part of the cumulative total algorithm. Cumulative totals shall totalize until manually reset by the operator. The reset tag within the PLC shall be set by the operator at the HMI software and reset by the PLC. There shall be a manual reset for each signal. The PLC shall display the date of the last cumulative totalizer reset for each signal.

- H. Indication of time remaining for all timers (hardcoded and operator adjustable) within PLCs shall be made available for indication on the HMI.
- I. Float switches shall include time delays to prevent intermittent starting and stopping and/or alarming because of bouncing floats (including hardwired relay logic).
- J. The operator with supervisor level access shall be able to set the processor clock and processor date in the PLC from the HMI software.
- K. All analog signals shall be scaled to engineering units in the PLC with real or floating-point data types to prevent scaling values in the HMI. System Supplier shall provide all analog ranges and PLC register/tag addresses to OWNER and ENGINEER. This shall include upper and lower limits for the associated device (i.e., 0 to 150 psi).
- L. For all analog input signals to the PLC I/O cards, provide transmitter fail alarm at the SCADA System for each transmitter. Transmitter fail shall be defined as the signal from the transmitter being out of range.
- M. The following analog signals shall have associated high and low setpoints and alarms: all levels, amps, and voltages. All high and low alarms shall have dedicated delay (seconds) setpoints.
- N. PLCs shall be set up so that the ranges of all analog input signals to the PLC I/O cards can be configured from the HMI software. Provide two operator-adjustable setpoints for each analog input, one corresponding to 4 mA and the other corresponding to 20 mA. This feature is intended to be used for startup and calibration purposes.
- O. All equipment controlled automatically from the PLC shall have "Call-to-Run" signals generated from their associated PLCs. These signals shall be displayed through the HMI software. Each associated PLC shall also generate a Call-to-Run Fail alarm if the equipment is called-to-run but does not start within a specific time period. The Call-to-Run Fail alarm shall be generated within the PLC software and may not be combined with other fail signals such as hardwired motor fails, and overtemperature. Call-to-Run Fail alarms shall only be active when the selector switch on the motor controller is in the "Auto" position.
- P. In cases where the automatic alternation of equipment is provided by the PLC, indication of the lead, lag, and standby pumps shall be made available for display at the HMI.
- Q. Where a manual reset is required (i.e., level lockout, pressure lockout), the HMI software shall be configured to set a discrete reset bit. Once the PLC receives the bit and the alarm condition has cleared, the PLC shall clear the alarm and place the associated equipment back in service.

- R. The system shall allow the operator to change all setpoints and operating parameters within the PLCs as described herein. All control algorithms and alarms for equipment shall be programmed in the PLC at the pump station. There shall be no control algorithms or alarms in the SCADA computers. Control of each piece of equipment shall be accomplished as described herein and in Part 3—Execution of this section.
- S. The PLC at the pump station shall be set up so that the AEGIS System is activated in the event of a PLC scan fail or in the event that the PLC power supply fails. For the PLC scan fail, there shall be one PLC output hardwired to a relay that the PLC will energize and deenergize every 15 seconds. This relay shall be wired to two time-delay relays (one N.C.T.O. and one N.O.T.C.) that will be hardwired to the alarm dialer (one dedicated channel). In the event either one of the time-delay relays remains in the closed state for longer than 60 seconds, the alarm dialer shall be activated. The PLC power supply shall power an interface relay that, when deenergized, activates the same alarm dialer channel.
- T. Each alarm shall have a discrete PLC tag that is able to be toggled at the HMI to enable or disable the associated alarm from being activated.
- U. Alarm functions shall be capable of being printed out listing both time and date of their occurrence, as well as acknowledgment, the operator that acknowledged the alarm, and the current state of the alarm. Any change in alarm state shall also be capable of being printed. These alarms shall list both station and type of alarm that has occurred. Again, based on demand, a log or record of 24-hour/30-day records shall be kept and stored both by hard copy as well as hard disk or USB drive. All alarm points developed in PLC software, shall each be indicated individually at the SCADA System (i.e., no common alarms).
- V. In the event of a power failure, when power is restored, the PLC shall automatically stagger the restart of any controlled equipment that is being called to run by the PLC. The stagger shall be operator-adjustable from 0 to 300 seconds through the HMI graphics software on the SCADA computers.

1.14 WARRANTY

- A. Standard one-year warranty of the date of Final Acceptance of the entire Project by ENGINEER. Unless otherwise stated below, manufacturer shall warrant the equipment to be free from defects in material and workmanship for a period of one year from Substantial Completion or the date of final acceptance of the project.
- B. In addition, see the gas detectors and monitoring system section for additional warranty information.

PART 2—PRODUCTS

2.01 SCADA HMI RACK-MOUNTED COMPUTER

- A. Provide one fully configured rack-mounted computer system including hardware, peripherals, operating software, application software, and configuration as specified herein for running application, data logging, and trending animation.

- B. SCADA rack-mounted computer shall be Dell, HP, or Lenovo.
- C. The SCADA rack-mounted computer shall have an Intel processor based PC in a rack-mount configuration with the following features as minimum system requirements:
 - 1. Rack-mount configuration.
 - 2. Intel Xeon Processor (6-core, 15MB cache, 3.6 GHz processor, 85W).
 - 3. Memory: Minimum 16 GB 4800 MT/s DDR5 RAM memory.
 - 4. Internal Hard Drive: 1TB, 2.5-inch SATA (7,200 RPM).
 - 5. Removable Media Options: 16x DVD+/- RW or portable external DVD drive.
 - 6. 10/100/1000 Ethernet port, 1 VGA port.
 - 7. Graphics Card shall be dual-port, and capable of running multiple monitors simultaneously. Graphics card shall have a minimum of two HDMI ports.
 - 8. Operating System: Windows 11 (x64) Professional.
 - 9. Minimum 4 USB ports. Standard USB mouse and keyboard shall be included.
 - 10. Dual, hot-plug, redundant power supply.
 - 11. Input Voltage: 90 to 264VAC, autoranging.
 - 12. Line Frequency: 47 to 63 Hz.
 - 13. Operating Temperature: 0°C to 50°C (32°F to 122°F).
 - 14. Operating Humidity: 10 to 90% noncondensing.
 - 15. Operating Vibration: 1g peak, 11 to 500Hz.
 - 16. Operating Shock 15g (1/2 sine, 11ms).
 - 17. Rating: NEMA 1, 12, 4, IP66.
 - 18. Certifications: UL 60950 recognized component, c-UL 950 recognized component, or UL/c-UL listed when marked; CE marked, C-Tick.
- D. Provide a minimum 3-year hardware service plan and onsite service plan.
- E. Provide, install, and configure the latest version of Microsoft Office Professional software on the computer.
- F. The computer shall be programmed for auto-startup and login to Operator after loss of power.
- G. All software shall be licensed to IDOT.
- H. Provide all software on original media, software publisher licenses, and manuals.

2.02 SCADA HMI SOFTWARE

- A. Provide FactoryTalk View SE Client, FactoryTalk Historian SE (500 tags), I/O driver, and other software as required for a complete and operable system that shall be capable of displaying separate screens on each HMI Monitor.
- B. All software shall be licensed to IDOT.
- C. Provide service and support for the above software throughout construction and for one full year after project final completion. Service and support shall include software version

upgrades and service packs. All software shall include manuals, license, and registration cards.

- D. Engineering:
1. System Supplier shall provide all engineering necessary to accomplish and document a system that meets these specifications and is in accordance with the system configuration. The engineering to be performed by System Supplier on this project shall include, but not be limited to, the following categories:
 - a. System layouts.
 - b. Control panel layouts.
 - c. Input/output (I/O) configuration and wiring diagrams.
 - d. Programming of PLCs and coordination of addressing with HMI Programming. Coordination shall include address grouping to allow group transfers to the HMI Software.
 - e. Network layout.
 - f. Cellular communications layout.
 2. Submittals: In addition to submittals previously described, provide:
 - a. Shop Drawing and Product Data.
 - b. Logic Programs.
 - c. Recommended Spare Parts Lists.
 3. Installation: CONTRACTOR shall install all system equipment including, but not limited to, all local I/O enclosures, remote I/O enclosures, and interconnecting cabling. This work shall include all interconnections and wiring from new and existing equipment for completion of the system.
- E. Any and all configuration, programming, setup or other software functions (SOFTWARE) performed on all intelligent devices provided as part of this Project is considered "Work for Hire" under the 1976 Copyright Act as amended (title 17 of the United States Code). The SOFTWARE shall be owned by the Department and shall be turned over to the Department fully documented with accompanying commentary as the work is completed.
- F. The Department intends only to obtain the SOFTWARE for its own use.
- G. The Department will not prevent the SOFTWARE supplier from reuse of the SOFTWARE concepts and ideas for other projects. Any reuse of the SOFTWARE concepts and ideas generated under this Project is solely the responsibility of the SOFTWARE supplier. The SOFTWARE supplier shall defend, indemnify and hold harmless the Department from all claims, damages and expenses including reasonable litigation costs, arising out of any use, misuse or misapplication of SOFTWARE concepts and ideas.

2.03 GRAPHICS AND HMI CONFIGURATION

- A. HMI-1 shall be configured to display various graphics screens as the operator selects for monitoring and control of the Pump Station. HMI-2 shall be configured to display an alarm annunciation-style graphics screen as default with the ability of each HMI to interpose functionality between the two with one click of mouse or active touch space on-screen. Each HMI shall have access to all graphics screens. The HMIs shall operate as redundant equipment.

- B. All color displays shall contain and continuously update the displayed process variables, date and time of day. All process values shall be displayed in engineering units. All displays shall incorporate references to both instrumentation tag numbers and plant equipment numbers as shown on the Drawings. The following basic types of HMI displays are required:
1. Index displays.
 2. Graphic displays.
 3. Trend displays.
 4. Alarm summary displays.
 5. System status displays.
 6. Single point configuration/status displays.
 7. Pop-up displays.
 8. Help displays.
 9. Set-point displays.
 10. PID tuning constants.
 11. Date.
 12. Time.
- C. The HMI displays shall make maximum use of the colors available. Colors for status such as open/close, start/stop shall be the same as the indicators on the local control panels and motor control center. The use of color for status shall be unique and consistent for all graphic screens.
- D. The HMI displays shall be interlinked for easy and direct access. Navigation shall be accomplished by mouse selection from Windows like pulldown menus or via hot links on displays. Display hot links shall allow navigation from the general to the specific and include a "PREVIOUS" select point for reversing the previous 10 navigation steps.
- E. The system shall allow the operator to manually interrogate the status of pumps, valves, etc., via either keyboard entry on the currently displayed graphic screen.
- F. Index displays: Display shall be provided as a guide to the available display options. The index displays shall be a complete and logical listing of the names and number of all screens. Provide hot links on the index displays to allow immediate access to any screen listed.
- G. Graphic displays: The display shall depict basic process schematic diagrams with representative symbols for pumps, etc., combined with real time process variables or conditions. The equipment represented on the display shall be suitably titled for identity. The displays shall be dynamic (i.e., symbols for a pump shall change color indicating run or stop or alarm, the volume of tanks shall be indicated by varying the height of the interior color of the tank symbol, etc.) The data shall be identified on the display by its name and tag number. All of the current data in the database shall be available for graphic displays. It shall be possible to easily modify an existing display or generate a new display. The graphic displays shall consist of a single master plant flow schematic and multiple subscreens detailing specific plant systems or elements. The process graphic displays shall be comprised of master, area and system displays. The master and area displays shall show general graphic representations of the facility covered with general equipment, alarm, analytical summaries and control capabilities. The system display shall detail all relevant aspects of the individual equipment or system (i.e., an individual pump). The intent is to provide the Operator with an overview (Master) with the capability to "zoom in" on a process (Area) or a piece of

equipment (System) as necessary. The System Integrator shall use the Process, Mechanical, and Instrumentation Drawings included as part of this Contract to generate the graphic displays.

1. Trend display: The trend display shall display the value of a process variable versus time. The intent of the display is to resemble the type of plot produced on an analog recorder, only displayed on the HMI. Each of the assigned points will have its point identification number, point name, current value, and instrument range displayed in the color used for its trend. Each point will be trended in a different color. The time period shall be selected and time and date of start, shall be displayed. The values displayed on an historical trend shall consist of the stored values for each variable trended. Provide both historical and real-time trending capability. Real-time trends shall be updated at the scan frequency of the variable. Provide historical and real-time trending for all analog inputs shown on the P&ID. Points shall be logically grouped on a trend screen as requested by IDOT or ENGINEER.
 2. Alarm summary display: The display shall consist of all equipment current in alarm, and shall include the tag number, description, time of occurrence, present status (high, low, normal, etc.). The alarm summary shall identify alarm points by severity by utilizing distinct colors for each severity category. The severity classification shall be a configuration option.
 3. System status displays: The displays shall summarize all error status of all devices in the system capable of reporting errors to the CPU (e.g., printers, communication devices, communication lines, remote PLCs, etc.). The display shall indicate if an error is detected or a failure occurs. These displays shall be used primarily for maintenance purposes.
 4. Single Point Configuration/Status displays: The configuration/status displays shall be of the software vendors standard format.
 5. Pop-up displays: Provide pop-up style displays for operator notification, help screens, or ancillary display functions. Pop-up display shall conform to Microsoft Windows look and feel including pop-up termination or action pushbuttons.
 6. Help displays: Provide process help displays for all graphic screens developed for this project. Help displays shall be pop-up type and provide operator information about the process graphic currently displayed.
 7. Set-point displays: Provide standard display for all PID loops presenting all analog process variables, associated PID set-points and loop tuning parameters stored in the PLC. Provide additional level of password protection prior to allowing any changes to loop tuning parameters.
 8. Electrical metering screen: Displays graphical representation of one line diagram showing breaker status for main and pump breakers and shall show station power status.
 9. Communication screen: Displays graphical representation of communications network showing status for networking equipment and any alarms/errors.
 10. Provide button link graphic icons that allow operator action by selection of the button with the mouse and mouse key. Button link shall be a standard graphic item and be modifiable for any process action or graphic call.
- H. Alarm/Equipment Status Reporting:
1. The alarm log shall store all alarms as they occur. The alarm message shall include the time of occurrence, tag name, tag number, and whether it's a low, high, or failure alarm. When the point in alarm returns to normal, the time, point identification number, and

return to normal shall be printed. All reports shall include the plant equipment number of the associated device.

2. Equipment status shall be logged whenever a change in status occurs (i.e., start, stop). The status monitoring shall be capable of being disabled and/or suppressed from the operator's console. The equipment status log shall include the time, the equipment name, tag number, and the particular change in status.
- I. System Supplier shall include the following as part of the HMI configuration: Meetings at initiation and 50% completion of the HMI with the System Supplier's Programmer, OWNER, and ENGINEER to review graphical user interface layouts, alarm configuration, and security information. The Graphic displays shall be sent to ENGINEER and OWNER on USB flash drive with project-specific label at least 1 week prior to each meeting. All meetings shall be held at the IDOT District 1 Headquarters in Schaumburg, IL. Meetings may be attended by any parties associated with the Contract. At a minimum, one representative of System Supplier capable of making binding decisions related to this scope of work shall attend.
- J. Refer to the appendix for example HMI graphic screens.

2.04 PLC PROGRAM DEVELOPMENT AND SOFTWARE GUIDELINES

- A. The System Integrator shall provide all PLC programming and configuration required to implement the control strategies specified in this Section and shown on Drawings for a complete and fully operational Pump Station.
- B. ControlLogix PLC's shall be programmed using Allen-Bradley RSLogix 5000 (latest version compatible with all software and hardware), and be fully commented.
- C. Provide PLC program fully documented with individual rung and page commentary describing the action and interaction of rung with other control ladder logic. A PDF of sample program will be provided to the successful bidder.
- D. Prior to final completion of construction project, the System Supplier shall turn over two CDs with all PLC programs fully documented and labeled: "Pump Station 49 PLC Programs" with System Suppliers full contact information. Two hardcopy of the PLC program shall accompany the CD.

2.05 PLC PROGRAM DEVELOPMENT GUIDELINES

- A. IDOT will provide sample PLC logic upon request of CONTRACTOR. Sample logic shall be used as the basis for programming development on this project.
- B. Set-points, alarm values, timer values, control loop tuning parameters, and other numeric values used within PLC and HMI programs shall be part of continuous common data table within program. Parameter changes shall not require modification to instructions within program. Parameter changes shall be adjustable by changing data table through operator input via HMI.

- C. Unless specified otherwise, procedure for control power fail restart for equipment shall be as follows:
 - 1. Equipment shall shut down on loss of control power (if UPS has been exhausted).
 - 2. Upon restoration of power, previously running equipment shall be restarted using same sequence of startup used for "Auto" control.
 - 3. Prior to Restart, Auxiliary equipment shall be placed in "Off" position.
 - 4. Equipment Restart shall be sequenced through use of timer functions to prevent simultaneous restart.
- D. PLC shall not be enabled to control equipment unless respective field or MCC Hand/Off/Auto, Local/Remote, On/Off/Remote or Open/Close/Remote selector switch is in "Remote" or "Auto" position. Equipment status monitoring/displaying and process parameter logging/trending shall continue in all modes of control.
- E. E. Determination of high (low) Off-Normal conditions shall be by comparing an analog input value to Operator entered set-point values. Off-Normal status bit shall be set when rising (falling) input value is equal or greater (less) than entered set-point value. Off-Normal status bit shall be reset when falling (rising) input value is equal or less (greater) than entered set-point value minus (plus) entered deadband value. Operator entered high (low) set-point values are absolute values and deadband values are relative values. All values are entered through HMI.
- F. Setting of Off-Normal status bits shall cause status conditions to be displayed and/or alarmed at HMI.
- G. Resetting Off-Normal status bits shall cause status conditions displayed and/or alarmed at HMI to be cleared.
- H. Adjustable delay timers on alarm points shall prevent nuisance alarming or nuisance clearing of alarms. Timer values shall be ranged 0-30 seconds. Initial setting, unless otherwise specified shall be 5 seconds.
- I. All status conditions at HMI shall also be logged to data table and event log.
- J. Motor Running status shall be monitored and displayed at HMI continuously.
- K. Setting of Motor Failed status bits: If motor is required to run via PLC control (MCC Hand/Off/Auto selector switch in "Auto"), and if absence of Motor Running status causes Motor Fail watchdog timer to time out, then Motor Failed status bit shall be set.
- L. Setting a Motor Failed status bit shall cause motor command output to be inhibited and shall cause Motor Failed status to be displayed and alarmed at HMI.
- M. Resetting of Motor Failed status bits: If MCC Hand/Off/Auto selector switch is in "Auto" position, and if failure condition is abated, then Motor Failed status bit shall be reset.
- N. Resetting a Motor Failed status bit shall cause motor command output to be re-enabled and shall cause Motor Failed status displayed and alarmed at HMI to be cleared.

- O. Adjustable filtering of analog inputs shall eliminate process upsets due to noise. Filtering shall be by running-average method.
- P. Integration algorithm shall be included for "Totalizing" analog flow signals.
- Q. Integration algorithm shall be included for "Totalizing" Equipment Run times (Elapsed Time Meter). Pump ETM and Pump number of starts shall be password protected and require Supervisor level verification to reset.
- R. PLC input coils shall be configured as non-latched unless specified otherwise.
- S. PLC output contacts shall be configured as maintained unless specified otherwise.
- T. The following are PLC generated alarms or conditions (specific to Pump Station 49) that are extrapolated based on field I/O conditions:
 - 1. If LIT-007A (located in the upstream Screen Chamber) exceeds 791.50 elevation, then the PLC shall evaluate level differential between LIT-007A (located in the upstream Screen Chamber) and LIT-007B (located in the downstream Screen Chamber). If level differential exceeds an Operator adjustable set-point (initially set at 18 inches) an alarm shall be generated. Level differential calculation shall only be made when LIT-007A exceeds 791.50 elevation. Alarm shall be designated "Bar Screen Blockage".
 - 2. "SCADA MPR Override" output shall be generated if more than one pump exhibits a High Temp or Seal Fail as detected by the Motor Protection Relay (MPR). Effectively, this allows the Lag Pump and the Standby Pump to operate with the MPR in alarm.
 - 3. "Pump Off" is defined as the MCC Hand/Off/Auto switch in the "off" position.
 - 4. "Pump Not Running" is defined as the inverse of pump running.
 - 5. "Pump Fail to Stop" status alarm shall be generated if a Pump is running and Low Water Level float is de-activated.
 - 6. "Pump Alarm" status transmitted to AEGIS shall be determined as any pump in overload, over-temp, seal-fail, or fail-to-start condition.
 - 7. "Not in Auto" is defined as the inverse of any PLC input "In Auto".
 - 8. "Equipment Out Of Service" status shall be determined by main breaker in the off position, and the Hand-Off-Auto selector switch in the off position.
 - 9. "SCADA Call" output to supply fans and exhaust fans is generated whenever lights are on in the Pump Station in a respective area as the fans.
 - 10. "FLOAT FAIL" alarm shall be generated when a float fails to activate when water level (as measured by analog level elements) exceeds the floats expected activation level by more than 12 inches. Additionally, if a float remains active when water level drops below the floats deactivation level by more than 12 inches.
 - 11. "PLC Fail" output that is de-energized when primary and secondary level elements are out of range, and/or both PLC processors fail.
 - 12. An alarm shall be generated if the lights and or the fans in the Pump Station are continuously on for more than (an Operator adjustable) 4 hours.
 - 13. An alarm shall be generated if the primary or secondary analog level signals are outside the two float elevations (above and below) for a period of 30 minutes. Alarmed device shall be removed from all control until remedied.
 - 14. An ultrasonic level sensor alarm shall be generated if an "Out of Bounds", "Fail Safe Fault", or "Loss of Echo" signal is received by the PLC and sustained for 15 seconds or

longer. Alarmed device shall be removed from all control until remedied. Signals are dependent on manufacturer selected.

2.06 HMI PROGRAM DEVELOPMENT GUIDELINE:

A. Graphical Screens:

1. Overview screens and reports shall be first screens configured. Coordinate layout and information requirements with ENGINEER and IDOT prior to development of screens – see EXECUTION Section below for details and requirements.
2. HMI screens shall be developed for the complete operation of the Pump Station as allowed by design and PLC involvement in the processes.
3. Screen development is understood to be partially an art form in conveying the data in graphical manner that is best understood. Screen development shall be a coordinated effort with IDOT with input from being incorporated while staying within the scope of the project. Changes in color, texture, font, area of screen an item is located, and other artistic changes shall be incorporated without additional costs to IDOT.
4. Graphic screens for HMI shall be formatted to resemble P&ID's, one-line diagrams, and physical layout of the Pump Station. As a minimum, one graphic display per process loop shall be provided.
5. Screens shall be simplified representation of process flow stream and associated equipment as shown on Drawings. Only major devices shall be shown. Non-reporting equipment (isolation valves, check valves, indicators) need not be shown.
6. Each screen shall include a legend of shapes and colors that depict status of equipment.
7. The following shall be provided as minimum:
 - a. Main Menu Screen: Icon selection of all graphics screens available for selection.
 - b. Alarm Annunciator-style Screen: The display shall be designed to have the look of an annunciator panel whereby critical Pump Station equipment is listed in individual squares that change color depending upon status of the equipment. If the equipment is operating normal with no alarms, then the square is gray in color. If the equipment is under an alarm condition, the respective square shall turn red and flash. The following equipment (or condition) shall be individually segregated with an alarm square:
 - (1) Low Flow Pump Fail to Start.
 - (2) Low Flow Pump Overtemp/moisture.
 - (3) Low Flow Pump Overload.
 - (4) Main Pump 1 Fail to Start.
 - (5) Main Pump 1 Overtemp/moisture.
 - (6) Main Pump 1 Overload.
 - (7) Main Pump 2 Fail to Start.
 - (8) Main Pump 2 Overtemp/moisture.
 - (9) Main Pump 2 Overload.
 - (10) Main Pump 3 Fail to Start.
 - (11) Main Pump 3 Overtemp/moisture.
 - (12) Main Pump 3 Overload.
 - (13) Low Water Level.
 - (14) High Water Level.
 - (15) Discharge Chamber Flooded.
 - (16) Float Failure.
 - (17) Intrusion Alarm.

- (18) Fire Alarm.
 - (19) Fire Panel Trouble.
 - (20) Normal Electrical service Failure.
 - (21) Emergency Electrical Service Failure.
 - (22) SCADA Power Failure.
 - (23) SCADA Panel Common Alarm.
 - (24) Combustible Gas Alarm.
 - (25) Gas Monitor Failure.
 - (26) UPS Low Battery.
 - (27) UPS Failure.
 - (28) PLC Failure.
 - (29) Pump Not in Auto.
 - (30) Pump "Under Maintenance."
 - (31) Bar Screen Blockage.
 - (32) Level Sensor Alarm.
 - (33) Up to (10) additional as defined by ENGINEER.
- 8. System Overview: Depiction of wet well (including wet well level) and pumps, status of pumps (running/off/under maintenance) and Lead/Lag/Standby position of each pump in the pump sequencer. Icon of all other Screens shall be provided for jump to that specific screen.
 - 9. Float Status Screen: Shows wet well level and status of each float switch with legend for status. This screen may be combined with System Overview Screen if all equipment depictions are clear, concise, and unambiguous to the Operator. Icon of all other Screens shall be provided for jump to that specific screen.
 - 10. Individual Pump Screens: Containing graphical information about each Pump. See Drawings for specific requirements (total runtime hours, total number of starts, running/off/under maintenance status, amps, breaker position, overload, overtemp, seal fail status, not in auto, etc.). Icon of all other Screens shall be provided for jump to that specific screen.
 - 11. Motor Current Alarm Set-points Screen: contains Operator adjustable variables for low and high current limits for each Pump used for alarming and maintenance purposes (pumps will not stop based on these entered values). This may be included on the Individual Pump Screen of space permits. Icon of all other Screens shall be provided for jump to that specific screen.
 - 12. Electrical one-line Diagram Screen: containing status of circuit breakers (green = breaker open, red = breaker closed) as seen by the PLC in a graphical power one-line schematic representation. A legend shall also be included indicating color representation. Each power service shall indicate voltage (A-B, A-C, B-C, and each leg with respect to ground), amps of each leg, frequency, power (kW), and power factor. Icon of all other Screens shall be provided for jump to that specific screen.
 - 13. Network Communications Diagram. Icon of all other Screens shall be provided for jump to that specific screen.
 - 14. Generator Screen: containing status of generator circuit breaker (green = breaker open, red = breaker closed) as seen by the PLC in a graphical power one-line schematic representation. A legend shall also be included indicating color representation. Generator service shall indicate voltage (A-B, A-C, B-C, and each leg with respect to ground), amps of each leg, frequency, power (kW), and power factor. Icon of all other Screens shall be provided for jump to that specific screen.

15. Analog Level Element Set-point Screen: contains Operator adjustable variables for Pump on/off level operation. A default level setting matrix shall also be included as the default Pump Station settings, with a reset-to-defaults selection available. A graphical representation of wet well, with pumps listed at various levels (Lead, Lag, etc.) on the left side of wet well in order of operation. The numerical level of each level element with floats also represented as reference to the analog level. An Operator adjustable set-point (initially set at 18") shall be provided whereby a level differential between level sensor in the upstream Screen Chamber and the level sensor in the downstream Screen Chamber shall cause an alarm. Icon of all other Screens shall be provided for jump to that specific screen.
 16. Station Status Screen: contains depiction of all PLC's and their status with regards to power and communications. Also contains the following: status of each supply and exhaust fan, gas monitor status, fire alarm panel status, AEGIS alarm status, key switch box position, and pump room lighting status, etc. Icon of all other Screens shall be provided for jump to that specific screen.
 17. Alarm Screens: contains all alarms in a LED style depiction with status of each (normal = green, alarm = red). Any device, equipment, or PLC generated alarm shall be represented with time and date stamp.
 18. Event logs and password protected system administration screens.
 19. AEGIS Common Alarm Screen: There is a SCADA Common Alarm that is transmitted to the AEGIS Panel for alerting outside entities of possible alarms in the Pump Station (from Pump Failure, lights on, etc.). Provide an alarm selection screen whereby the Operator may select which Pump Station alarm conditions will be part of the SCADA Common Alarm that is transmitted to the AEGIS Panel. This screen shall have each alarm condition listed and a check box selection matrix. This screen is provided as a means to de-select possible nuisance alarm conditions.
 20. Trend Screen: Operator adjustable points for trending. Provide trending capability for all analog inputs at PLC. 96 hours retained trend data minimum.
 21. Operator and Engineering screens shall be segregated to allow password protection of engineering-entered values.
 22. There shall be pick-fields on all screens that will allow for return to main menu or to adjacent process flow screen (continuation of all process flow paths, either entering or existing).
 23. Pick-fields shall be activated by placing mouse cursor on object or text and clicking left mouse button, or by selection of associated function key (F1-F12).
- B. Data Input:
1. Data entry areas shall be provided at HMI for adjustment of process and alarm set-points. Data entry areas shall be password protected.
 2. Upper and lower limits shall be provided for all data entry values. Entry of values outside of limits shall not be accepted and shall generate appropriate error message on screen. Upper and lower limit values shall be adjustable at HMI and shall be password protected.
 3. Upper and lower limits shall be provided for all logged analog input values. Logged values outside of limits shall generate appropriate alarm. Upper and lower limit values shall be adjustable at HMI and shall be password protected.
 4. Upper and lower limits shall determine range of analog input value. Value shall be scaled in standard Engineering Units.

5. Password protection shall consist of alpha-numeric sequence and shall be intended for Plant Supervisor and Head Operator entry only.
 6. Unless otherwise specified process points shall be scanned as follows:
 - a. Critical Alarm points and analog input process points shall be scanned continuously.
 - b. General Alarm points shall be scanned only on change of state into alarm condition.
 - c. All other points scanned only when required for display at HMI.
 - d. All dynamic screen displays shall be updated every 2 seconds, minimum.
- C. Display Objects – General:
1. Process piping and pumps/fans/mixers may be animated with color to show active/non-active status.
 2. Use graphic symbology for rendering of objects.
- D. Display Objects – Process Lines and Inline Device Symbology:
1. Where inline devices are dynamic in nature, their equipment symbols shall be formatted as Display Objects to change color based upon feedback. Coordinate color use with Department's existing HMI configuration. Recommended color use:
 - a. Off – Red.
 - b. On – Green.
 - c. Fail/Alarm – Red, Flashing.
 - d. Status – Amber.
 2. Inline devices shall have alphanumeric tag identified near them, adjacent to associated symbol.
 3. Arrow heads shall be used as pointers for flow direction at all points of entrance to equipment, at all points where process lines change direction and at points of merger.
 4. Process lines entering or leaving screen shall have points of continuation identified by boxed text, indicating From/To screen. One end of box shall form arrow to show direction of flow and act as pick-field for selection of screen of continuation. Color shall be same as associated process line.
 5. Process lines shall be identified with flow stream abbreviation as listed in standard symbolic table and as shown on Drawings, where convenient.
- E. Display Objects – Data Fields:
1. Analog process data not conducive to graphic symbology shall be formatted as rectangular Data Fields.
 2. Process values (i.e. Flow, Elapsed Time) shall be displayed as Data Fields near associated device symbol and shall consist of: alphanumeric tag, green in color; data value, white in color, right justified; engineering unit, green in color. Entire field shall be grouped as one block.
 3. Data Fields shall be configured with high and low limits (adjustable) as described above.
- F. Display Objects – Status Displays:
1. Status Displays shall be similar to Data Fields but shall be linked to discrete data points or status bits.
 2. Discrete equipment parameters (i.e. Run, Fail, On/Off, Open/Close) shall be indicated as rectangular Status Displays and shall consist of: alphanumeric tag, green in color; single or dual-state equipment value, white in color, center justified. Entire field shall be grouped as one block.
 3. Displays shall be classified as Alarms or Events (see below).

- G. Data Entry Field: Similar to Data Display Field described above. Allows Operator entry of process values such as set-points. Pop-up activation for dynamic control of equipment shall be by pick-fields associated with symbol of device to be controlled. Pop-up shall be small window or graphic overlay on current screen in location that will not interfere with current operation. Pop-up will contain necessary symbolism for dynamic control and worded prompts as necessary.
- H. Alarming Requirements:
 - 1. Alarms and Events shall be logged to data file.
 - 2. Critical alarms shall alert AEGIS system (See selection matrix above).
 - 3. Alarms shall fall within one of following categories.
 - a. Critical: Alarms displayed and annunciated at AEGIS and broadcast to IDOT District 1, IDOT TSC, and Maintenance Contractor Facility.
 - b. General: Alarms displayed and annunciated at local HMI and logged to alarm event file.
 - 4. Provide alarm summary screen(s) at HMI.
 - 5. Display only current alarms. Acknowledged alarms which are no longer active shall not be displayed.
 - 6. Allow operator to acknowledge alarms using single keystroke or cursor pick at alarm summary screen.
 - 7. Alarm Display shall include following information:
 - a. Time and date alarm initially occurred.
 - b. Alarm point identification.
 - c. Alarm value and engineering units for alarms generated from analog process points.
 - d. Description of alarm (up to 40 characters).
 - 8. Events shall be logged to separate data file. Events shall not be displayed unless evoked and shall not be annunciated.
 - 9. In addition to the above, an alarm matrix shall be developed for expanding upon basic FactoryTalk alarming features which allow the Operator to select which alarms shall transmit to AEGIS when active (described in greater detail above).
 - 10. The Operator shall have the ability to silence alarms.
 - 11. The alarm silence feature shall also have a manual override.
- I. Data Logging requirements – Analog and Discrete:
 - 1. All input process points shall be logged to the hard disk of the HMI computer.
 - 2. Procedure for data collection and storage shall be as follows:
 - a. HMI I/O driver shall poll process points as specified on I/O list and transfer data to image table.
 - b. HMI shall scan image table for analog process points once every second, and log value to data base.
 - c. HMI shall calculate minimum, maximum and average for each analog process point and log to data base.
 - d. HMI shall scan image table for discrete process points on status change only, and log value to data base.
- J. Trend Display Requirements:
 - 1. Configure HMI computer to display logged data in graphical trend format.

2. Trend Display Requirements:
 - a. Identification of process point being displayed. Use same nomenclature as used on HMI screens.
 - b. Start and end time of data being displayed.
 - c. Display shall incorporate movable vertical cursor along time axis. Parameter values at cursor date and time shall be displayed digitally.
 - d. Initial configuration of displays shall display data from present time back to 96 hrs prior to present time. Provide capability for operator to enter new start time for data being displayed to view parameter trend more than 96 hrs old. System shall be capable of retrieving 1 year of stored data.
 - e. Displays shall include y-axis range identification, including values and engineering units.
 - f. Configure trend displays to use maximum of computer screen area possible for purpose of increased resolution.
 - g. Trend displays shall be accessible, via single keystroke, from graphic screen displaying trended point.
3. Organize graphics screens for trend displays into categories by process:
 - a. Provide separate graphic screen within each category to display each process point trend. Provide different color for each process point.
 - b. Provide separate category for manually entered data from HMI computer.

2.07 SCADA HMI TOUCHSCREEN MONITORS

- A. Provide two HMI screens touchscreen monitors on the front of SCADA Panel SP-49 where shown on the Drawings. HMI touchscreen monitors shall be as follows:
 1. Voltage: 100 VAC to 240 VAC.
 2. Temperature: 0°C to 50°C (32°F to 122°F).
 3. Humidity: 20% to 90% non-condensing.
 4. Type: Single-touch Analog Resistive Touch Screen.
 5. Display Size: Minimum 22-inch.
 6. Resolution: 1920 x 1080, 16:9 aspect ratio, 16.7 million colors.
 7. Brightness: 350 nits.
 8. Response Time: 14 ms.
 9. Panel Rating: NEMA 4X, with stainless steel faceplate.
 10. Input Type: HDMI visual/audio and USB control.
 11. Warranties: Three-year factory warranty.
- B. Touchscreen monitors shall be Hope Industrial model HIS-ML22-STAC, Beetrionics, or Maple Systems. Provide cable lengths as required to connect rack-mounted computer to touchscreen monitor.

2.08 ELECTRONIC INDICATORS

- A. The electronic indicators shall be 6-digit LED type. LED lights shall be a minimum of 0.56 inch. The instrument shall accept a 4-20 mAdc input signal. The meter accuracy shall be $\pm 0.01\%$ of full scale. Scales shall be as required.

2.09 EQUIPMENT ENCLOSURES

- A. New enclosures shall be front access only, minimum No. 14 gauge steel, with continuously-hinged doors. Enclosures equal to or smaller than 24 inches wide by 24 inches high shall be equipped with at least two quarter turn latches. Enclosures larger than 24 inches in any dimension shall be equipped with 3-point latch with top and bottom bolts actuated by one rotating, lockable handle on each door. Provide a door stop kit for each door, data pocket for wiring diagrams, and minimum 12-inch, bolt-on, LED light and door switch. Panels over 48 inches wide shall have two lights. Painting shall include phosphate treatment, zinc chromate iron oxide primer, baked rust-inhibiting enamel, and white interior. All doors and panels shall be gasketed. All louvers shall be filtered and forced-air cooling shall be provided as necessary for conditions where installed. Provide enclosure dimensions as specified herein. MCC structures are not acceptable. Where installed next to motor control centers, enclosure color shall match that of the MCC.
- B. Each PLC enclosure shall include, but not be limited to, the following equipment:
 - 1. PLC, I/O modules, and communication modules.
 - 2. Power supplies.
 - 3. Surge protective devices.
 - 4. DIN-rail mounted terminal blocks for field wiring terminations.
 - 5. Plastic wiring ducts.
 - 6. General purpose 15-amp, 120-volt AC duplex GFCI receptacle.
 - 7. 20-amp, 120-volt AC main circuit breaker and branch circuit breakers as required to feed the PLC and the I/O controlled field devices.
 - 8. Other accessories required to provide a complete and working PLC system.
 - 9. Front panel-mounted programming port with RJ-45 jack and 120-volt receptacle.
- C. The equipment mounted within the enclosures shall be mounted on the enclosure back panel, neatly organized, and shall be in accordance with the manufacturer's recommendations.
- D. Refer to Section 26 05 53—Electrical Identification for the control panel and field wiring color code.
- E. 24 VDC power supplies shall be provided in the enclosures to power all 24 VDC devices and loop-powered analog input signals, where required.
- F. NEMA ratings of enclosures shall be as required for the area where installed, unless specified otherwise.
- G. Manufacturer of Accessories:
 - 1. Terminal blocks shall meet the requirements of Section 26 05 19—Wire.
 - 2. Wire markers shall meet the requirements of Section 26 05 53—Electrical Identification.
 - 3. Circuit breakers shall be Square D Type QO, Eaton, or GE with mounting bases. Circuit breakers can be rail-mounted type, Square D, Class 9080, Type GCB-150, Eaton FAZ-NA, or GE.
 - 4. Power supplies shall be Sola, DIN rail mount, SPD or SDN Series, PULS CP or CD series, or Phoenix Contact..

- H. All wiring within the enclosure shall be through plastic wiring troughs. Plastic wiring troughs shall have removable covers. Maximum fill for wiring troughs shall be 60%. All wiring in supervisory enclosures and control panels not in wiring troughs shall be bound with continuous-type spiral windings. Terminal strips located adjacent to wiring troughs shall have a minimum of 1 1/2 inches between terminal strip and wiring trough. All wiring labels shall be able to be read without removing wiring trough covers. Wiring troughs shall be provided for all field wiring.
- I. All wiring for new panels shall be done in the factory, Class II, Type C with master terminal strips for exterior connections. Terminal strips shall be located either at the bottom or on the side of the enclosure, depending on where the I/O conduits penetrate the enclosure. Splices are not allowed within enclosures or wireways. All enclosures must pass through doors to point of installation, and if enclosures are shipped in sections, all wiring and connections between sections shall be done by CONTRACTOR. The field wiring terminals shall be clearly identified as to which I/O terminals they are wired. Jumpers between adjacent terminal blocks shall be copper jumper bars supplied by the terminal block manufacturer. All wiring shall be labeled at each end with corresponding numbers matching the associated terminal block. This numbering shall be shown on the shop and Record Drawings.
- J. All door-mounted devices shall be furnished flush-mounted, and an exterior-engraved phenolic nameplate worded as shown on the Drawings shall be provided for each component, device, and light. All components within the enclosures shall be identified with engraved phenolic nameplates. Nameplates shall be installed on the enclosure back panel and not on the device or wireway. Devices shall be grouped for each device or unit being controlled.
- K. All panels with DIN rail-mounted equipment shall include a minimum of 25% spare DIN rail space.
- L. In addition to spare I/O shown on the Drawings, provide a minimum of 25% spare hot and neutral terminals wired to terminal strips. Spares shall be provided for all voltage sources within the panel (e.g., 120 V, 24 V).
- M. Enclosures that include motor controllers shall have a main disconnect for the enclosure.

2.10 CONTROLLOGIX PROGRAMMABLE LOGIC CONTROLLERS

- A. Construction:
 - 1. A single local chassis shall house a CPU, memory, and communications.
 - 2. Separate power supplies shall supply necessary power to each chassis.
 - 3. All system modules shall be chassis mounted.
 - 4. All system modules shall be able to operate in an industrial environment with an ambient temperature of 32°F to 140°F.
 - 5. All system modules shall be able to operate in a free airflow environment.
 - 6. All system modules shall be able to operate in high electrical noise environments.

- B. The system shall support a minimum of eight local I/O expansion modules in up to three chassis, along with remote I/O expansion modules connected via the Ethernet network.
 - 1. Local expansion modules shall be installed in the local chassis or in chassis adjacent to the local chassis.
 - 2. The manufacturer shall have available a variety of I/O modules, including, but not limited to, AC or DC discrete input, AC or DC relay contact output, 4-20 mA analog input and output, and RTD.
 - 3. Each chassis in multiple-chassis installations shall be interconnected via Ethernet.
 - 4. Discrete I/O cards shall be 120 VAC 16 point maximum, unless otherwise noted.
 - 5. Isolated discrete I/O cards shall be 16 point maximum. Isolated discrete cards shall be used if there are multiple or external power sources associated with the signals, if wiring leaves the building, or if the card is driving a load (i.e., solenoids, etc.).
 - 6. Analog input cards shall be 8 point.
 - 7. Analog output cards shall be 8 point isolated type.
- C. Central Processing Unit (CPU):
 - 1. The CPU shall be a self-contained unit, and shall be capable of providing control program execution, supporting remote and local programming, controlling all I/O scanning and inter-controller and peripheral communication and diagnostic functions as follows:
 - a. 32 tasks (100 programs per task):
 - (1) Continuous—one allowed.
 - (2) Periodic—Run via an interrupt at a user-defined interval in 1 μ s increments from 1 ms to 2000 s.
 - (3) Event—Triggered by consumed tag or EVENT instruction.
 - b. 256 controller connections.
 - c. Network connections:
 - (1) Up to 256 Ethernet/IP.
 - (2) Up to 128 TCP/IP.
 - 2. The PLC shall organize user applications as tasks, which can be specified as continuous, periodic, or event based. Tasks shall be triggered by input point or instruction.
 - 3. The CPU shall have a real-time clock.
 - 4. When the main power supply is removed, the CPU shall have the ability to back up user program and all data, or a nonenergy storage option.
 - 5. The front of the CPU shall have a USB port.
 - 6. The front of the CPU shall have an integrated latching mechanism for securing the secure digital (SD) memory card. The PLC shall operate with the memory card removed.
 - 7. The processor module shall have LED indicators to indicate CPU status.
 - 8. The processor module shall have a mode switch.
- D. Memory:
 - 1. The PLC shall have a minimum of 4 MB of standard user memory. Provide processor configurations with additional memory as required.
 - 2. The program storage medium shall be solid-state, nonvolatile type.
 - 3. The PLC shall include a 1 GB SD memory card to store the user program and the firmware of all modules residing in the same chassis to protect against memory loss.

- E. Programming Environment:
 - 1. Programming shall be through the USB 2.0 port or through the Ethernet/IP network.
 - 2. The programming software shall run on the latest version of Windows and the programming methods shall be:
 - a. IEC 61131-3 compliant ladder diagram.
 - b. Structured text.
 - c. Function block diagram.
 - d. Sequential function chart.
- F. Communication:
 - 1. USB 2.0 port to support upload and download, online edits, firmware updates, and bridging to other modules.
 - 2. Ethernet/IP switch and dual 10/100/1000 Mbps Ethernet/IP ports with unique IP addresses or a single IP address when connected as part of a device level ring. The interface shall support:
 - a. IEEE 802.3 Physical and Data Link Standard.
 - b. Common Industrial Protocol (CIP), the protocol that provides real-time I/O messaging and information/peer-to-peer messaging.
 - c. Standard TCP/IP and UDP/IP communication.
 - d. 10/100/1000 Mbps auto sensing and auto switching.
 - e. Standard Ethernet media.
 - f. Subnet masking.
 - g. BOOTP and DHCP support.
 - h. Manual configuration using specified software.
 - i. Programmable Logic Controller messaging to peer controllers and workstations.
 - j. I/O data, real-time interlocking and information.
 - k. Full or half-duplex communication.
 - l. Built-in web access to diagnostics.
 - m. I/O control.
 - n. Precision Time Protocol (CIP Sync, IEEE 1588).
- G. Power Supply:
 - 1. The power supply shall operate on 120 VAC, single-phase.
 - 2. A single, main power supply shall be capable of supplying all necessary power to the local chassis housing the CPU and local I/O modules. Each PLC chassis and I/O chassis shall have two redundant power supplies, as manufactured by Rockwell Automation, ControlLogix 1756-PA75R, with ControlLogix 1756-PSCA2, redundant power supply adapter.
 - 3. The power supply shall be capable of converting AC power to the DC power required to operate the PLC system.
 - 4. The power supply shall include an easily viewed indicator to show status of the DC power applied to the backplane.
 - 5. The power supply shall provide electronic protection:
 - a. At the time of power-up, the power supply shall inhibit operation of the controller and I/O modules until the DC voltages are within specifications.
 - b. The power supply shall automatically shut down the PLC when its output power exceeds 125% of its rated power.
 - c. The power supply shall provide surge protection, isolation and outage carry-over of up to 6 cycles of the AC line or 40 ms at 24 VDC.

- d. The power supply shall be fused.
- H. PLCs shall be as manufactured by Rockwell Automation, ControlLogix 5570 L7 Series.
- I. PLC Programming and PLC Software: System Supplier shall provide all PLC programming and software required to meet this specification. The software shall include, but not be limited to, the following:
 - 1. PLC logic programs to be written by System Supplier for the PLC systems to accomplish the monitoring and control functions as specified herein. The System Supplier shall document and annotate the programs, update them as required after startup, and then turn two copies of the programs over to OWNER on two USB flash drives with project-specific labels.
 - 2. All I/O addressing that is to be viewed or manipulated by the HMI software shall be organized into contiguous blocks of integer tags for discrete bits and floating point tags for all other values to facilitate block data transfer between computers and PLCs.
 - 3. Provide PLC program fully documented with individual rung and page commentary describing the action and interaction of rung with other control ladder logic. IDOT standard programming code shall be used as basis, and is available as .pdf during bid-phase upon request.
- J. Communication modules shall communicate via the Ethernet/IP network protocol between each PLC chassis and I/O Chassis. Each PLC chassis shall have a redundancy module as manufactured by Rockwell Automation, ControlLogix 1756-RM2. Provide a premanufactured 3 meter fiber optic cable, model 1756-RMC1, between each redundancy module. Communication modules shall be as manufactured by Rockwell Automation, ControlLogix 1756-AENTR.

2.11 INDUSTRIAL CONTROL RELAYS AND CONTACTORS

- A. Industrial control and power relays shall be installed in motor control centers, pump control panels, and motor controller enclosures where required by System Supplier. Relays used to interface with PLC I/O, motor control circuits, hard-wired control logic, and for loads less than 8 amps shall be terminal style, interposing/isolation relays. Relays for inductive loads, alarm lights, alarm horns, field wiring, or loads up to 15 amps shall be industrial, general purpose square base relays. Relays for monitoring the output voltage of uninterruptable power supplies shall be UPS voltage monitoring relays. Contactors for lighting circuits, branch circuits, or loads greater than 15 amps shall be industrial, electrically-held lighting contactors. Contactors for motor power control shall be industrial, electrically-held power contactors.
- B. Relays shall meet the following requirements:
 - 1. Interposing/isolation relays:
 - a. Configuration: SPDT or DPDT as required by System Supplier.
 - b. Mounting: DIN rail with screw terminal base socket.
 - c. Voltage: 120 VAC, or as required by System Supplier.
 - d. Contact rating: 8 A (DPDT), 16 A (SPDT).
 - e. Operating life: 10 million cycles.
 - f. Status: On-Off flag-type or LED indicator.
 - g. UL listed.

2. General purpose relays:
 - a. Configuration: DPDT or 3PDT as required by System Supplier.
 - b. Mounting: DIN rail with screw terminal base socket.
 - c. Voltage: 120 VAC.
 - d. Contact rating: 15 A, minimum; 3/4 hp.
 - e. Operating life: 10 million cycles.
 - f. Status: On-Off flag-type or LED indicator.
 - g. UL listed.
3. UPS voltage monitoring relays:
 - a. Configuration: SPDT.
 - b. Mounting: DIN rail.
 - c. Voltage: 120 VAC.
 - d. Contact rating: 15 A.
 - e. Operating life: 10 million cycles.
 - f. Over-voltage range: 80 to 150 VAC, adjustable.
 - g. Under-voltage range: 30 to 95% of pickup, adjustable.
 - h. Drop-out time delay: 0.1 to 10 seconds, adjustable.
 - i. UL listed.
4. Lighting contactors:
 - a. Configuration: Electrically-held, 2-12 poles.
 - b. Mounting: DIN rail.
 - c. Voltage: 120 VAC.
 - d. Contact rating: 30 A continuous.
 - e. UL listed.
5. Power contactors:
 - a. Configuration: Electrically-held, 3 poles.
 - b. Mounting: DIN rail.
 - c. Voltage: 120 VAC.
 - d. Minimum contact rating: 20 A continuous, 1 hp.
 - e. Operating life: 1.3 million cycles.
 - f. UL listed.
 - g. NEMA rated.

2.12 FLOAT SWITCHES

- A. Float switches when specified herein, shown on the Drawings, or necessary to complete an operating system shall be as follows:
 1. The float switches shall be mercury free and consist of a 304 stainless steel housing 5 1/2 inches in diameter, stainless steel mounting clamp, a flexible two-conductor cable with a CPE jacket, and a potted SPST magnetic reed switch. Provide switch configuration (NO or NC) as required. The electrical load for the switch contacts shall be 100 VA at up to 250 volts. Float switches shall include a two-conductor cable 16 AWG with fine strands made for heavy flexing service and underwater use. Provide cable length as required for a continuous run to the terminating control panel. Provide a minimum 10 feet of slack in all cables in wet wells and tanks. A green grounding wire shall connect internally to the float housing.
 2. Weight and buoyancy shall be such that contaminants will not result in the float switch changing operating level more than 1-inch.
 3. Operating temperature range shall be -31°F to 110°F.

- B. Floats shall be mounted on a stainless steel cable with PVC-covered anchor according to manufacturer's instructions. All mounting hardware shall be stainless steel and provided with the floats.
- C. Provide stainless steel kellum grips for each float cable.
- D. All floats indicated on the Drawings or specified herein to be intrinsically safe in design shall be as such. Provide intrinsically safe barriers as specified herein.

2.13 LIMIT SWITCHES

- A. Limit switches (door switches) where called for on the Drawings shall be Square D, Class 9007, Type C, Honeywell, or Allen-Bradley. CONTRACTOR shall provide head and body style to fit application. Limit switches in hazardous locations shall be rated for a Class I, Division 1, Groups C and D location where shown on the Drawings. The door switch contacts shall be closed when the door is open and open when the door is closed.

2.14 CURRENT SWITCHES

- A. Current switches where called for shall be Veris Industries, Hawkeye H800HV, Automation Components Inc., or Eaton, and include DIN rail mounting hardware.

2.15 SUBMERSIBLE LEVEL TRANSMITTERS

- A. Where indicated on the Drawings, levels shall be sensed by a submersible pressure transmitter. The transmitter shall be a KPSI Model 750, Siemens A1000i, or PMC Engineering, loop powered submersible pressure transmitter, with an intrinsically safe wiring barrier. The transmitter shall be of the head-pressure sensing type, suitable for continuous submergence and operation, and shall be installed in accordance with manufacturer's instructions. The bottom diaphragm face of the sensor shall be installed at an elevation as shown on the Drawings. The sensor shall be mounted using a self-supporting cable system; location shall be determined in the field. Cable shall be vented, reinforced, and rated for full weight of transmitter. A separate support cable or anchor shall not be required. Provide stainless steel Kellum grip at suspension point.
- B. If necessary for the installation/application, transmitter shall include a terminal connection box. Moisture protection shall be provided for all units through an aneroid bellows.
- C. The transmitter shall sense water level (pressure) variations and transform these variations directly into a standard process signal of 4-20 mA over the desired level range (span). The transmitter shall be completely solid-state, with no mechanical linkages or moving parts. Supply voltage shall be as required by CONTRACTOR. Accuracy shall be $\pm 0.25\%$ of full scale. Transmitter shall be backed by a minimum 2-year warranty.
- D. The transmitter shall incorporate a variable-capacitance transducer element to convert the sensed pressure to a corresponding electrical value. The sensed media shall exert its pressure against a PTFE chemical coated Buna-N or elastomeric diaphragm that flexes minutely so as to vary its proximity to a ceramic substrate to vary the capacitance of an

electrical field created between the two surfaces. A stable, hybrid, operational amplifier assembly shall be incorporated in the transmitter to excite and demodulate the sensing mechanism. The transmitter shall incorporate laser-trimmed, temperature compensation to provide a precise, reliable, stable output signal directly proportional to the sensed pressure over a factory-calibrated range. Operating pressure range of the transmitter shall be approximately 0 to 15 psig.

2.16 ULTRASONIC LEVEL TRANSMITTERS

- A. Ultrasonic level transmitters shall utilize an ultrasonic, noncontacting method to measure level with an accuracy of $\pm 0.25\%$ of measurement. Level calculation shall be selectable from a "standard" exponent for the given tank type but shall allow field entry of user-selected exponents. A four-digit local display shall allow operator-selected display of level, and level shall be field-programmed for units of feet, inches, etc. All adjustments shall be by digital values in EEPROM, providing memory storage through power failures without requiring battery backup. Levels shall be stored to EEPROM to minimize lost data during a power outage. Field adjustments shall include zero, span, blanking, and dampening. Programming shall be performed by a 4-button HMI, maintaining NEMA 4X enclosure integrity during programming or when removed from the enclosure. Output shall be 4-20 mA_{dc} into a 350-ohm load and a pulse output.
- B. Transducers in non-rated locations shall be FM approved and have an operating range of -40°F to 200°F.
- C. Transducers in Class I locations shall be FM approved as being suitable for Class I, Division 1, Groups A, B, C, and D locations and shall have an operating range of -40°F to 200°F.
- D. The transducer radiating surface shall be self-cleaning and shall operate without problems in moisture, dust, and frost. It shall be suited for continuous submergence, with the interconnecting cable splice made above flood level. The transducer shall be designed to amplify acoustic output 54 times over normal outputs. Transducer beam angle shall be 6 degrees. Where differential level measurement is required, two transducers shall be provided. CONTRACTOR shall coordinate transducer mounting height with maximum water level to be monitored.
- E. The interconnecting cable between transducer and the transmitter shall be provided with the instrument, limited to 1,200 feet, and be run in a conduit separate from other wires or cables. The transmitter shall be temperature compensated through an internal temperature sensor within the transducer. Provide a 120-volt AC power source for the amplifier.
- F. The transmitter enclosure shall house the amplifier and digital indicator in a NEMA 4X enclosure suitable for indoor or outdoor installation.

2.17 THERMOSTATS

- A. Thermostats associated with the SCADA System as shown on the Drawings shall be provided by System Supplier and be as specified in Section 26 27 26—Wiring Devices.

Thermostats shown to be not associated with the SCADA System on the Drawings shall be provided as part of Section 26 27 26–Wiring Devices.

2.18 SURGE PROTECTIVE DEVICES FOR CONTROL PANELS, INSTRUMENTATION, AND NETWORK EQUIPMENT

- A. The incoming power supply of each control panel supervisory control center shall be protected with a surge protective device (SPD). Surge protection shall be provided for all phases and neutral.
- B. Each analog signal entering or leaving a supervisory control panel and leaving a building shall be provided with a DIN-rail mounted surge protection device. Each transmitter shall be provided with a surge protection device on the output and on the power supply. Surge protection shall be provided for all phases and neutral.

2.19 INTRINSIC SAFETY BARRIERS

- A. Instrumentation equipment located in hazardous areas as noted on the Drawings shall be wired to intrinsic safety barriers. Safety barriers for discrete devices shall include indicating LED and be DIN-rail mounted, as manufactured by Phoenix Contact, Model MACX MCR-EX-SL-2NAM, (voltage as required), PR Electronics, Model 5202B2, or Eaton. Safety barriers for analog devices shall be DIN-rail mounted, as manufactured by Phoenix, Model MACX MCR-EX-SL-RPSSI, PR Electronics, Model 5104B, or Eaton.

2.20 INDUSTRIAL ETHERNET SWITCHES

- A. Rack-Mounted Managed Switches–Gigabit Uplink: Provide managed Ethernet network switches with Gigabit-Uplink SFP ports where shown on the Drawings. Network switches shall be as manufactured by N-tron model 7026TX, Hirschman, or Cisco. Each switch shall include, but not be limited to, the following:
 - 1. Selectable Gigabit Ethernet star or ring topology with redundant fail-over. Switches shall be configured for a ring topology, unless noted otherwise.
 - 2. DIN rail mounting and redundant 24-volt DC power supply inputs. Provide redundant power supplies.
 - 3. Command line interface, DHCP, and store and forward switching.
 - 4. SNTP real time clock.
 - 5. IP and MAC port security and SNMPv3.
 - 6. Compliance with the following IEEE Standards: 802.1D, 802.1p QoS, 802.3, 802.3u, 802.3x flow control, 802.1w RSTP, and 802.1Q VLAN.
 - 7. SNMP with web browsing for switch configuration, diagnostics, and monitoring.
 - 8. Up to 24 copper 10/100 Fast Ethernet ports. The switch shall have a minimum of 25% spare ports.

2.21 GAS DETECTORS AND MONITORING SYSTEMS

- A. Combustible and hazardous gas detectors shall consist of transmitters with displays and remotely mounted sensors. Sensor/transmitter unit shall be designed so that the sensors are able to be field-replaced without the use of tools and without exposing personnel to explosion hazards. Detectors shall be capable of detecting hydrocarbon combustible

gasses, including but not limited to: methane and propane. Provide transmitters and sensors as shown on the Drawings.

- B. Sensors shall contain all relevant sensor information (sensor manufacturer, date, gas type, gas range, calibration data) within the sensor module. Sensor shall not require a battery or other power source to maintain the sensor information.
 - 1. Hydrocarbon combustible gas sensors shall be IR Combustible type.
 - a. The sensor shall be a microprocessor-based infrared point gas detector capable of continuously monitoring 0% to 100% IR combustible gas LEL.
 - b. The sensor shall be based on dual wavelength, heated-optics technology, providing definitive compensation for temperature, humidity, and aging effects.
 - c. The sensor shall be capable of complete calibration using oxygen only. Sensor shall be capable of performing a full calibration by zero adjustment only one time per year.
 - d. The sensor shall detect an above 100% LEL condition (over-range). This condition shall be indicated on the transmitter display.
 - e. The sensor shall not contain a flashback arrestor/frit.
 - f. Sensors shall have <2% full scale/year zero drift stability, $\pm 1\%$ full scale repeatability, $\pm 2\%$ full scale accuracy for <50% LEL, $\pm 5\%$ full scale accuracy for >50% LEL, and a response time to a 90% change in gas concentration of <2 sec with the sensor guard removed.
 - g. Sensor shall include diffusion supervision to detect sensor inlet blockage.
 - h. Sensor shall include splash guard and flexible polymer tubing from sensor down to 3 feet 0-inch above finished floor.
 - i. Sensors shall be MSA IR Plus Series, General Monitors "Smart Sensor" Series, or Honeywell.
 - 2. Sensors shall be equipped with a 3/4-inch NPT conduit entry with explosion-proof conduit assembly containing terminal strip for wiring to sensor.
 - 3. Sensors shall be constructed of 316 stainless steel and be rated for Class I, Division 1, Groups C and D locations.
 - 4. Each sensor shall be mounted at height and orientation recommended by sensor manufacturer.
 - 5. The sensors shall be certified for removal in a hazardous location while the transmitter is powered.
- C. Transmitter shall be microprocessor-based, capable of powering and monitoring up to two remote sensors.
 - 1. Transmitter shall accept 24 VDC power.
 - 2. Transmitter shall be equipped with two 4-20 mA outputs representative of % LEL measured by each sensor connected to the transmitter, one latching warning and one latching alarm relay output for each sensor connected to the transmitter, and one "Fault" relay output. Relay outputs shall be rated for 5 amps at 30 VDC.
 - 3. Transmitter shall have an OLED display that shall continuously scroll through the % LEL sensed by each of the sensors. The units of measurement shall be displayed on the display.
 - 4. Transmitter shall be equipped with green and red LEDs. LEDs shall allow operator to quickly determine if the display/sensor combination is in normal operation, a fault condition is present, or an alarm condition is present.

5. Transmitter shall have a 316 stainless steel enclosure and be rated for Class I, Division 1, Groups C and D locations. Enclosure shall be equipped with minimum four 3/4-inch NPT conduit entries.
 6. Transmitter shall be Ultima X5000 with relays as manufactured by MSA, General Monitors "Smart Sensor" Series, or Honeywell.
 7. Calibrations shall be performed using the transmitter display.
- D. Provide a wall-mounted Gas Monitoring Control Panel consisting of a multi-channel controller, GasGard XL as manufactured by MSA, General Monitors, or Honeywell, where shown on the Drawings. Controller shall accept a minimum of eight gas concentration 4-20 mA signals from gas transmitters. Provide additional 4-20 mA channel boards as required. Controller shall accept 120-volt, single-phase power and shall have an internal 2.2 Ah battery backup pack. Controller shall provide 5% LEL detected alarm dry contacts, 10% LEL detected alarm dry contacts, and transmitter trouble dry contacts as shown on the Drawings. Provide additional relay cards as required. Controller shall accept an acknowledge alarm dry contact input from the fire alarm control panel. Controller shall provide 24 VDC power to each gas detection transmitter as shown on the Drawings.
- E. The sensor and transmitter shall be suitable for use in -40°F to 140°F ambient temperatures and 0% to 95% relative humidity (noncondensing).
- F. The sensor and transmitter shall be guaranteed throughout the correction period as a complete unit. The transmitter shall have a minimum 2-year warranty. The IR combustible sensor electronics shall have a minimum 5-year warranty. The IR combustible sensor source light shall have a minimum 10-year warranty.
- G. Provide one calibration kit with regulator and carrying case. Provide two sets of gas cylinders for each gas being monitored, one for use during set-up and training and one to be turned over to OWNER for future use.
- H. System Supplier shall obtain the services of manufacturer's representative to start and calibrate the sensors and transmitters. Manufacturer's representative shall provide a certified start-up report at the completion of start-up.
- I. Provide emergency alarm notification devices for the system as specified herein and shown on the Drawings and a Certificate of Proper Installation as specified in Section 04 91 00-Starting of Systems stating that the system is properly installed and functions as recommended by the manufacturer and as described herein.

PART 3-EXECUTION

3.01 MOTOR CONTROL CENTER P49 (MCC-P49)

- A. Low Flow Pump (LFP) and Main Pumps (MP-1, MP-2, and MP-3):
1. H-O-A Selector Switch:
 - a. With the H-O-A selector switch in the "Hand" position, the motor shall be controlled by the following start and stop push buttons:

- (1) When the start push button on this MCC is pressed the motor shall start and run continuously. When the stop push button on this MCC is pressed the motor shall shut down.
 - (2) When the start push button at the unit is pressed the motor shall start and run continuously. When the stop push button at the unit is pressed the motor shall shut down.
 - (3) When the bump push button on this MCC is pressed the motor shall start and run while the bump push button is pressed. When the bump push button is released, the motor shall shutdown.
 - (4) When the bump push button at the unit is pressed the motor shall start and run while the bump push button is pressed. When the bump push button is released, the motor shall shutdown.
 - (5) The SCADA System and hardwired float switches shall not shut down the pump when operating in "Hand."
 - b. With the H-O-A selector switch in the "Off" position, the motor shall be inoperable.
 - c. With the H-O-A selector switch in the "Auto" position, the motor shall be controlled from the SCADA System and the float controls as described under SP-49.
 2. The motor has internal thermal overloads which shall shut down the motor in the event of over-temperature ("Hand" and "Auto" modes). Manual reset shall be required to restart the motor. The motor also has internal moisture detection which shall shut down the motor in the event of internal moisture detection ("Hand" and "Auto" modes). There is a 120-volt AC pump protection module furnished with the unit as specified in Division 43 for thermal and moisture detection that shall be installed in the MCC starter bucket by System Supplier.
 3. Provide a current transformer on the motor power circuit for indication of amperage at the SCADA System.
 4. All of the above controls shall be hardwired and not through the PLC.
- B. Dry Well Supply Fan (SF-1)
1. H-O-A Selector Switch (at the unit):
 - a. With the H-O-A selector switch in the "Hand" position, the motor shall be controlled by on and off pushbuttons at the unit. When the on pushbutton is pressed the motor shall start and run continuously. When the off pushbutton is pressed the motor shall shut down.
 - b. With the H-O-A selector switch in the "Off" position, the motor shall be inoperable.
 - c. With the H-O-A selector switch in the "Auto" position, the motor shall be controlled via the following interlocks:
 - (1) When the lights in the Dry Well and/or Stairway are turned on (LP-49 Circuits 1 and 3), the fan shall start and run continuously. When the lights in the Dry Well and Stairway are turned off the fan shall shut down.
 - (2) When the gas monitoring system detects the presence of hydrocarbon combustible gas (warning and alarm) the fan shall start and run continuously. When the gas monitoring system does not detect the presence of hydrocarbon combustible gas the fan shall run for an operator-adjustable hardwired shut down time delay (0 to 60 minutes). When the shut down time delay expires, the fan shall shut down. In the event the fan is running for a duration greater than 10 minutes beyond the hardwired operator-adjustable shut down time delay an alarm shall be indicated at SCADA System. Coordinate hardwired time delay and alarm timer duration.

- (3) The fan shall be controlled from the SCADA System as described under SP-49.
 2. The associated damper shall open when the fan is called-to-run. Provide an extra capacity control power transformer for 120-volt power to the associated damper. The fan shall be interlocked with the damper open limit switch such that the fan shall not start if the damper is closed.
 3. The fan shall be interlocked with the fire alarm control panel such that in the event of a fire alarm the fan shall shut down. Provide interface relays as required.
 4. Provide a current transformer on the motor power circuit for indication of amperage at the SCADA System.
 5. All of the above controls shall be hardwired and not through the PLC.
- C. Dry Well Exhaust Fan (EF-1):
1. When the Dry Well Supply Fan (SF-1) is running the fan shall start and run continuously.
 2. The associated damper shall open when the fan is called-to-run. Provide an extra capacity control power transformer for 120-volt power to the associated damper. The fan shall be interlocked with the damper open limit switch such that the fan shall not start if the damper is closed.
 3. Provide a current transformer on the motor power circuit for indication of amperage at the SCADA System.
 4. All of the above controls shall be hardwired and not through the PLC.
- D. Wet Well Supply Fan (SF-2):
1. H-O-A Selector Switch (at the unit):
 - a. With the H-O-A selector switch in the "Hand" position, the motor shall be controlled by on and off pushbuttons at the unit. When the on pushbutton is pressed the motor shall start and run continuously. When the off pushbutton is pressed the motor shall shut down.
 - b. With the H-O-A selector switch in the "Off" position, the motor shall be inoperable.
 - c. With the H-O-A selector switch in the "Auto" position, the motor shall be controlled via the following interlocks:
 - (1) When the lights in the Wet Well are turned on (LP-49 Circuits 2 and 4), the fan shall start and run continuously. When the lights in the Wet Well are turned off the fan shall shut down.
 - (2) When the gas monitoring system detects the presence of hydrocarbon combustible gas (warning and alarm) the fan shall start and run continuously. When the gas monitoring system does not detect the presence of hydrocarbon combustible gas the fan shall run for an operator-adjustable hardwired shut down time delay (0 to 60 minutes). When the shut down time delay expires, the fan shall shut down. In the event the fan is running for a duration greater than 10 minutes beyond the hardwired operator-adjustable shut down time delay an alarm shall be indicated at SCADA System. Coordinate hardwired time delay and alarm timer duration.
 - (3) The fan shall be controlled from the SCADA System as described under SP-49.
 2. The associated damper shall open when the fan is called-to-run. Provide an extra capacity control power transformer for 120-volt power to the associated damper. The fan shall be interlocked with the damper open limit switch such that the fan shall not start if the damper is closed.

3. The fan shall be interlocked with the fire alarm control panel such that in the event of a fire alarm the fan shall shut down. Provide interface relays as required.
 4. Provide a current transformer on the motor power circuit for indication of amperage at the SCADA System.
 5. All of the above controls shall be hardwired and not through the PLC.
- E. Wet Well Exhaust Fan (EF-2):
1. When the Wet Well Supply Fan (SF-2) is running the fan shall start and run continuously.
 2. The associated damper shall open when the fan is called-to-run. Provide an extra capacity control power transformer for 120-volt power to the associated damper. The fan shall be interlocked with the damper open limit switch such that the fan shall not start if the damper is closed.
 3. Provide a current transformer on the motor power circuit for indication of amperage at the SCADA System.
 4. All of the above controls shall be hardwired and not through the PLC.
- F. Power Metering: Power meter shall provide the following electrical value I/O via Ethernet/IP"
1. Voltage for each phase and system voltage. This includes A-B, A-C, B-C, and each phase to ground voltage.
 2. Current for each phase and total current.
 3. Kilowatts.
 4. Kilowatts Demand.
 5. kVA.
 6. kVA Demand.
 7. kVAR.
 8. Frequency.
 9. Power Factor.

3.02 FAN CONTROL CURRENT SWITCH ENCLOSURE

- A. The fan current switch controls shall be provided in a NEMA 12 enclosure, sized as required, located in the electrical room, where shown on the Drawings. Provide four current switches for Dry Well, Wet Well, and Stairway lighting branch circuit (LP-49 Circuits 1, 2, 3, and 4) such that when the lights are turned on in the Dry Well, Wet Well, and/or Stairway from either circuit the fans shall start and run as described under MCC-P49. Provide interface relays as required.

3.03 WET WELL EXHAUST FAN EF-3 CONTROL PANEL

- A. Provide a NEMA 12, wall-mounted enclosure, sized as required, including, but not limited to, the following:
1. 20-amp main circuit breaker switch with door-interlocked, padlockable handle. Provide a defeater to allow opening the door without disconnecting the power feed. Power to the enclosure shall be 120-volt, single-phase.
 2. The control panel fault current interrupting rating shall be minimum 22,000 amps.
 3. Power distribution and overcurrent protective devices for all internal equipment powered from this control panel.

4. 20-amp, single-pole contactor, and overcurrent protective devices for the supply fan and associated dampers. Contactor shall include solid-state electronic overload protection relays with a minimum of one dry contact for overload indication.
 5. Relays, terminal blocks, and control devices as required for the ventilation system.
 6. Provide a current transformer on the motor power circuit for indication of amperage at the SCADA System.
- B. The following devices shall be mounted on the front door of the control panel:
1. Green "On" indicating light.
 2. Red "Starter Overload" indicating light.
- C. Wet Well Exhaust Fan (EF-3):
1. H-O-A Selector Switch (at the unit):
 - a. With the H-O-A selector switch in the "Hand" position, the motor shall be controlled by on and off pushbuttons at the unit. When the on pushbutton is pressed the motor shall start and run continuously. When the off pushbutton is pressed the motor shall shut down.
 - b. With the H-O-A selector switch in the "Off" position, the motor shall be inoperable.
 - c. With the H-O-A selector switch in the "Auto" position, the motor shall be controlled via the following interlocks:
 - (1) When the lights in the Wet Well are turned on (LP-49 Circuits 2 and 4), the fan shall start and run continuously. When the lights in the Wet Well are turned off the fan shall shut down.
 - (2) When the gas monitoring system detects the presence of hydrocarbon combustible gas (warning and alarm) the fan shall start and run continuously. When the gas monitoring system does not detect the presence of hydrocarbon combustible gas the fan shall run for an operator-adjustable hardwired shut down time delay (0 to 60 minutes). When the shut down time delay expires, the fan shall shut down. In the event the fan is running for a duration greater than 10 minutes beyond the hardwired operator-adjustable shut down time delay an alarm shall be indicated at SCADA System. Coordinate hardwired time delay and alarm timer duration.
 - (3) The fan shall be controlled from the SCADA System as described under SP-49.
 2. The associated dampers shall open when the fan is called-to-run. The fan shall be interlocked with the dampers open limit switch such that the fan shall not start if either damper are closed.
 3. The fan shall be interlocked with the fire alarm control panel such that in the event of a fire alarm the fan shall shut down. Provide interface relays as required.
 4. Provide a current transformer on the motor power circuit for indication of amperage at the SCADA System.
 5. All of the above controls shall be hardwired and not through the PLC.

3.04 EXTERIOR LIGHTING CONTROL PANEL

- A. Provide a NEMA 12, wall-mounted enclosure, sized as required, including, but not limited to, the following:
1. A three-pole lighting contactor.
 2. Time clock as specified in specification section 26 27 26–Wiring Devices.

3. Relays, terminal blocks, and control devices as required for the lighting system.
- B. The following devices shall be mounted on the front door of the control panel: Hand-Off-Auto selector switch.
- C. Exterior Pump Station Lights (LP-49 Circuits 6 and 8)–H-O-A Selector Switch:
 1. With the H-O-A selector switch in “Hand” position, the exterior pump station lights shall be on.
 2. With the H-O-A selector switch in “Off” position, the exterior pump station lights shall be off.
 3. With the H-O-A selector switch in “Auto” position, the exterior pump station lights shall be controlled by the time clock.

3.05 INTRUSION SYSTEM KEYED CONTROL STATION

- A. Provide a NEMA 4X control station with a 30mm, 2-position, maintained, keyed selector switch labeled “Occupied-Unoccupied.” Keyed selector switch shall accept a custom keyed cylinder as required by IDOT. Coordinate Medeco cylinder type, biaxial security switch lock keying with IDOT. The selector switch shall have two contacts, one for hardwired control to disable the intrusion door switches and one contact for indication at the SCADA System. Provide a tamper pushbutton in the control station which is held open by the cover plate of the control station, and spring closed when the control station cover is removed for control station tamper indication at the SCADA System.
- B. Refer to AEGIS control panel below for additional requirements and information.

3.06 AEGIS (ABNORMAL EVENT GUIDANCE AND INFORMATION SYSTEM) CONTROL PANEL

- A. Provide a NEMA 12, wall-mounted enclosure, sized as required, including, but not limited to, the following:
 1. Provide an AEGIS ADEMCO Vista 20P circuit board.
 2. The cellular communication system shall allow communicate between the three central monitoring computers, multiple remote terminal units (RTU's), and this stations AEGIS system via MODBUS RTU. The three central monitoring locations are the Communication Center at IDOT District 1 in Schaumburg, IL, the Electrical Maintenance Contractor (EMC) Dispatch Center, and the IDOT Traffic Systems Center (TSC) in Oak Park, IL.
 3. Power distribution and overcurrent protective devices for all internal equipment powered from this control panel.
 4. 12VDC UPS battery power supply and batteries, sized for a minimum of 24-hours of operation of the AEGIS System.
 5. Relays, terminal blocks, and control devices as required for the AEGIS system.
 6. Alarm buzzer/horn.
 7. Red LED strobe light mounted to top of enclosure.
- B. The AEGIS systems primary function is intrusion detection and secondary function is alarm reporting of the alarms shown in the Contract Documents to the Communication Center, EMC, and TSC.

- C. An 'intrusion' alarm condition shall be sent to the SCADA panels when a door is opened. The door switches can be disabled via an override switch ("Occupied-Unoccupied" keyed switch) located on the outside of the electrical room. The override switch shall be weatherproof and key operated, key to be coordinated with the Department's existing key system (Medeco cylinder type, biaxial high security switch lock) and removable from both positions. The switch shall contain an LED status light to indicate open or closed position and include a tamper pushbutton to be held open by the cover plate and spring closed if the cover is removed. The override switch shall have two contacts, one contact for enabling the door switches and one contact for connection to the SCADA panel.
 - D. The panel shall report alarms via cellular communications as part of the Department's system wide AEGIS alarm system, the following signals shall be monitored by the intrusion system setup to alarm on a contact closure:
 - 1. Intrusion Alarm.
 - 2. Fire Alarm & Gas Alarms.
 - 3. Electrical Service Failure.
 - 4. High Wet Well Water Level.
 - 5. SCADA Panel/PLC Failure Alarm.
 - 6. Low Wet Well Water Level.
 - 7. Pump Alarm*.
 - 8. Internal Battery Low.
 - 9. AEGIS Heartbeat.
- * Pump Alarm is generated in SCADA when any one of the Main Pumps or Low Flow Pumps fails to start upon call OR when a pump trips due to an overload or fault OR High Moisture OR High Temperature OR when a pump fails to stop at its respective Stop elevation.
- E. Submittal information shall include all necessary internal and external wiring diagrams and installation requirements. Complete system connection diagrams of all initiating devices and notification appliance. A detailed bill of material with technical descriptions and summary of quantities, project specific catalog cutsheets, one line riser diagram, and applicable features of components shall be included.

3.07 SCADA PANEL - GENERAL

- A. Control descriptions described herein are specific in nature to equipment associated with the SCADA Panel. CONTRACTOR shall refer to Section 1.11—General Control Algorithms for additional programming requirements. Control descriptions shall reside in the local remote telemetry connected PLC and not in the master telemetry PLC.
- B. UPSs installed in the network rack shall be configured to provide two dry contact outputs to the PLC in the event of a UPS fail and UPS low battery.
- C. Each UPS shall be connected inside the SCADA panel with an overcurrent protective device. All UPS-powered devices shall be continuously powered through the primary UPS under normal operating conditions. Provide a UPS voltage monitoring relay on the output of the primary UPS and a hardwired bypass circuit to automatically bypass the primary UPS with secondary UPS control power when the primary UPS output rises 110% above or falls 90%

below the rated UPS output voltage. Provide dedicated green indicator lights for indication of primary and secondary power on.

- D. The SCADA panel shall have an exterior, panel-mounted receptacle and programming port for the Ethernet network mounted to the front of the panel. The receptacle and programming port shall be provided to allow for PLC programming via laptop without opening the panel door.
- E. Provide a control power fail relay in the SCADA panel for each incoming control power branch circuits (primary and secondary) that shall be used to indicate an incoming control power fail alarm at the SCADA System. Provide a green indicating light on the front of the SCADA panel for each incoming control power branch circuit (primary and secondary) to indicate power is being provided. Control power fail wiring shall be hardwired and not through the PLC.
- F. Provide a red indicator light on the front of the SCADA panel for indication of a SCADA alarm.
- G. Refer to the Drawings for all required I/O that shall interface with the PLC.

3.08 SCADA PANEL 49 (SP-49)

- A. Provide a new NEMA 12 freestanding, PLC-based SCADA panel, sized a minimum of 72 inches wide by 20 inches deep by 90 inches high, where shown on the Drawings. All control algorithms and alarms described herein shall be programmed into this PLC.
- B. Provide a 24-inch by 24-inch folding shelf on the front door of the SCADA panel, where shown on the Drawings.
- C. Provide a louver kit assembly on the front door of the SCADA panel, where shown on the Drawings. Provide thermostat inside SCADA panel for control of louver kit assembly.
- D. Provide redundant 24-volt DC power supplies (one powered by the primary UPS and the other powered by the secondary UPS) for power to the network cabinet network switch SW-1.
- E. Provide a 4G cellular modem and antenna in the SCADA panel for IDOT Electrical Maintenance Traffic System Center provided SIM card. IDOT Electrical Maintenance will determine where the cellular antenna will be installed. Provide space on the exterior of the SCADA Panel for the cellular antenna in the event IDOT Electrical Maintenance determine that they shall be installed on the exterior of the SCADA Panel. Coordinate cellular service with the Department's Central Management Services (CMS) and IDOT District 1, Business Services for the installation and configuration of the SCADA system as described herein.
- F. For each interior lighting circuit (lighting panel 49 circuits 1, 2, 3, and 4) provide a dedicated alarm for indication at the SCADA System that the lighting circuit has been energized for greater than 24 hours.

- G. The Low Flow Pump (LFP) and Main Pumps (MP-1, MP-2, and MP-3) shall be controlled from this PLC as follows:
1. The primary control ultrasonic wet well level transmitter shall be LIT-009 and the secondary control submersible wet well level transmitter shall be LT-010. In the event the primary control wet well level transmitter fails, the secondary control wet well level transmitter shall automatically control the pumps.
 2. The pumps shall be controlled simultaneously from the SCADA system PLC via the primary/secondary transmitters as described below and the hardwired float controls as described below.
 - a. SCADA System PLC control:
 - (1) The pump sequence shall be selected as follows:
 - (a) Provide a four-position selector switch on the front door of this SCADA Panel to allow the operator to select the pump sequence of the four pumps (i.e., LFP-1-2-3, 1-2-3-LFP, 2-3-LFP-1, 3-LFP-1-2). The first pump in the sequence shall be the low flow pump, the second pump in the sequence shall be the lead pump, the third pump in the sequence shall be the lag pump, and the fourth pump in the sequence shall be the standby pump.
 - (b) Provide indication of which pump is the low flow pump, lead, lag, and standby pump at the SCADA system.
 - (2) The pumps shall be controlled via the wet well level by the primary or secondary wet well level transmitter, as described below, with operator-adjustable level (0.0 to 14.5 feet) setpoints for the following:
 - (a) Wet Well High Level Alarm.
 - (b) Start Standby Pump.
 - (c) Start Lag Pump.
 - (d) Start Lead Pump/Stop Low Flow Pump.
 - (e) Stop Pumps/Start Low Flow Pump.
 - (f) Start Low Flow Pump.
 - (g) Stop Low Flow Pump.
 - (h) Wet Well Low Level Alarm.
 - (i) Each of the above level setpoints shall be set at the same elevation as the associated float switches such that the PLC control and hardwired float switch control operate the pumps in parallel.
 - (3) When the level in the wet well rises above the "Start Low Flow Pump" level setpoint the low flow pump shall start and run continuously. When the level in the wet well rises above the "Start Lead Pump/Stop Low Flow Pump" level setpoint the low flow pump shall shut down and the lead pump shall start and run continuously. When the level in the wet well rises above the "Start Lag Pump" level setpoint the lag pump shall start and the lead and lag pumps shall run continuously. When the level in the wet well rises above the "Start Standby Pump" level setpoint and both/either the lead pump and/or lag pump have failed (e.g., starter overload, motor overtemperature, seal fail) the standby pump shall start and the remaining operating pump and standby pump shall run continuously. When the level in the wet well falls below the "Stop Pumps/Start Low Flow Pump" the operating pump(s) shall shut down and the low flow pump shall start and run continuously. When the level in the wet well falls below the "Stop Low Flow Pump" level setpoint the low flow pump shall shut down.

- (4) When the level in the wet well rises above the "Wet Well High Level Alarm" the lead and lag pump shall start and run continuously and an alarm shall be activated at the SCADA System. In the event the lead pump or lag pump have failed (e.g., starter overload, motor overtemperature, seal fail) the standby pump shall start and run continuously. Provide operator-adjustable time delays so that the pumps do not start simultaneously.
 - (5) When the level in the wet well falls below the "Wet Well Low Level Alarm" an alarm shall be indicated at the SCADA System.
 - (6) Provide and operator-adjustable primary/secondary level transmitter difference setpoint (0.0 to 14.5 feet). When the difference between the level measured by the primary level transmitter and secondary level transmitter is greater than the primary/secondary level transmitter difference setpoint, an alarm shall be indicated at the SCADA System.
 - b. Hardwired float control:
 - (1) The eight floats in the wet well shall control the pumps as described below. The control shall be hardwired and not through the PLC and shall control the pumps simultaneously with the SCADA System.
 - (2) When the level in the wet well rises above the high level float switch, the lead and lag pump shall start and run continuously and an alarm shall be activated at the SCADA System. In the event the lead pump or lag pump have failed (e.g., starter overload, motor overtemperature, seal fail) the standby pump shall start and run continuously. Provide hardwired adjustable time delays so that the pumps do not start simultaneously.
 - (3) When the lead and/or lag pump(s) started, the lead and/or lag pump(s) shall continue to run until the water level in the wet well falls below the stop pumps/start low flow pump float switch (LS-008B) and the low flow pump shall start and run continuously. When the water level in the wet well falls below the stop low flow pump float switch (LS-008) the low flow pump shall shut down.
 - (4) When the water level in the wet well rises above the start low flow pump float switch (LS-008A) the low flow pump shall start and run continuously. When the water level in the wet well rises above the start lead pump/stop low flow pump floats switch (LS-008C) the low flow pump shall shut down and lead pump shall start and run continuously. When the water level in the wet well rises above the start lag pump float switch (LS-008D) lag pump shall start and the lead pump and lag pump shall run continuously.
 - (5) When the water level in the wet well rises above the start standby pump float switch (LS-008E) and both/either lead pump and/or lag pump have failed (e.g., starter overload, motor overtemperature, seal fail) standby pump shall start and the remaining operating pump and standby pump shall run continuously.
 - (6) When the water level in the wet well falls below the low level float switch (LSL-008) an alarm shall be activated at the SCADA System.
 - (7) The low flow pump shall not be able to operate at the same time as lead pump, lag pump, or standby pump.
 - (8) Standby pump shall not be able to operate if both lead pump and lag pump are running.
3. Provide hardwired indicator lights not controlled via the PLC on the front of this SP for the following indication:
 - a. High Level Alarm (red indicator light).
 - b. Float Standby Pump Call (red indicator light).

- c. Float Lag Pump Call (white indicator light).
- d. Float Lead Pump Call (blue indicator light).
- e. Float Low Flow Pump Call (amber indicator light).
- f. Low Level Alarm (red indicator light).
- g. Provide indicator lights controlled via the PLC on the front of this SP for the following indication:
 - (1) SCADA Standby Pump Call (red indicator light).
 - (2) SCADA Lag Pump Call (white indicator light).
 - (3) SCADA Lead Pump Call (blue indicator light).
 - (4) SCADA Low Flow Pump Call (amber indicator light).
- 4. Level Control and Monitoring Requirements.
- 5. Table below details PLC and Float Control for pump station as described above.

PLC CONTROL				FLOAT CONTROL				
ELEVATION	RISING LEVEL ACTION	FALLING LEVEL ACTION	FEET ABOVE FLOOR	RISING LEVEL ACTION	FALLING LEVEL ACTION	ELEVATION	ACTUATING DEVICE	FEET ABOVE FLOOR
791.00	HIGH LEVEL ALARM	-	13.5	HIGH LEVEL ALARM	-	791.00	LSH-008	13.5
788.50	*START STANDBY PUMP	-	11.0	* START STANDBY PUMP	-	788.50	LS-008E	11.0
786.50	* START LAG PUMP	-	9.0	START LAG PUMP	-	786.50	LS-008D	9.0
785.50	* START LEAD PUMP	-	8.0	START LEAD PUMP	-	785.50	LS-008C	8.0
	STOP LOW FLOW PUMP	-		STOP LOW FLOW PUMP	-			
784.00	-	STOP PUMPS	6.5	-	STOP PUMPS	784.00	LS-008B	6.5
	-	START LOW FLOW PUMP		-	START LOW FLOW PUMP			
783.50	START LOW FLOW PUMP	-	6.0	START LOW FLOW PUMP	-	783.50	LS-008A	6.0
782.00	-	STOP LOW FLOW PUMP	4.5	-	STOP LOW FLOW PUMP	782.00	LS-008	4.5
781.25	-	LOW LEVEL ALARM	3.75	-	LOW LEVEL ALARM	781.25	LSL-008	3.75
				* STANDBY PUMP SHALL ONLY START IF LEAD OR LAG PUMP HAS FAILED AND ELEVATION HAS REACHED 788.5				

- H. The Dry Well Supply Fan (SF-1) shall be controlled from this PLC as follows: There shall be an operator-adjustable Dry Well high temperature setpoint (0 to 130°F). When the

temperature in the Dry Well (TT-402A) rises above the high temperature setpoint the fan shall start and run continuously. When the temperature in the Dry Well falls below the high temperature set point the fan shall shut down.

- I. The Wet Well Supply Fan (SF-2) shall be controlled from this PLC as follows: There shall be an operator-adjustable Wet Well high temperature setpoint (0 to 130°F). When the temperature in the Wet Well (TT-402D and TT-402C) rises above the high temperature setpoint the fan shall start and run continuously. When the temperature in the Wet Well falls below the high temperature set point the fan shall shut down.
- J. The Wet Well Exhaust Fan (EF-3) shall be controlled from this PLC as follows: There shall be an operator-adjustable Wet Well high temperature setpoint (0 to 130°F). When the temperature in the Wet Well (TT-402D and TT-402C) rises above the high temperature setpoint the fan shall start and run continuously. When the temperature in the Wet Well falls below the high temperature set point the fan shall shut down.
- K. Provide the following alarms for indication at the SCADA System, including all additional alarms specified herein:
 - 1. PLC no. 1 failover.
 - 2. PLC no. 2 failover.
 - 3. SCADA panel A/C power failure.
 - 4. SCADA train 1 line filter fail.
 - 5. SCADA train 2 line filter fail.
 - 6. SCADA 120VAC train 1 power failure.
 - 7. SCADA 120VAC train 2 power failure.
 - 8. SCADA train 1 UPS-1 failure.
 - 9. SCADA train 1 UPS-1 low battery.
 - 10. SCADA train 2 UPS-2 failure.
 - 11. SCADA train 2 UPS-2 low battery.
 - 12. SCADA 24VDC train 1 power failure.
 - 13. SCADA 24VDC train 2 power failure.
 - 14. PLC scan fail.
 - 15. Dry well/stair lighting circuit 1 on exceeding 24-hours.
 - 16. Wet well lighting circuit 2 on exceeding 24-hours.
 - 17. Dry well/stair lighting circuit 3 on exceeding 24-hours.
 - 18. Wet well lighting circuit 4 on exceeding 24-hours.
 - 19. MCC-P49 power meter high amps.
 - 20. MCC-P49 power meter low amps.
 - 21. MCC-P49 power meter high voltage.
 - 22. MCC-P49 power meter low voltage.
 - 23. ATS failure.
 - 24. Service no. 1 power failure.
 - 25. Service no. 2 power failure.
 - 26. Service no. 1 breaker tripped.
 - 27. Service no. 1 breaker ground fault.
 - 28. Service no. 2 breaker tripped.
 - 29. Service no. 2 breaker ground fault.
 - 30. Generator breaker tripped.
 - 31. Generator breaker ground fault.

32. Fire alarm control panel alarm (circuit 1).
33. Fire alarm control panel alarm (circuit 2).
34. Fire alarm control panel trouble.
35. Intrusion System - Electrical room door alarm.
36. Intrusion System - Wet well access door alarm.
37. Intrusion System - North dry well access door alarm.
38. Intrusion System - Stairwell access door alarm.
39. Intrusion System - Occupied exceeding 24-hours.
40. Combustible gas monitoring - Warning (5% LEL).
41. Combustible gas monitoring - Alarm (10% LEL).
42. Combustible gas monitoring - Trouble.
43. Bar rack upstream high level alarm.
44. Bar rack upstream low level alarm.
45. Bar rack upstream level transmitter failure.
46. Bar rack downstream high level alarm.
47. Bar rack downstream low level alarm.
48. Bar rack downstream level transmitter failure.
49. Bar rack differential high level alarm.
50. Bar rack differential level transmitter failure.
51. Wet well high level alarm - SCADA.
52. Wet well high level alarm - Floats.
53. Wet well low level alarm - SCADA.
54. Wet well low level alarm - Floats.
55. Wet well primary high level alarm.
56. Wet well primary low level alarm.
57. Wet well primary level transmitter failure.
58. Wet well secondary high level alarm.
59. Wet well secondary low level alarm.
60. Wet well secondary level transmitter failure.
61. Main Pump No. 1 call-to-run fail.
62. Main Pump No. 1 under maintenance (HOA in Off position)
63. Main Pump No. 1 circuit breaker tripped.
64. Main Pump No. 1 contactor overload trip.
65. Main Pump No. 1 high temperature.
66. Main Pump No. 1 moisture sensed.
67. Main Pump No. 1 high temperature/moisture protection in bypass mode.
68. Main Pump No. 1 high amps.
69. Main Pump No. 1 low amps.
70. Main Pump No. 2 call-to-run fail.
71. Main Pump No. 2 under maintenance (HOA in Off position)
72. Main Pump No. 2 circuit breaker tripped.
73. Main Pump No. 2 contactor overload trip.
74. Main Pump No. 2 high temperature.
75. Main Pump No. 2 moisture sensed.
76. Main Pump No. 2 high temperature/moisture protection in bypass mode.
77. Main Pump No. 2 high amps.
78. Main Pump No. 2 low amps.
79. Main Pump No. 3 call-to-run fail.
80. Main Pump No. 3 under maintenance (HOA in Off position)

81. Main Pump No. 3 circuit breaker tripped.
82. Main Pump No. 3 contactor overload trip.
83. Main Pump No. 3 high temperature.
84. Main Pump No. 3 moisture sensed.
85. Main Pump No. 3 high temperature/moisture protection in bypass mode.
86. Main Pump No. 3 high amps.
87. Main Pump No. 3 low amps.
88. Low flow pump call-to-run fail.
89. Low flow pump under maintenance (HOA in Off position)
90. Low flow pump circuit breaker tripped.
91. Low flow pump contactor overload trip.
92. Low flow pump high temperature.
93. Low flow pump moisture sensed.
94. Low flow pump high temperature/moisture protection in bypass mode.
95. Low flow pump high amps.
96. Low flow pump low amps.
97. Discharge chamber high level.
98. Discharge chamber low level.
99. Discharge chamber level transmitter failure.
100. Sump pump fault.
101. Sump pump high water alarm.
102. Pump station dry well high temperature.
103. Pump station dry well low temperature.
104. Pump station dry well temperature transmitter failure.
105. Electric room high temperature.
106. Electric room low temperature.
107. Electric room temperature transmitter failure.
108. Wet well intermediate level high temperature.
109. Wet well intermediate level low temperature.
110. Wet well intermediate temperature transmitter failure.
111. Wet well ground level high temperature.
112. Wet well ground level low temperature.
113. Wet well ground temperature transmitter failure.
114. Dry well supply fan call-to-run failure.
115. Dry well supply fan motor overload.
116. Dry well supply fan excessive running alarm.
117. Dry well exhaust fan call-to-run failure.
118. Dry well exhaust fan motor overload.
119. Wet well supply fan call-to-run failure.
120. Wet well supply fan motor overload.
121. Wet well exhaust fan 1 call-to-run failure.
122. Wet well exhaust fan 1 motor overload.
123. Wet well exhaust fan 2 call-to-run failure.
124. Wet well exhaust fan 2 motor overload.

END OF SECTION

SCADA SYSTEM I/O LISTING

STRAND ASSOCIATES, INC.® STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION ILLINOIS PUMP STATION 49 CONTRACT NO. 61J87 SCADA SYSTEM I/O LISTING - SCADA PANEL 49 (SP49)									
SP	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS	
	IN THE EVENT OF CONFLICT, THE CONTRACT DRAWINGS SUPERSEDE THE I/O LIST HEREIN.								
49	CONTROL PANEL A/C POWER AVAILABLE								
49	SCADA TRAIN 1 LINE FILTER FAIL	LF-1	1	0	0	0	2-#14	FROM POWER FAIL RELAY IN THIS SP	
49	SCADA TRAIN 2 LINE FILTER FAIL	LF-2	1	0	0	0	2-#14	FROM LINE FILTER IN THIS SP	
49	SCADA 120VAC TRAIN 1 POWER FAIL		1	0	0	0	2-#14	FROM POWER FAIL RELAY IN THIS SP	
49	SCADA 120VAC TRAIN 2 POWER FAIL		1	0	0	0	2-#14	FROM POWER FAIL RELAY IN THIS SP	
49	SCADA TRAIN 1 UPS	UPS-1							
49	UPS-1 FAIL		1	0	0	0	2-#14	FROM UPS-1 IN THIS SP	
49	UPS-1 LOW BATTERY		1	0	0	0	2-#14	FROM UPS-1 IN THIS SP	
49	SCADA TRAIN 2 UPS	UPS-2							
49	UPS-2 FAIL		1	0	0	0	2-#14	FROM UPS-2 IN THIS SP	
49	UPS-2 LOW BATTERY		1	0	0	0	2-#14	FROM UPS-2 IN THIS SP	
49	SCADA 24VDC TRAIN 1 POWER FAIL		1	0	0	0	2-#14	FROM POWER FAIL RELAY IN THIS SP	
49	SCADA 24VDC TRAIN 2 POWER FAIL		1	0	0	0	2-#14	FROM POWER FAIL RELAY IN THIS SP	
49	PLC SCAN FAIL		0	1	0	0	2-#14	TO RELAY LOGIC IN THIS SP	
49	SCADA ALARM LIGHT		0	1	0	0	2-#14	TO SCADA ALARM LIGHT ON THIS SP	
49	DRY WELL/STAIR LIGHTING CIRCUIT 1 STATUS		1	0	0	0	2-#14	FROM FAN CONTROL CURRENT SWITCH ENCLOSURE	
49	WET WELL LIGHTING CIRCUIT 2 STATUS		1	0	0	0	2-#14	FROM FAN CONTROL CURRENT SWITCH ENCLOSURE	
49	DRY WELL/STAIR LIGHTING CIRCUIT 3 STATUS		1	0	0	0	2-#14	FROM FAN CONTROL CURRENT SWITCH ENCLOSURE	
49	WET WELL LIGHTING CIRCUIT 4 STATUS		1	0	0	0	2-#14	FROM FAN CONTROL CURRENT SWITCH ENCLOSURE	
49	MCC-P49 POWER METER		1	0	0	0	2-#14	FROM FAN CONTROL CURRENT SWITCH ENCLOSURE	
49	VOLTAGE (FOR EACH PHASE/SYSTEM)		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	CURRENT (FOR EACH PHASE AND TOTAL)		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	KVAR		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	KW		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	KW DEMAND		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	KVA		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	KVA DEMAND		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	FREQUENCY		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	POWER FACTOR		0	0	X	0	ENET	FROM POWER METER IN MCC	
49	AUTOMATIC TRANSFER SWITCH								
49	ATS FAILURE		1	0	0	0	2-#14	FROM ATS IN MCC-P49	
49	OPERATING VIA SERVICE NO. 1		1	0	0	0	2-#14	FROM ATS IN MCC-P49	

STRAND ASSOCIATES, INC.®
STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
ILLINOIS
PUMP STATION 49
CONTRACT NO. 61J87
SCADA SYSTEM I/O LISTING - SCADA PANEL 49 (SP49)

SP	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS
49	SERVICE NO. 1 POWER FAILURE		1	0	0	0	2~#14	FROM ATS IN MCC-P49
49	OPERATING VIA SERVICE NO. 2		1	0	0	0	2~#14	FROM ATS IN MCC-P49
49	SERVICE NO. 2 POWER FAILURE		1	0	0	0	2~#14	FROM ATS IN MCC-P49
49	SERVICE NO. 1 BREAKER							
49	CLOSED	CB-1A						
49	OPEN		1	0	0	0	2~#14	FROM SERVICE NO. 1 BREAKER
49	TRIPPED		1	0	0	0	2~#14	FROM SERVICE NO. 1 BREAKER
49	GROUND FAULT	GFR-1	1	0	0	0	2~#14	FROM SERVICE NO. 1 BREAKER GROUND FAULT RELAY
49	SERVICE NO. 2 BREAKER							
49	CLOSED	CB-2A						
49	OPEN		1	0	0	0	2~#14	FROM SERVICE NO. 2 BREAKER
49	TRIPPED		1	0	0	0	2~#14	FROM SERVICE NO. 2 BREAKER
49	GROUND FAULT	GFR-2	1	0	0	0	2~#14	FROM SERVICE NO. 2 BREAKER GROUND FAULT RELAY
49	GENERATOR BREAKER							
49	CLOSED	CB-GEN						
49	OPEN		1	0	0	0	2~#14	FROM GENERATOR BREAKER
49	TRIPPED		1	0	0	0	2~#14	FROM GENERATOR BREAKER
49	GROUND FAULT	GFR-GEN	1	0	0	0	2~#14	FROM GENERATOR BREAKER GROUND FAULT RELAY
49	FIRE ALARM CONTROL PANEL	FACP						
49	ALARM (CIRCUIT 1)		1	0	0	0	2~#14	FROM FIRE ALARM CONTROL PANEL
49	ALARM (CIRCUIT 2)		1	0	0	0	2~#14	FROM FIRE ALARM CONTROL PANEL
49	TROUBLE		1	0	0	0	2~#14	FROM FIRE ALARM CONTROL PANEL
49	EXTERIOR LIGHTING ON		1	0	0	0	2~#14	FROM EXTERIOR LIGHTING CONTROL PANEL
49	INTRUSION SYSTEM							
49	ENTRY KEY IN NON-ALARM POSITION	KS-1	1	0	0	0	2~#14	FROM KEYED SWITCH
49	ELECTRICAL ROOM DOOR ALARM	DS-1	1	0	0	0	2~#14	FROM ELECTRICAL ROOM DOOR SWITCH
49	WET WELL ACCESS DOOR ALARM	DS-2	1	0	0	0	2~#14	FROM WET WELL DOOR SWITCH
49	NORTH DRY WELL ACCESS DOOR ALARM	DS-3	1	0	0	0	2~#14	FROM NORTH DRY WELL DOOR SWITCH
49	STAIRWELL ACCESS DOOR ALARM	DS-4	1	0	0	0	2~#14	FROM STAIRWELL DOOR SWITCH
49	COMBUSTIBLE GAS MONITORING SYSTEM	GM-1						
49	WARNING (5% LEL)		1	0	0	0	2~#14	FROM GAS MONITORING SYSTEM
49	ALARM (10% LEL)		1	0	0	0	2~#14	FROM GAS MONITORING SYSTEM
49	TROUBLE		1	0	0	0	2~#14	FROM GAS MONITORING SYSTEM
49	AEGIS SYSTEM							
49	SCADA ALARM		0	1	0	0	2~#14	TO AEGIS SYSTEM
49	PUMP ALARM		0	1	0	0	2~#14	TO AEGIS SYSTEM
49	PUMP STATION POWER FAIL		0	1	0	0	2~#14	TO AEGIS SYSTEM

STRAND ASSOCIATES, INC.® STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION ILLINOIS PUMP STATION 49 CONTRACT NO. 61J87 SCADA SYSTEM I/O LISTING - SCADA PANEL 49 (SP49)									
SP	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS	
49	BAR RACK								
49	UPSTREAM LEVEL	LIT-007A	0	0	1	0	SH. PR.	FROM LEVEL TRANSMITTER	
49	DOWNSTREAM LEVEL	LIT-007B	0	0	1	0	SH. PR.	FROM LEVEL TRANSMITTER	
49	DIFFERENTIAL LEVEL INDICATOR	LDI-007	0	0	0	1	SH. PR.	TO LEVEL INDICATOR ON THIS SP	
49	WET WELL								
49	HIGH WATER LEVEL ALARM	LSH-008	1	0	0	0	2~#14	FROM FLOAT SWITCH	
49	START STANDBY PUMP	LS-008E	1	0	0	0	2~#14	FROM FLOAT SWITCH	
49	START LAG PUMP	LS-008D	1	0	0	0	2~#14	FROM FLOAT SWITCH	
49	START LEAD PUMP/STOP LOW FLOW PUMP	LS-008C	1	0	0	0	2~#14	FROM FLOAT SWITCH	
49	STOP PUMPS/START LOW FLOW PUMP	LS-008B	1	0	0	0	2~#14	FROM FLOAT SWITCH	
49	START LOW FLOW PUMP	LS-008A	1	0	0	0	2~#14	FROM FLOAT SWITCH	
49	STOP LOW FLOW PUMP	LS-008	1	0	0	0	2~#14	FROM FLOAT SWITCH	
49	LOW WATER LEVEL ALARM	LSL-008	1	0	0	0	2~#14	FROM FLOAT SWITCH	
49	PRIMARY WET WELL LEVEL	LIT-009	0	0	1	0	SH. PR.	FROM LEVEL TRANSMITTER	
49	SECONDARY WET WELL LEVEL	LIT-010	0	0	1	0	SH. PR.	FROM LEVEL TRANSMITTER	
49	PRIMARY WET WELL LEVEL INDICATOR	LI-009	0	0	0	1	SH. PR.	TO LEVEL INDICATOR ON THIS SP	
49	SECONDARY WET WELL LEVEL INDICATOR	LI-010	0	0	0	1	SH. PR.	TO LEVEL INDICATOR ON THIS SP	
49	PUMP CONTROL								
49	LFP-1-2-3 PUMP SEQUENCE		1	0	0	0	2~#14	FROM PUMP SEQUENCE SELECTOR SWITCH ON THIS SP	
49	1-2-3-LFP PUMP SEQUENCE		1	0	0	0	2~#14	FROM PUMP SEQUENCE SELECTOR SWITCH ON THIS SP	
49	2-3-LFP-1 PUMP SEQUENCE		1	0	0	0	2~#14	FROM PUMP SEQUENCE SELECTOR SWITCH ON THIS SP	
49	3-LFP-1-2 PUMP SEQUENCE		1	0	0	0	2~#14	FROM PUMP SEQUENCE SELECTOR SWITCH ON THIS SP	
49	SCADA LOW FLOW PUMP CALL INDICATOR LIGHT		0	1	0	0	2~#14	TO INDICATOR LIGHT ON THIS SP	
49	SCADA LEAD PUMP CALL INDICATOR LIGHT		0	1	0	0	2~#14	TO INDICATOR LIGHT ON THIS SP	
49	SCADA LAG PUMP CALL INDICATOR LIGHT		0	1	0	0	2~#14	TO INDICATOR LIGHT ON THIS SP	
49	SCADA STANDBY PUMP CALL INDICATOR LIGHT		0	1	0	0	2~#14	TO INDICATOR LIGHT ON THIS SP	
49	MAIN PUMP NO. 1	MP-1							
49	CIRCUIT BREAKER TRIPPED		1	0	0	0	2~#14	FROM LFP CIRCUIT BREAKER IN MCC-P49	
49	IN HAND MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	OFF		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	IN AUTO MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	CALLED FOR		1	0	0	0	2~#14	FROM CALL RELAY IN MCC-P49	
49	FLOAT CALL		1	0	0	0	2~#14	FROM FLOAT CALL RELAY IN THIS SP	
49	RUNNING		1	0	0	0	2~#14	FROM STARTER IN MCC-P49	
49	CONTACTOR OVERLOAD TRIP		1	0	0	0	2~#14	FROM STARTER IN MCC-P49	

<p>STRAND ASSOCIATES, INC.® STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION ILLINOIS PUMP STATION 49 CONTRACT NO. 61J87 SCADA SYSTEM I/O LISTING - SCADA PANEL 49 (SP49)</p>									
SP	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS	
49	HIGH TEMPERATURE		1	0	0	0	2~#14	FROM MINICAS RELAY IN MCC-P49	
49	MOISTURE SENSED		1	0	0	0	2~#14	FROM MINICAS RELAY IN MCC-P49	
49	HIGH TEMPERATURE/MOISTURE PROTECTION		1	0	0	0	2~#14	FROM RELAY LOGIC IN MCC-P49	
49	IN BYPASS MODE								
49	SCADA CALL		0	1	0	0	2~#14	TO STARTER IN MCC-P49	
49	HIGH TEMPERATURE/MOISTURE PROTECTION		0	1	0	0	2~#14	TO RELAY LOGIC IN MCC-P49	
49	BYPASS								
49	MOTOR CURRENT	IT-001	0	0	1	0	SH. PR.	FROM CURRENT TRANSFORMER IN MCC-P49	
49	MAIN PUMP NO. 2	MP-2							
49	CIRCUIT BREAKER TRIPPED		1	0	0	0	2~#14	FROM LFP CIRCUIT BREAKER IN MCC-P49	
49	IN HAND MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	OFF		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	IN AUTO MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	CALLED FOR		1	0	0	0	2~#14	FROM CALL RELAY IN MCC-P49	
49	FLOAT CALL		1	0	0	0	2~#14	FROM FLOAT CALL RELAY IN THIS SP	
49	RUNNING		1	0	0	0	2~#14	FROM STARTER IN MCC-P49	
49	CONTACTOR OVERLOAD TRIP		1	0	0	0	2~#14	FROM STARTER IN MCC-P49	
49	HIGH TEMPERATURE		1	0	0	0	2~#14	FROM MINICAS RELAY IN MCC-P49	
49	MOISTURE SENSED		1	0	0	0	2~#14	FROM MINICAS RELAY IN MCC-P49	
49	HIGH TEMPERATURE/MOISTURE PROTECTION		1	0	0	0	2~#14	FROM RELAY LOGIC IN MCC-P49	
49	IN BYPASS MODE								
49	SCADA CALL		0	1	0	0	2~#14	TO STARTER IN MCC-P49	
49	HIGH TEMPERATURE/MOISTURE PROTECTION		0	1	0	0	2~#14	TO RELAY LOGIC IN MCC-P49	
49	BYPASS								
49	MOTOR CURRENT	IT-002	0	0	1	0	SH. PR.	FROM CURRENT TRANSFORMER IN MCC-P49	
49	MAIN PUMP NO. 3	MP-3							
49	CIRCUIT BREAKER TRIPPED		1	0	0	0	2~#14	FROM LFP CIRCUIT BREAKER IN MCC-P49	
49	IN HAND MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	OFF		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	IN AUTO MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	CALLED FOR		1	0	0	0	2~#14	FROM CALL RELAY IN MCC-P49	
49	FLOAT CALL		1	0	0	0	2~#14	FROM FLOAT CALL RELAY IN THIS SP	
49	RUNNING		1	0	0	0	2~#14	FROM STARTER IN MCC-P49	
49	CONTACTOR OVERLOAD TRIP		1	0	0	0	2~#14	FROM STARTER IN MCC-P49	
49	HIGH TEMPERATURE		1	0	0	0	2~#14	FROM MINICAS RELAY IN MCC-P49	
49	MOISTURE SENSED		1	0	0	0	2~#14	FROM MINICAS RELAY IN MCC-P49	

<p>STRAND ASSOCIATES, INC.® STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION ILLINOIS PUMP STATION 49 CONTRACT NO. 61J87 SCADA SYSTEM I/O LISTING - SCADA PANEL 49 (SP49)</p>									
SP	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS	
49	HIGH TEMPERATURE/MOISTURE PROTECTION IN BYPASS MODE		1	0	0	0	2~#14	FROM RELAY LOGIC IN MCC-P49	
49	SCADA CALL		0	1	0	0	2~#14	TO STARTER IN MCC-P49	
49	HIGH TEMPERATURE/MOISTURE PROTECTION BYPASS		0	1	0	0	2~#14	TO RELAY LOGIC IN MCC-P49	
49	MOTOR CURRENT	IT-003	0	0	1	0	SH. PR.	FROM CURRENT TRANSFORMER IN MCC-P49	
49	LOW FLOW PUMP	LFP							
49	CIRCUIT BREAKER TRIPPED		1	0	0	0	2~#14	FROM LFP CIRCUIT BREAKER IN MCC-P49	
49	IN HAND MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	OFF		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	IN AUTO MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49	
49	CALLED FOR		1	0	0	0	2~#14	FROM CALL RELAY IN MCC-P49	
49	FLOAT CALL		1	0	0	0	2~#14	FROM FLOAT CALL RELAY IN THIS SP	
49	RUNNING		1	0	0	0	2~#14	FROM STARTER IN MCC-P49	
49	CONTACTOR OVERLOAD TRIP		1	0	0	0	2~#14	FROM STARTER IN MCC-P49	
49	HIGH TEMPERATURE		1	0	0	0	2~#14	FROM MINICAS RELAY IN MCC-P49	
49	MOISTURE SENSED		1	0	0	0	2~#14	FROM MINICAS RELAY IN MCC-P49	
49	HIGH TEMPERATURE/MOISTURE PROTECTION IN BYPASS MODE		1	0	0	0	2~#14	FROM RELAY LOGIC IN MCC-P49	
49	SCADA CALL		0	1	0	0	2~#14	TO STARTER IN MCC-P49	
49	HIGH TEMPERATURE/MOISTURE PROTECTION BYPASS		0	1	0	0	2~#14	TO RELAY LOGIC IN MCC-P49	
49	MOTOR CURRENT	IT-004	0	0	1	0	SH. PR.	FROM CURRENT TRANSFORMER IN MCC-P49	
49	DISCHARGE CHAMBER								
49	LEVEL	LIT-011	0	0	1	0	SH. PR.	FROM LEVEL TRANSMITTER	
49	LEVEL INDICATOR	LI-007	0	0	0	1	SH. PR.	TO LEVEL INDICATOR ON THIS SP	
49	SUMP PUMP								
49	IN AUTO MODE		1	0	0	0	2~#14	FROM SUMP PUMP CONTROL PANEL	
49	RUNNING		1	0	0	0	2~#14	FROM SUMP PUMP CONTROL PANEL	
49	FAULT		1	0	0	0	2~#14	FROM SUMP PUMP CONTROL PANEL	
49	HIGH WATER ALARM		1	0	0	0	2~#14	FROM SUMP PUMP CONTROL PANEL	
49	PUMP STATION TEMPERATURE								
49	DRY WELL TEMPERATURE	TT-402A	0	0	1	0	SH. PR.	FROM THERMOSTAT	
49	ELECTRIC ROOM TEMPERATURE	TT-402B	0	0	1	0	SH. PR.	FROM THERMOSTAT	
49	WET WELL INTERMEDIATE LEVEL TEMPERATURE	TT-402C	0	0	1	0	SH. PR.	FROM THERMOSTAT	
49	WET WELL GROUND LEVEL TEMPERATURE	TT-402D	0	0	1	0	SH. PR.	FROM THERMOSTAT	

STRAND ASSOCIATES, INC.®
STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
ILLINOIS
PUMP STATION 49
CONTRACT NO. 61J87
SCADA SYSTEM I/O LISTING - SCADA PANEL 49 (SP49)

SP	EQUIPMENT NAME	NUMBER	DI	DO	AI	AO	WIRE	COMMENTS
49	DRY WELL SUPPLY FAN	SF-1						
49	IN HAND MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49
49	IN AUTO MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49
49	RUNNING (CURRENT SWITCH)		1	0	0	0	2~#14	FROM CURRENT SWITCH IN MCC-P49
49	MOTOR OVERLOAD		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	CALLED FOR		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	EXCESSIVE RUNNING		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	SCADA CALL		0	1	0	0	2~#14	TO STARTER IN MCC-P49
49	DRY WELL EXHAUST FAN	EF-1						
49	RUNNING (CURRENT SWITCH)		1	0	0	0	2~#14	FROM CURRENT SWITCH IN MCC-P49
49	MOTOR OVERLOAD		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	CALLED FOR		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	WET WELL SUPPLY FAN	SF-2						
49	IN HAND MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49
49	IN AUTO MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON MCC-P49
49	RUNNING (CURRENT SWITCH)		1	0	0	0	2~#14	FROM CURRENT SWITCH IN MCC-P49
49	MOTOR OVERLOAD		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	CALLED FOR		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	SCADA CALL		0	1	0	0	2~#14	TO STARTER IN MCC-P49
49	WET WELL EXHAUST FAN NO. 1	EF-2						
49	RUNNING (CURRENT SWITCH)		1	0	0	0	2~#14	FROM CURRENT SWITCH IN MCC-P49
49	MOTOR OVERLOAD		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	CALLED FOR		1	0	0	0	2~#14	FROM STARTER IN MCC-P49
49	WET WELL EXHAUST FAN NO. 2	EF-3						
49	IN HAND MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON EF-3 CONTROL PANEL
49	IN AUTO MODE		1	0	0	0	2~#14	FROM HOA SWITCH ON EF-3 CONTROL PANEL
49	RUNNING (CURRENT SWITCH)		1	0	0	0	2~#14	FROM CURRENT SWITCH IN EF-3 CONTROL PANEL
49	MOTOR OVERLOAD		1	0	0	0	2~#14	FROM RELAY LOGIC IN EF-3 CONTROL PANEL
49	CALLED FOR		1	0	0	0	2~#14	FROM RELAY LOGIC IN EF-3 CONTROL PANEL
49	SCADA CALL		0	1	0	0	2~#14	TO RELAY LOGIC IN EF-3 CONTROL PANEL
TOTALS			127	20	13	4		

SECTION 41 22 23

HOISTS AND CRANES

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included:
 - 1. Hoists.
 - 2. Trolleys.
 - 3. Flat cable festoon systems.
 - 4. Electrical system controls.
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.
- C. Mechanical equipment specified under this section will be considered 80% complete once "Substantially Complete", corresponding O&M manuals have been approved by ENGINEER, training has been provided to the Department, and O&M manuals have been delivered for each pay item. Substantial Completion is defined as the time at which the Work (or a specified part thereof) specified herein has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) specified herein is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) specified herein can be utilized for the purposes for which it is intended. Equipment will not be considered 100% complete for each corresponding pay item until Final Acceptance by ENGINEER, all incomplete works have been addressed, spare parts have been delivered, Record Drawings have been approved and delivered, and all outstanding issues have been completed.

1.02 REFERENCES

- A. CMAA—Crane Manufacturers Association of America.
- B. MHI—Material Handling Institute, Inc.
- C. ANSI—American National Standard Institute.
- D. HMI—Hoist Manufacturers Institute.
- E. MMA—Monorail Manufacturers Association.

1.03 SYSTEM DESCRIPTION

- A. Monorail System: Monorail system shall include monorail beam(s) furnished under Division 05 and items specified in this section (excluding bridge cranes and portable cranes) as appropriate, and all other specified accessories necessary to provide a complete functioning system.

1.04 DESIGN REQUIREMENTS

- A. Hoists shall be designed and manufactured in accordance with the standards of the Hoist Manufacturers Institute.

1.05 PERFORMANCE REQUIREMENTS

- A. Monorail Systems: CONTRACTOR shall conduct start-up and testing of monorail systems to demonstrate that load capacity and total system operation meet the requirements and intent of the Contract Documents.

1.06 SUBMITTALS

- A. Submittals shall be in accordance with provisions of Section 01 33 00–Submittals.
- B. Shop Drawings:
 - 1. Complete material list of all components proposed to be furnished and installed under this Section.
 - 2. Girder layout including supports, connections and appurtenances.
 - 3. Stop locations and dimensions from interior building surfaces.
 - 4. Proposed factory coating system shall meet requirements of Section 09 96 00 and shall be submitted with the shop drawings.
 - 5. Provide OSHA and any other required certification to the Department prior to the Final Acceptance of the entire project.
- C. Load test results and certification.
- D. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 04 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- E. Submit type, brand, and thickness of primer paint to be furnished on bridge cranes, runway beams, and monorails.
- F. Provide project specific point-to-point wiring diagrams.
- G. Operations and Maintenance Manuals:
 - 1. Equipment function, normal operating characteristics, and limiting conditions.
 - 2. Assembly, installation, alignment, and maintenance instructions.
 - 3. Lubrication and maintenance instructions.
 - 4. Guide to “troubleshooting.”
 - 5. Parts list.

1.07 WARRANTY

- A. Monorail, hoist, trolley, winches, and ancillary items associated with the bridge crane system shall be warranted by the manufacturer who shall replace or repair any parts that have failed within a period of 12 months from the date of Final Acceptance of the entire project by ENGINEER.

PART 2-PRODUCTS

2.01 HOISTS

- A. Hoists shall be electric chain hoists. Motors shall be 460-volt, three-phase, 60 Hz. Provide chain container with hoists.
- B. Hoist schedule is as follows:

Location	Load Capacity	Motor Size	Speeds	Lift Height
Dry Well Access	1 Ton	3 hp	32/16 FPM	50 feet

2.02 TROLLEYS

- A. Trolleys shall be Robbins & Myer (R & M), Yale, Coffing, or Columbus McKinnon. Trolley motors, where required, shall be 460 volts, three-phase, 60 Hz.
- B. Trolley schedule is as follows:

Location	Load Capacity	Motor Size
Dry Well Access	1 Ton	0.25 hp

2.03 FLAT CABLE FESTOON SYSTEM

- A. Tracks, support brackets, and accessories shall be galvanized steel.

2.04 ELECTRICAL SYSTEM CONTROLS

- A. Hoists, trolleys, pendant controls, and flat cable festoon systems shall be rated for a Class I, Division 2, Groups C and D location.
- B. Hoists and trolleys shall be controlled via a pushbutton pendant. Pushbutton pendant shall reach to within 3 feet 6 inches of the operating floor. Pushbutton pendant shall provide control of all system motions (up/down, forward/reverse, etc.) and shall have an emergency stop pushbutton.
- C. Hoists and trolleys shall have a control power transformer for dedicated control power circuit.

- D. Hoists and trolleys motion shall be controlled by magnetic motor contactors mounted on shockproof mountings.
- E. Hoists and trolleys shall accept a single point power connection.
- F. Where hoists and trolleys are specified to be provided on the same mounting structure (i.e., monorail, etc.) the hoist and trolley shall be combined as one unit and shall be wired by manufacturer such that the hoist and trolley unit shall accept a single point power connection. Additional CONTRACTOR interconnection wiring between the hoist and trolley shall not be required.
- G. Local disconnect shall be provided by Division 26.

2.05 FINISHES

- A. Monorail beams shall be painted in accordance with Section 09 91 00—Painting requirements for steel, machinery, and equipment not submerged. Primer shall consist of one shop coat of epoxy primer, 5.0 mils DFT. Load capacity shall be stenciled on the bridge and monorail beam after finish painting.
- B. Hoists and trolleys shall be factory-finished painted with the manufacturer's epoxy paint finish system.

PART 3—EXECUTION

3.01 EQUIPMENT INSTALLATION

- A. Install equipment as indicated and according to supplier's and manufacturer's instructions.
- B. CONTRACTOR shall inspect the units after delivery to the site for any damage to the units during shipping.

3.02 FIELD QUALITY CONTROL AND DEMONSTRATION

- A. Provide manufacturer's services for the following:
 - 1. Start-up.
 - 2. Field Testing: Equipment manufacturer shall provide a written report covering checkout, testing, inspections and start-up, and shall identify any deficiencies noted. Report shall be submitted to ENGINEER. CONTRACTOR shall be responsible for correcting all deficiencies noted in report.
 - 3. Operator training and final adjustment.
- B. Supervision and Start-Up: Installation of all equipment furnished under this Contract shall be supervised as required by a qualified representative of equipment manufacturer. All equipment shall be placed in operation, and the plant operator shall be trained to the satisfaction of OWNER by a qualified representative of the equipment manufacturer. OWNER may videotape training presentation given by manufacturer's representatives.

3.03 FINISHING

- A. CONTRACTOR shall provide finish paint as required by Section 09 91 00–Painting.

3.04 ADJUSTING, CLEANING, AND PROTECTION

- A. CONTRACTOR shall provide final adjusting, cleaning, and protection in accordance with Division 01. CONTRACTOR shall make all final adjusting on equipment as required by manufacturer. CONTRACTOR shall leave equipment in a clean condition.

3.05 LUBRICATION

- A. CONTRACTOR shall furnish a one-year supply of grease and oils for all items of equipment requiring lubrication. Lubricants for all items of equipment shall be the same brand, when available, as recommended by the manufacturer to meet both warm and cold weather requirements.

3.06 USE BY CONTRACTOR.

- A. If crane is used by CONTRACTOR, it shall be repaired, repainted, and otherwise refurbished to like new condition prior to its acceptance. CONTRACTOR assumes all responsibility for operation and maintenance until the crane has been accepted by OWNER.

END OF SECTION

SECTION 43 25 10

VERTICAL DRY-PIT SUBMERSIBLE PUMPS

PART 1—GENERAL

1.01 SUMMARY

- A. Work Included: This section includes furnishing, installing, and placing into successful operation vertical dry pit submersible pumps and appurtenances. The pumps and appurtenances shall be furnished by the same supplier. They are to include:
1. Three main flow pumps (MP1, MP2, and MP3).
 2. One low flow pump (LFP).
 3. One spare pump (SMP).
- B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern Work in this section.

1.02 REFERENCES

- A. ANSI/Hydraulic Institute (ANSI/HI):
1. 9.6.3, Rotodynamic (Centrifugal and Vertical) Pumps – Guideline for Allowable Operating Region.
 2. 9.6.4, Rotodynamic Pumps for Vibration Measurements and Allowable Values.
 3. 9.6.6, Rotodynamic Pumps for Pump Piping.
 4. 11.6, Rotodynamic Submersible Pump for Hydraulic Performance, Hydrostatic Pressure, Mechanical, and Electrical Acceptance Tests.
 5. 14.6, Rotodynamic Pumps for Hydraulic Performance Acceptance Tests.

1.03 SYSTEM DESCRIPTION

- A. Application: Pumps MP1, MP2, MP3, and LFP shall be installed in the Pump Station 49 dry well. The pumps shall convey stormwater from the pump station wet well to a gravity discharge channel within the station. Pumps shall be controlled by full-voltage non-reversing starters provided in Section 26 24 19—Motor Control. SMP shall be located within the station in the event it needs to be placed into service.
- B. Design Requirements:
1. The submersible pumps shall meet the following operating condition:

OPERATING CONDITION			
Pump	Location	GPM	TDH (ft)
*MP1, MP2, MP3, SMP, LFP	Dry Well	900	33.25

*Design point shall meet HI Acceptance Grade 1U.

2. The submersible pump motors shall meet the following operating conditions:

Pump	Power Factor-Full Load	HP	FLA	Voltage	Phase	RPM	Minimum Pump Eff.*	Minimum Motor Eff.*
MP1, MP2, MP3, SMP	0.98	14	15	460	3	1,800	73.3%	92.8%
LFP	0.98	14	15	460	3	1,800	74.5%	92.8%

*Minimum efficiency at average operating conditions.

- C. Performance Requirements: CONTRACTOR shall supply pumps to meet the following requirements using constant speed operation:
1. Operate at the conditions listed above following Hydraulic Institute (HI) Acceptance Grade 2B as noted in HI 14.6: Hydrodynamic Pumps for Hydraulic Performance Acceptance Tests.
 2. While operating under suction head at the normal operating conditions, the pump design shall be such that the pump will operate satisfactorily without cavitation, excessive noise, or vibration when installed as shown on the Drawings and operating at the head specified.
 3. Motor horsepower shown is the minimum requirement. The motor shall be large enough not to be overloaded at any point on the design curve for the pump chosen to meet the operating conditions.
 4. The maximum and minimum head conditions are given as a guide to the shape of the head discharge curve. The pumps shall have a head discharge curve of the same shape or steeper within the guidelines previously specified.
 5. Be designed to operate in submerged condition in the space allotted.
 6. Be vertical, nonclog centrifugal wastewater pumps with integral motors designed and assembled by same manufacturer.
 7. Be capable of handling solids and long stringy materials found in raw unscreened wastewater.
 8. With its appurtenances and cable, be capable of operation with continuous submergence without loss of watertight integrity to a depth of 65 feet.
 9. Be capable of running continuously at full nameplate rated load while the pump is submerged, partially submerged or unsubmerged. The use of shower systems, secondary pumps, or cooling systems to cool the motor shall not be acceptable.
 10. Be UL, CSA, or FM approved for Class I, Division 1, Groups C and D hazardous locations. The entire pumping equipment including power supply system shall meet the NEC requirement for Class 1, Div. 2, Group D hazardous locations.
 11. The main pumps shall be capable of a pump down to a low water level at elevation 782.00 without cavitation occurring. The low pumps shall be capable of a draw down to a low water level at elevation 782.00 without cavitation occurring. Manufacturer's certification of the preceding shall be provided as part of the submittal data.
 12. The new pumps including main pumps and low flow pumps shall operate at the capacities and heads and over the range of operating conditions specified without overloading, cavitation, and vibration. The pumps shall conform with the following requirements:

1.04 QUALITY ASSURANCE

- A. Pumping station shall be in conformance with requirements of the Illinois Environmental Protection Agency and all applicable industry codes and laws.
- B. Materials of construction for the pumps and related equipment shall be suitable for the environment in which they are to be located.

1.05 WARRANTY

- A. The pump manufacturer shall warrant the units being supplied to OWNER against defects in workmanship and materials for a period of 5 years of the date of Final Acceptance of the entire Project by ENGINEER or 10,000 hours under normal use, operation and service on a non-prorated basis. The warranty shall be in printed form and apply to all similar units.

1.06 SUBMITTALS

- A. Standard submittal data for approval shall consist of:
 - 1. Pump Performance Curves.
 - 2. Pump Outline Drawing.
 - 3. Station Drawing for Accessories.
 - 4. Electrical Motor Data.
 - 5. Typical Installation Guides.
 - 6. Spare parts list.
 - 7. 7. record drawings.
 - 8. Submit location where pumps and motor are manufactured and the nearest permanent service headquarters of the pump and motor manufacturers.
 - 9. Five bound copies of operating and maintenance instructions, diagrams, and parts list.
 - 10. Technical Manuals and Parts List.
 - 11. Printed Warranty.
 - 12. Management system certificate ISO 9001.
 - 13. Manufacturer's Equipment Storage Recommendations.
 - 14. Manufacturer's Standard Recommended Start-Up Report Form.
- B. In addition, submittal data shall include:
 - 1. Complete manufacturer's specifications and descriptive bulletins highlighting applicable data for all equipment including size, capacity, description and make of pumps and motors. Detailed data sheets for pumps and motors, cable, temperature/moisture monitoring unit.
 - 2. Detailed control description, illustrations, wiring diagrams of manual-offautomatic controls and starting equipment.
 - 3. Complete motor and manufacturer supplied cables and cable support data.
 - 4. Pump performance curves for the specified conditions including head, input kilowatts, net positive suction head and overall efficiency, as a function of capacity from zero to maximum capacity.
 - 5. Drawings of the equipment, including arrangement and erection drawings of the equipment and equipment operating characteristics in such detail as to give all dimensions necessary to accurately locate through the floors and walls all openings for pipes, anchor bolts and fittings for motors, pumps, motor and pump control center

- openings, and conduit between the associated equipment. This includes drawings, indents, pockets, and clearances necessary in the floors and walls for proper installation of the equipment specified.
6. General arrangement drawing of pumping unit, suction elbow and pump stand. Include equipment weight and anchor methods and materials.
 7. Cross section drawing of pumping unit.
 8. Factory and field testing procedures shall be submitted prior to factory testing.
 9. Parts list with materials of construction technical descriptions and complete model number and quantity
 10. Motor performance characteristics.
 11. Spare parts list with technical description, complete model number and quantity.
 12. Painting procedure, details of finish color and ANSI numbers.
 13. Six certified copies of the Shop Test results including analysis of test results and recommendations. Explosion proof UL or FM Certification for all proposed pumps.
 14. Motor Nameplate Technical Data shall include:
 - a. Manufacturer name.
 - b. Model number.
 - c. Series number.
 - d. Rated horsepower.
 - e. Rated voltage.
 - f. Full load current.
 - g. No load current.
 - h. Rated frequency.
 - i. Number of phases.
 - j. Rated full load rpm.
 - k. Rated temperature rise.
 - l. Insulation class.
 - m. Recommended starting restrictions, including allowable starts per hour.
 - n. Locked rotor motor starting inrush current and NEC code letter.
 - o. Service factor.
 - p. Efficiency.
 - q. Frame size.
 - r. NEMA design letter.
 - s. Full load power factor.
 - t. Recommended maximum KVAR rating of power factor correction capacitors.
 - u. Class 1, Division 2, Group D rating showing UL or FM approval.
 - v. Year of manufacturing.
 - w. Total weight of pump and motor assembly.
 15. Pump nameplate technical data:
 - a. Pump manufacturer name.
 - b. Pump model and serial number.
 - c. Nominal size.
 - d. Impeller code.
 - e. Impeller diameter.
 - f. Suction and discharge size.
 - g. Specific duty conditions.
 - h. Customer name.
 - i. Rated rpm and rated HP.
 - j. Max temperature rating.

- k. Total weight of pump and motor assembly.
- 16. CONTRACTOR's Responsibility: If the power demand of pumping units proposed to be provided for this Project exceeds the maximum horse power and/or full load amps as specified and as provided or shown in the Drawings, it is CONTRACTOR's sole responsibility, without additional cost to the Department, to upgrade all affected electrical facilities such as, but not limited to, wiring, conduits, motor controls, switchgear, transformers and incoming facilities to be able to operate all the pumping units satisfactorily and to meet the Specifications.
- 17. Manufacturer's Certifications:
 - a. Submit manufacturer's certification that he has carefully examined all of the Contract Documents in detail, including the arrangement and conditions of proposed structures affecting the performance of the pumping equipment units, and the detailed requirements of manufacturing and subsequent installation of the pumping equipment units.
 - b. Submit manufacturer's certification that there are no omissions, ambiguities or conflicts in the Contract Documents or in the pumping station piping layout that affect the pumping units, as shown on the Drawings which have not already been clarified in writing by ENGINEER.
 - c. Submit manufacturer's certification that they have reviewed the location and discharge piping design, the discharge valve locations and types, the pumping unit locations such as the physical separation to each other and adjacent walls, the water to be pumped, and pumping station piping layout, as shown on the Drawings, and that any incidental modifications thereto will not affect the specified pumping unit performance and efficiency to be furnished under this Contract, and they will be solely responsible for furnishing and delivering pumping equipment that will perform and meet the requirements, as specified in the Contract Documents.
 - d. Submit manufacturer's certification that they have inspected the storage of the pumping equipment and find no conditions that have adversely affected the equipment.
 - e. Submit manufacturer's certification that they have supervised the installation of the pumping equipment and that the pumping equipment has been properly installed.
 - f. Submit manufacturer's certification that they have inspected the pumping equipment after 1,000 hours of operation and certify the pumping equipment is operating satisfactorily.
 - g. Submit manufacturer's certification that the pumps were certified by UL and/or FM as listed in these specifications and meet the requirements of Class I Division 2.

PART 2-PRODUCTS

2.01 MANUFACTURER

- A. Submersible pumps shall be manufactured by Xylem-Flygt meeting the following requirements:

Pump	Series	Model	Impeller	Discharge Diameter	Estimated Pump Weight
MP1, MP2, MP3, LFP, and SMP	NT	3153 MT	437 (194 mm)	6-inch	460 pounds

- B. Equivalent or "or-equal" items or substitutions are not permitted without written approval of ENGINEER and the substitution meets all requirements in this Specification Section.

2.02 SUPPORT STAND FOR PUMPS

- A. Each pump in operation (MFP-1, MFP-2, MFP-3, and LFP-1) shall be supplied with a 90 degree suction elbow made of cast iron. The suction flange shall be 8 inches in diameter.
- B. Provide a steel reinforced concrete pedestal to mount the stand as detailed in the Drawings.
- C. The inlet elbow shall have an inspection port of at least 5 inches in diameter.

2.03 PUMP CONSTRUCTION

- A. All major parts such as the stator casing, lubricant casing, sliding bracket, discharge connection, volute and impeller shall be of gray iron with smooth surfaces. All exposed bolts, screws and nuts shall be stainless steel construction. All metal surfaces coming in contact with the pumped liquid other than steel or brass shall be protected by a manufacturer-selected paint system.
- B. All mating surfaces of major parts shall be machined and fitted with O-rings where watertight sealing is required. Machining and fitting shall be such that sealing is accomplished by automatic compression in two planes and O-ring contact made on four surfaces without the requirement of specific torque limits to affect this. Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered adequate or equal. Tolerances of all parts shall be such that allows replacement of any part without additional machining required to provide sealing as described above. No secondary sealing compounds, greases, or other devices shall be used.

2.04 PUMP VOLUTE

- A. Pump volute shall be of ASTM A48 Class 35B cast iron and shall have integral spiral-shaped, sharp-edged groove(s) at the suction of the volute. The spiral groove(s) shall provide the sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The internal volute bottom shall provide effective sealing between the multivane, semiopen impeller and the volute.

2.05 PUMP MOTOR

- A. The pump motor shall be housed in an air-filled watertight chamber and shall have moisture-resistant Class H insulation. The pump motor shall be NEMA Design B designed for continuous duty. Motor shall be capable of sustaining at least 15 evenly spaced starts per hour. Pump motor shall be explosion-proof. UL or FM approved.
- B. The combined service factor (combined effect of voltage, frequency, and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of $\pm 10\%$. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not

to exceed 80°C. Motor shall meet the requirements of NEMA MG-1 part 31 and be suitable for VFD operation.

- C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.
- D. Motor Schedule: If motor horsepower is increased to meet the requirements of this specification, CONTRACTOR is responsible for increasing all wiring, starters, drives, and other electrical components as required by Code, at no additional cost to OWNER.
- E. Motor shall be suitable for application in Class 1, Division 2, Group D hazardous location.
- F. Motor nameplate shall be per NEMA standards and must show these specific items:
 - 1. Manufacturer name.
 - 2. Model number.
 - 3. Series number.
 - 4. Rated horsepower.
 - 5. Rated voltage.
 - 6. Full load current.
 - 7. No load current.
 - 8. Rated frequency.
 - 9. Number of phases.
 - 10. Rated full load rpm.
 - 11. Rated temperature rise.
 - 12. Insulation class.
 - 13. Recommended starting restrictions, including allowable starts per hour.
 - 14. Locked rotor motor starting inrush current and NEC code letter.
 - 15. Service factor.
 - 16. Efficiency.
 - 17. Frame size.
 - 18. NEMA design letter.
 - 19. Full load power factor.
 - 20. Recommended maximum KVAR rating of power factor correction capacitors.
 - 21. Class 1, Division 2, Group D rating showing UL or FM approval.
 - 22. Year of manufacturer.

2.06 PUMP PROTECTION

- A. The motor stator shall incorporate three thermal switches in series to monitor the temperature of each phase winding. At a temperature preset to protect the motor the thermal switches shall stop the motor and be capable of activating an alarm.
- B. A float-type leakage sensor (FLS) shall be provided to detect fluid in the stator. When activated, the sensor shall be capable of stopping the motor and activating an alarm or indicator. The thermal switches and sensor shall be connected to a monitoring unit which shall be designed to be mounted in the control panel.

- C. A Mini-CAS unit rated for 120 VAC power supply shall be provided for installation in the MCC bucket.

2.07 PUMP SHAFT

- A. Pump and motor shaft shall be one unit. Couplings are not acceptable. The shaft shall be made of stainless steel ASTM A 479 S43100-T. The shaft shall rotate on two permanently lubricated bearings with a L-10 bearing life of 50,000 hours when pump is operating at or near best efficiency point. Bearings shall compensate for axial thrust and radial forces.

2.08 PUMP MECHANICAL SEALS

- A. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces. The lower primary seal unit between the pump and lubricant chamber shall contain one stationary and one positively driven rotating tungsten-carbide ring. The upper secondary seal unit between the lubricant chamber and the motor housing shall contain one stationary and one positively driven rotating tungsten carbide seal ring. Each interface shall be held in contact by its own spring system and not require being supplemented by external liquid pressures. Both seals shall be mounted on the shaft. The lower seal shall not be mounted on the impeller hub. The seals shall require neither maintenance nor adjustment, nor depend on direction of rotation for sealing. Shaft seals without positively driven rotating members or conventional double mechanical seals with a common single or double spring acting between the upper and lower units, requiring a pressure differential to offset external pressure and effect sealing shall not be considered acceptable, nor equal to, the dual independent seal system specified.
- B. The pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive antileak seal shall be easily accessible from the outside. No seal damage shall result from operating the pump in an unsubmerged condition. The seal system shall not rely on the pumped media for lubrication.

2.09 PUMP IMPELLER

- A. The impeller shall be of duplex stainless steel (ASTM CD-4MCuN), dynamically-balanced, semiopen, multivane, backswept, screw-shaped, nonclog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The impeller shall be capable of handling solids, fibrous materials, and other matter normally found in storm water. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impeller shall be locked to the shaft and held by an impeller bolt.

2.10 PUMP MOTOR CABLE

- A. The pump motor cable shall be suitable for submersible pump applications. This shall be indicated by a code or legend permanently printed on the cable. Cable size shall conform to

NEC and ICEA Standards and shall be of adequate size to allow motor voltage conversion without replacing the cable. Provide a stainless steel Kellum grip strain relief on motor cable to support cable at manhole cover. Provide minimum 50 feet of cable for each pump, more as necessary. Cable shall be of sufficient length to provide continuous run from in-place pump to point of cable connection. All ends of pump cables shall be fitted with a rubber shrink-fit boot to protect cable prior to installation.

2.11 CABLE ENTRY SEAL

- A. A cable entry seal shall be provided where the pump cable enters the pump. The cable entry seal design shall preclude specific torque requirements to provide a watertight and submersible seal. The cable entry shall consist of cylindrical elastomeric grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain-relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by stator lead sealing gland or a terminal board which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be required or used.

2.12 COOLING SYSTEM

- A. The motor shall be provided with an integral motor cooling system. A stainless steel cooling jacket shall encircle the stator housing, providing for dissipation of motor heat regardless of the type of pump installation. An impeller, integral to the cooling system and driven by the pump shaft, shall provide the necessary circulation of the cooling liquid through the jacket. The cooling liquid shall pass about the stator housing in the closed loop system in turbulent flow providing for superior heat transfer. The cooling system shall have one fill port and one drain port integral to the cooling jacket. The pump shall be capable of operating continuously (S1) in an ambient temperature up to 122°F (50 °C) and transport liquids with a temperature up to 104°F (40°C). Operational restrictions at temperatures below 122°F are not acceptable. Fans, blowers or auxiliary cooling systems that are mounted external to the pump motor are not acceptable..

2.13 CONTROLS

- A. All equipment and controls specified to be furnished with the equipment shall comply with the requirements of Section 40 94 23—Controls and Instrumentation.

2.14 FINISHES

- A. It is the intent of these specifications that the submersible pumps be furnished shop-primed and factory-finished painted. Priming and finish painting shall be as recommended by manufacturer and shall be suitable for the uses described in these specifications. Touch-up paint shall be provided by manufacturer.

2.15 ANCHOR BOLTS

- A. CONTRACTOR shall provide anchor bolts necessary for equipment furnished. Anchor bolts shall be 316 stainless steel and be of ample strength for the intended service. Provide anchor bolts in accordance with Division 05.
- B. Bolts, Studs and Nuts:
 - 1. All bolts, studs and nuts shall have American National form right-hand machine cut threads which shall be in conformity with the current ANSI B1.1, "Screw Threads," Coarse Thread Series, class 2 Fit, unless otherwise specified.
 - 2. Bolts heads and nuts shall be semi-finished and shall be in conformity with ANSI B18.2, "Wrench-Head Bolts and Nuts and Wrench Openings," Heavy Series, unless otherwise specified. All nuts shall be hexagonal in shape.
 - 3. Stainless steel anchor bolts, flange bolts, studs and nuts shall be in conformity with the current ASTM Designation: A193, Grade B8 (AISI 304), Class 1 and ASTM A194, Grade 8 (AISI 304), AISI 316 or approved equal.

2.16 PROTECTION MONITORING SYSTEM

- A. Each pumping unit shall be supplied with a monitoring system to protect critical machine functions during operation.
- B. Three thermoswitches, one per phase, shall be provided in the motor windings to protect against overheating by initiating an alarm on high temperature.
- C. A moisture sensor shall be provided to protect against damage from water contamination. The sensor shall be arranged to initiate the alarm upon sensing moisture in the oil chamber or prior to water reaching the motor windings.
- D. A monitoring device or devices designed to be compatible with the sensors and motor controls shall be provided for each pump. The monitoring system shall be intrinsically safe, intrinsically safe barriers shall be provided where required. The protective monitoring unit shall be installed on MCC bucket door for each pump configured with ability to automatically reset.
- E. Interface and coordination between pump and MCC manufacturers shall be required prior to shipment. See Section 16D for pump interface requirements with SCADA. Motor Protection Relay (MPR) interface signals:
 - 1. Motor High Temperature.
 - 2. Motor Moisture Sensor.

2.17 SPARE PARTS

- A. The following spare parts shall be provided; two sets for the main pumps, two sets for the spare pump and two sets for the low flow pump:
 - 1. Two sets of mechanical seals—upper and lower.
 - 2. Two sets of cable entry grommets.
 - 3. Two sets of motor bearings.
 - 4. Two sets of wear rings.

- B. A complete set of special wrenches, spanners, eyebolts, and other special tools shall be furnished sufficient to completely dismantle and reassemble each kind and size of pumping unit. Tools shall be forged steel, case hardened, full finished, and furnished with a metal tool case with a handle and provision for padlocking.

PART 3-EXECUTION

3.01 INSTALLATION

- A. Refer to requirements specified in Division 01 for field installation, testing, quality assurance, and start-up.
- B. Install in accordance with manufacturer's directions as supplemented herein.
- C. CONTRACTOR shall coordinate the proper location of access hatches over the pumps, roof access hatches over the pumps, and all associated pump accessories to facilitate installation and removal of pumps. Locations shall be suitable to meet current design and future design conditions without interference.

3.02 PUMP TESTING

- A. Factory Test: Each pumping unit to be furnished, including the spare main pump, shall be fully performance tested with water in the manufacturer's facility in accordance with the Standards of the Hydraulic Institute to determine compliance with the rated conditions. The pump tests shall be witnessed by OWNER. Notify OWNER at least three weeks in advance regarding the proposed test dates and location. Certified test curves, test data, and computations shall be submitted for approval prior to shipment and shall include pump performance curves for each of the speeds needed to meet the specified operating conditions defined under Paragraph 1.02.B. Each pump performance curve shall include at least four operating points and shall show:
 - 1. Head versus discharge.
 - 2. Pump efficiency.
 - 3. Break horsepower.
 - 4. NPSHr for maximum flow conditions.
 - 5. Hydrostatic pressure test for casing at 75 psi.
- B. Detailed factory test procedures shall be submitted prior to testing. The procedures shall include diagrams and drawings showing the exact set-up of the test and the location of the tested pump and the piping system with all required elevations. The diagrams and the drawings shall be clear and legible.
- C. Tests shall be conducted at rated speed to determine the curves of head, electric input kilowatts, and overall efficiency, wire to water, as a function of capacity. A minimum of six points shall be taken, including shutoff. One point shall be as near as possible to each specified condition of head and capacity and the remaining points at capacities necessary to provide a uniform distribution of data. Capacity shall be expressed in gallons per minute and head shall be expressed in feet. Raw test data, calculated results and sufficient

information for computation and plotting of the curves shall be furnished with the certified shop test curves. Record voltage, amps, power factor, and frequency at each point; provide screen shots and formulae tables for the derivation of raw data tabulations. The screen shots shall be colored. Manual calculation shall not be accepted. The testing screen shall present to the Departments' representatives the following parameters: Flow (GPM), Head (feet), Power (HP), Power Factor, Voltage (V), Amperage (Amp), frequency (Hz), and Efficiency (%), and their dynamic change in response to the flow change. The testing screen shall present the development of all the required curves as the points are being recorded. The testing screen shall present the settings for the vertical and horizontal tolerances in accordance to the specified Hydraulic Institute Standards. A copy of the nameplate of the pump and the motor shall be included in the factory witness test report.

- D. Certified test curves shall be furnished for approval prior to shipment. All tests shall be witnessed by the manufacturer by a Registered Professional Engineer. The witnessing Registered Professional Engineer shall sign and seal each copy of the curve and test data sheets. Six copies of the curves along with the certified drive unit test data, shall be furnished for approval. Shipment of the pumping units shall not be made until the test data and curves are approved.
- E. Curves shall be drawn to such scale that values can be read accurately within 1%. The efficiency curves submitted shall constitute a guarantee within 1% on the scale, for all deliveries between 3/4 rated capacity and 1 1/4 rated capacity.
- F. In addition to the hydraulic test, the pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory:
 - 1. Impeller, motor rating and electrical connections shall first be checked for compliance with the Specifications.
 - 2. Motor and power cable insulation shall be tested for moisture content and insulation defects with a megga-ohm meter once before performance test and again after completion of performance test.
 - 3. Winding resistance factory test for pump motors.
 - 4. Moisture and temperature detector factory tests and describe acceptance and rejection criteria.
 - 5. Describe tests acceptance and rejection criteria.
 - 6. After operational test and hydraulic test, the moisture and temperature detector tests and the insulation test shall be performed again and readings shall be recorded. A written report, stating the foregoing steps have been done, shall be submitted prior to shipment.
 - 7. Each pump shall be subjected to a hydrostatic test and certification of the hydrostatic test shall be provided. The hydrostatic pressure shall, in any case, not be less than 150% the shut-off pressure of the pump as shown by the characteristic curve. The minimum test duration time shall be 10 minutes.
 - 8. The certified test reports shall be submitted within two weeks from the completion of the tests. The results shall be certified that the equipment supplied meets the contract requirements.
- G. CONTRACTOR shall provide transportation and reasonable expenses to and from all factory pump testing for two representatives of the Department to witness such testing. The Department shall designate these individuals. CONTRACTOR shall notify ENGINEER of a

scheduled test date two months prior to said date and shall arrange an exact suitable date not less than two weeks prior to the test.

1. It is the responsibility of CONTRACTOR to coordinate with the manufacturer and so that the testing facility is ready for the test and fully equipped with the required equipment and fittings to perform the tests as described in the special provisions in a timely manner. No more than three business days shall be allowed for the factory witness test.
 2. If ENGINEER and ENGINEER's representatives, at their sole discretion, deem the testing facility is causing unreasonable delay, or the set-up of the test does not match with the testing procedures and diagrams provided prior to the test, or there is a malfunction in any of the testing equipment, the test shall be cancelled and CONTRACTOR shall re-arrange for the test on a different date that fits with ENGINEER's schedule. Any delay to the project due to the cancellation of the test shall be CONTRACTOR's responsibility and shall not be allowed any extension or compensation.
 3. CONTRACTOR shall credit the Department all expenses for any additional trips that ENGINEER and ENGINEER's representatives have to make to the testing facility due to tests cancellation.
- H. Installed Test: Prior to startup at OWNER's facility, manufacturer's representative shall certify that equipment has been properly aligned and installed. During equipment startup, manufacturer's representative shall confirm each pump is operating properly as specified. Report shall be submitted verifying test. Pump shall be modified if specified conditions are not met. Field tests shall be conducted under actual design conditions and be tested for the full anticipated operational range.
- I. Field Tests: The pump manufacturer shall perform the following inspections and tests on each pump, including the spare pump, at start-up:
1. Written test procedures shall be submitted two weeks prior to field testing.
 2. After installation of the pumping units, control equipment and all appurtenances, each unit shall be subjected to a field running test under actual operating conditions. Water for these tests shall be the responsibility of CONTRACTOR and adequate water supply shall be available for testing of two pumps concurrently. Field tests shall be performed in the presence of IDOT and as requested by ENGINEER. Tests shall demonstrate that under all conditions of operation each unit:
 - a. Has not been damaged during transportation or installation.
 - b. Has been properly installed.
 - c. Has no physical or mechanical defects.
 - d. Has been properly connected.
 - e. Is free of overheating of any parts.
 - f. Is free of overloading of any parts.
 - g. Verification of pump shaft rotation in proper direction.
 - h. The pump shall be free of any vibration and cavitation.
 3. Hand, off, auto, lead/lag, bump mode of each pump shall be tested from local control station, SCADA panel, and MCC to demonstrate that the pumps and control system operate as specified. Any defects in the equipment or failure to meet the requirements of the Specifications shall be promptly corrected.
 - a. Each Pump operates as expected at specified levels for on/off operation based on SCADA entered level variable data.

- b. Each Pump operates as expected at specified levels for on/off operation based on ball float level switches.
 - c. Each pump shall be tested to verify rated flow.
 - d. Verify that each Pump does not operate from local control station and or from MCC when hand-off-auto switch is in off position.
 - e. Each Pump start and stop operates as expected manually from MCC and from local control station located at grade level.
 - f. Each Pump is sequenced as expected for rising and falling water levels in the wet well.
 - g. Every possible pump auto sequence of each pump shall be tested for lead/lag/standby for rising and falling water levels based on SCADA controls.
 - h. Every possible pump auto sequence of each pump shall be tested for lead/lag/standby for rising and falling water levels based on hard wire float mode through float switches.
4. The following shall be checked on start-up:
- a. Current draw and voltage on all legs of each pump shall be observed and recorded to see if there is any imbalance.
 - b. Megga-ohm meter testing shall be performed and record reading on each pumps.
 - c. Winding resistance test for each phase shall be performed and recorded for each pump.
 - d. Pump controls and terminations shall be checked.
 - e. At a minimum, each pump including all spare pumps, shall be run in recirculation a minimum of 30 minutes.
 - f. Moisture and temperature detector tests and record results on each pump.
 - g. Each PLC I/O point shall be verified for proper operation. Analog signals shall be simulated with multimeter at 0, 4, 8, 12, 16, and 20 mA levels. Results of I/O checkout shall be witnessed by ENGINEER. A sign-off sheet shall be generated for each I/O point.

END OF SECTION

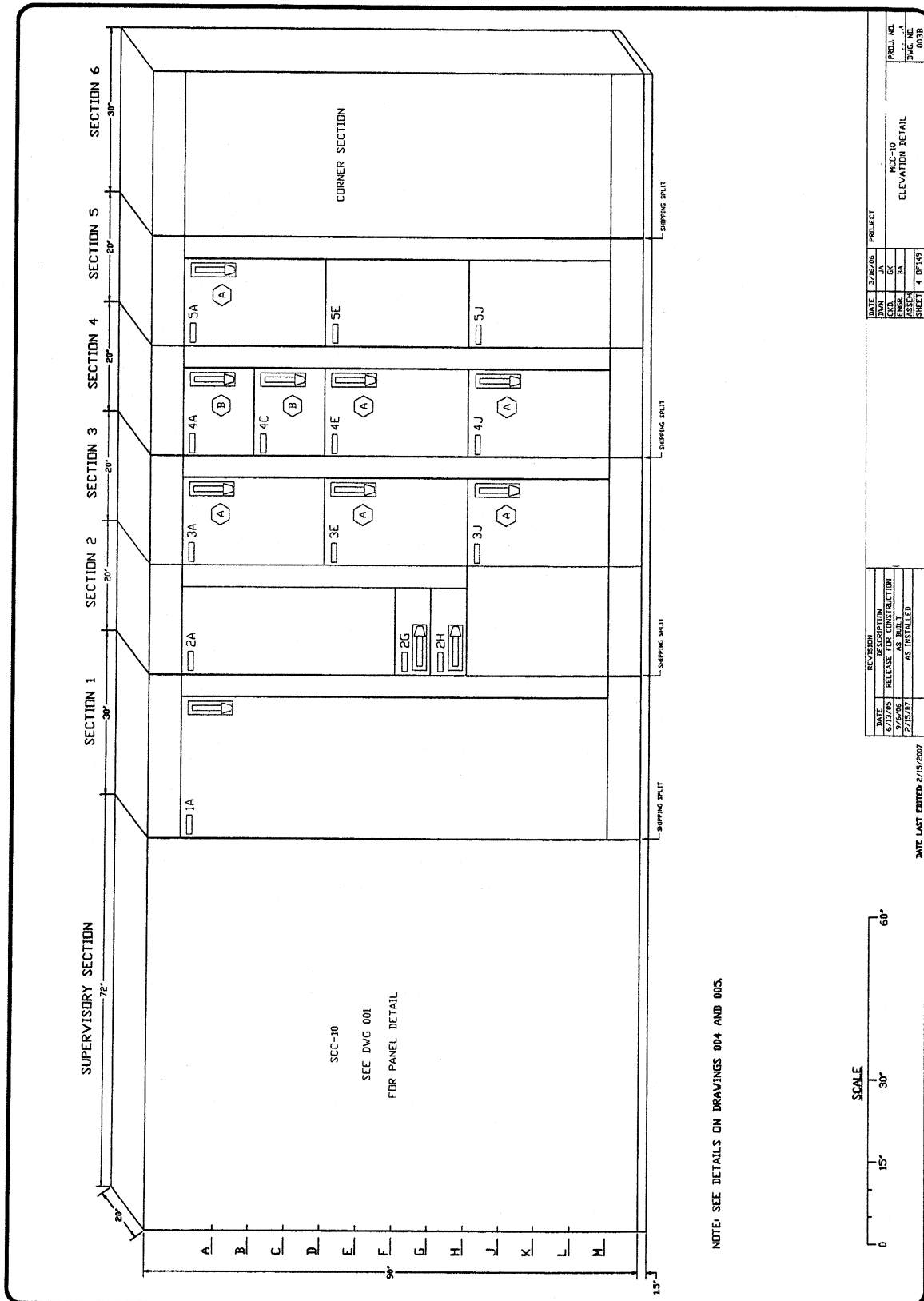
SAMPLE DRAWINGS

709

Standard Abbreviations

<u>Abbreviation</u>	<u>Description</u>	<u>Abbreviation</u>	<u>Description</u>
A	Air Compressed	OV	Overvoltage
AC	Air Condition	PB	Pushbutton
AD	Auto Dialer	PC	Pull Cord
AH	Alarm Horn	PC	Personal Computer
AL	Alarm Light	PFC	Power Factor Capacitor
AM	Amp Meter/Ammeter	PL	Pilot Light
ANN	Annunciator	PLC	Programmable Logic Controller
AR	Alternating Relay	PM	Power or Phase Monitor
AWG	American Wire Gauge	PN	Pneumatic
BA	Battery	PR	Pressure Regulator
BLU	Blue	PS	Pressure Switch
BRN	Brown	PS	Power Supply
CA	Cable	PSH	Pressure Switch High
CB	Circuit Breaker	PSL	Pressure Switch Low
CR	Control Relay	REC	Receptacle
CT	Current Transformer	SP	Surge Protector
DB	Distribution Block	SS	Selector Switch
DI	Diode	STP	Shielded Twisted Pair
DS	Disconnect Switch	SV	Solenoid Valve
EC	Electronic Control Device	TD	Time Delay Relay
ETM	Elapsed Time Meter	TG	Toggle Switch
EN	Enclosure	TS	Temperature Switch
FO	Fiber Optic	TSP	Twisted Shielded Pair
FS	Flow Switch	TT	Temperature Transmitter
FU	Fuse	UPS	Uninterruptible Power Supply
GFI	Ground Fault Interrupter	UTP	Unshielded Twisted Pair
GND	Ground	VA	Voltampere
GRN	Green	VFD	Variable
HTR	Heater	VM	Voltmeter
LA	Lightning Arrestor	WHT	White
LP	Lighting Panel	WS	Weight Switch
LR	Latching Relay	WT	Weight Transmitter
LS	Level Switch	XFMR	Transformer
MS	Motor Starter Contactor	SI	Signal Isolator
M	Motor	SS	Speed Switch
NP	Nameplate	ZS	Position Switch
OIT	Operator Interface Terminal		
OL or O/L	Overload		
ORG	Orange		

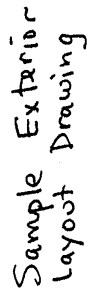
Sample List of
Abbreviations



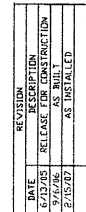
Sample Exterior
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9/6/06	AS BUILT	4/17/06	ASSET	4/17/06	ASSET	
2/15/07	AS INSTALLED	4/17/06	ASSET	4/17/06	ASSET	
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DATE LAST EDITED 2/15/2007







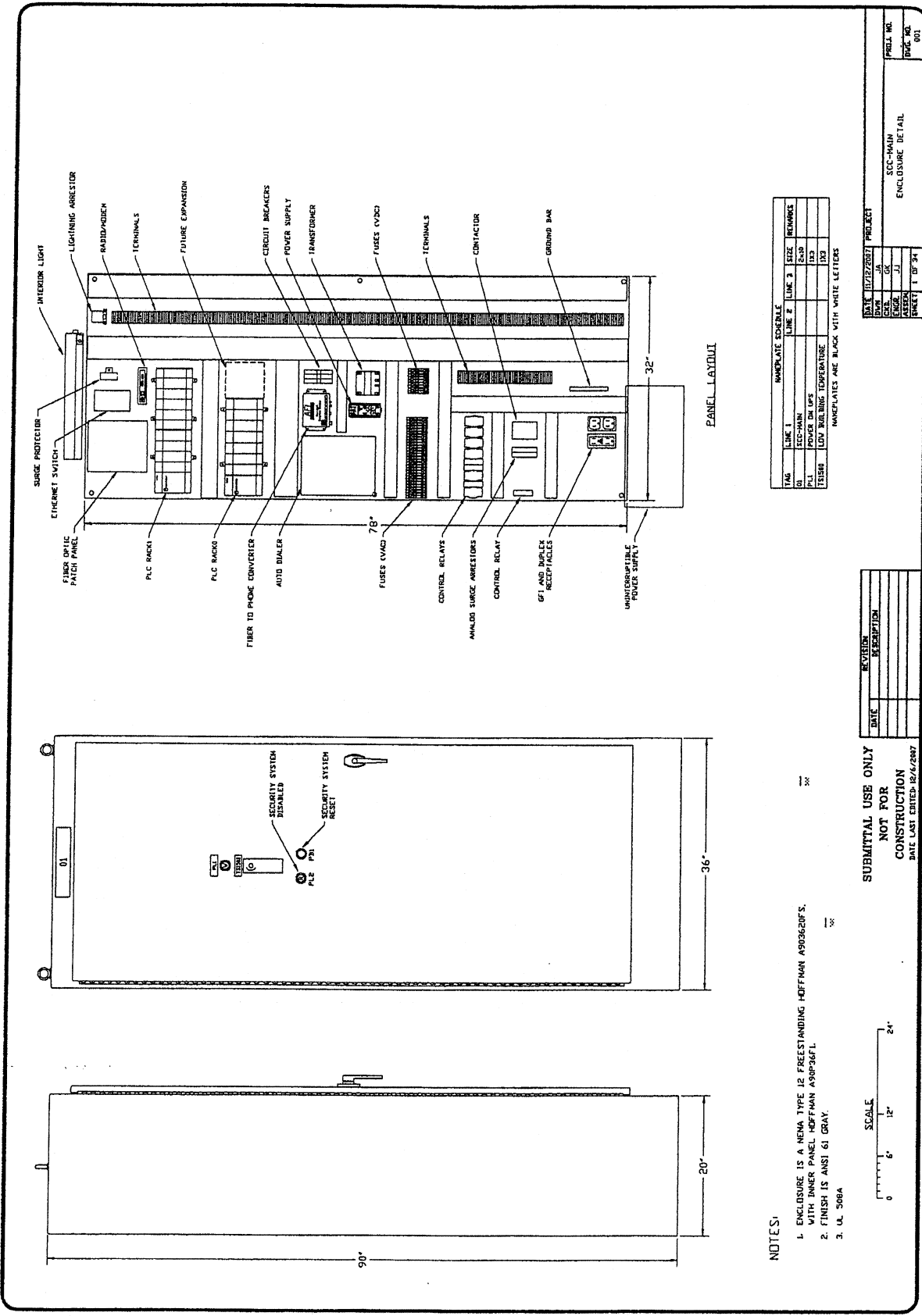
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Sample Exterior Layout Drawing

NOTES

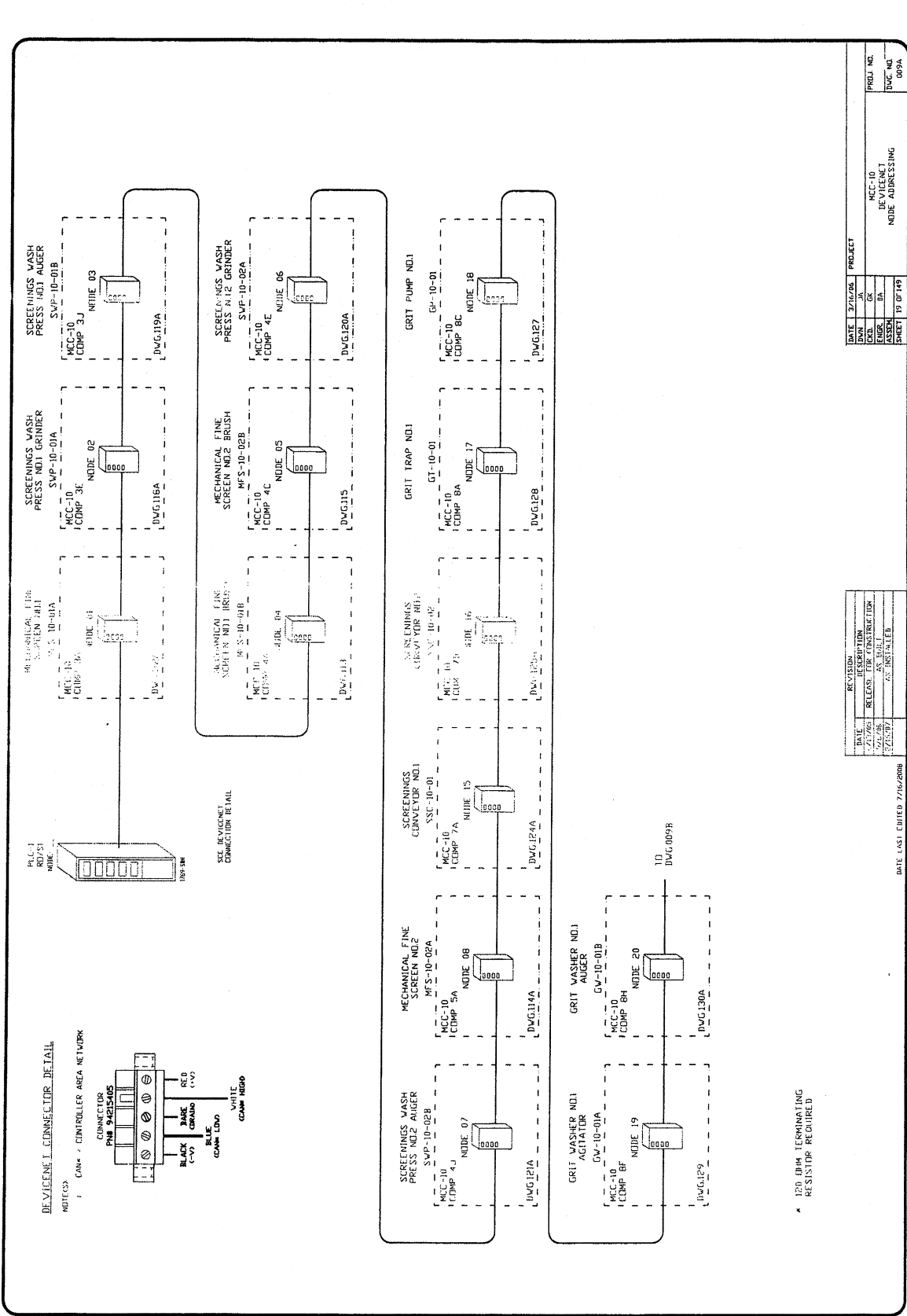
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WITH INNER PANEL HOISTMAN A-90P721
2 FINISH IS ANSI 61 GRAY
3 CR # BF-3171536





Sample Exterior and Interior Layout
Drawing

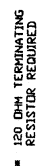


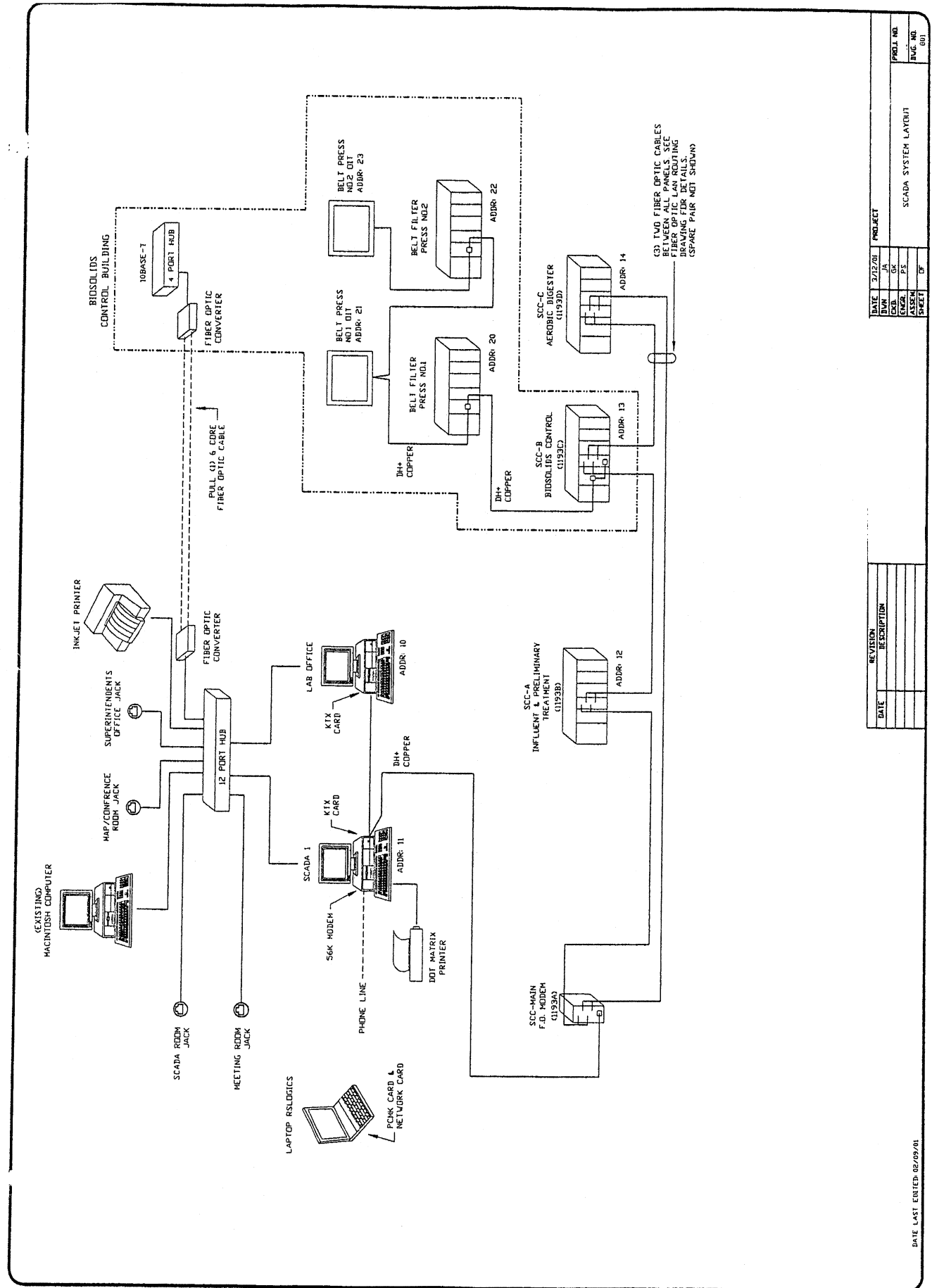


Sample Network Diagram

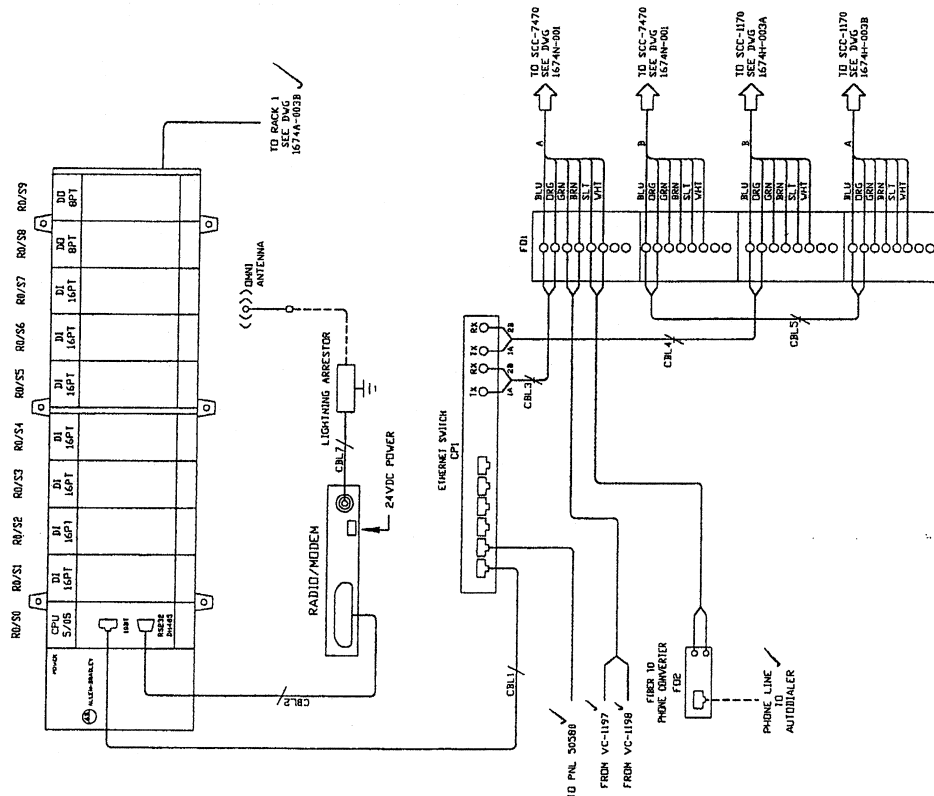
DATE	DESCRIPTION	RELEASE FROM	RECEIVED BY
10/11/72		AS	DEAN

DATE LAST EDITED: 7/16/2008





SLC500 I/O SCHEDULE



QTY	TAGS	DESCRIPTION	MFG	CATALOG
1	RO	PLC RACK BASE BACK	ALLEN BRADLEY	1746-A0
1	RP50	PLC POWER SUPPLY (3A @ 5VDC)	ALLEN BRADLEY	1746-P2
1	RO/50	PLC CPU WITH ETHERNET	ALLEN BRADLEY	1747-L552
7	RO/S1 RO/S2 RO/S3 RO/S4 RO/S5 RO/S6 RO/S7	PLC DIGITAL I/O MODULE CPU 5/05 WITH 256 MEMORY PLC I/O - GENERAL PURPOSE 85-120V AC	ALLEN BRADLEY	1746-1A16
2	RO/S7 RO/S8	PLC DIGITAL I/O MODULE 8 PORT ETHERNET I/O 8 PORT ETHERNET I/O 10/100 MBIT/S AUTODESIGNING (2) SC DUPLEX FIBER OPTIC 10/100 MBIT/S	ALLEN BRADLEY	1746-DX8
1	CP1	8 PORT ETHERNET I/O 10/100 MBIT/S AUTODESIGNING (2) SC DUPLEX FIBER OPTIC 10/100 MBIT/S	HIRSCHMANN	943 434-021
1	FO1	FIBER OPTIC PATCH PANEL, BLACK SVIC3-H-01	SIEMON COMPANY	SVIC3-H-01
4	FO1	ST BULKHEAD CONNECTOR MODULE TELEPHONE LINE EXTENDER 86 SERIES 12VAC 500mA	SIEMON COMPANY	RIC-F-SEP-01
1	FO2	TELEPHONE LINE EXTENDER 86 SERIES 12VAC 500mA	AMERICAN FIBERTEX	HT-86CC
1	CL1	UTP PATCH CABLE RJ45 RJ45	HUBBELL	PCASEB03
1	CL2	SERIAL COMMUNICATIONS CABLE 3 FEET	CABLE WHOLESALE	1001-03203
3	CL3 CL4 CL5	DUPLEX STRAIGHT THROUGH FIBER OPTIC CABLE 1 METER U-PATCH 627 FIBERS SC MM 625	HUBBELL	DIFFSCSC1MM
1	CL7	ETHERNET CABLE RG429/U RG429 - 25'1 LENGTH NPALE - TIE	TESSCO	448350

DATE	11/12/2007	PROJECT	1
DWN	JL	PROJECT NO.	SLC-HAIN
CHK	GC	PLC I/O SCHEDULE	
ENGR	JJ	DATE	003A
ASST			
SHRIT	3 OF 24		

Sample Interconnection Diagram

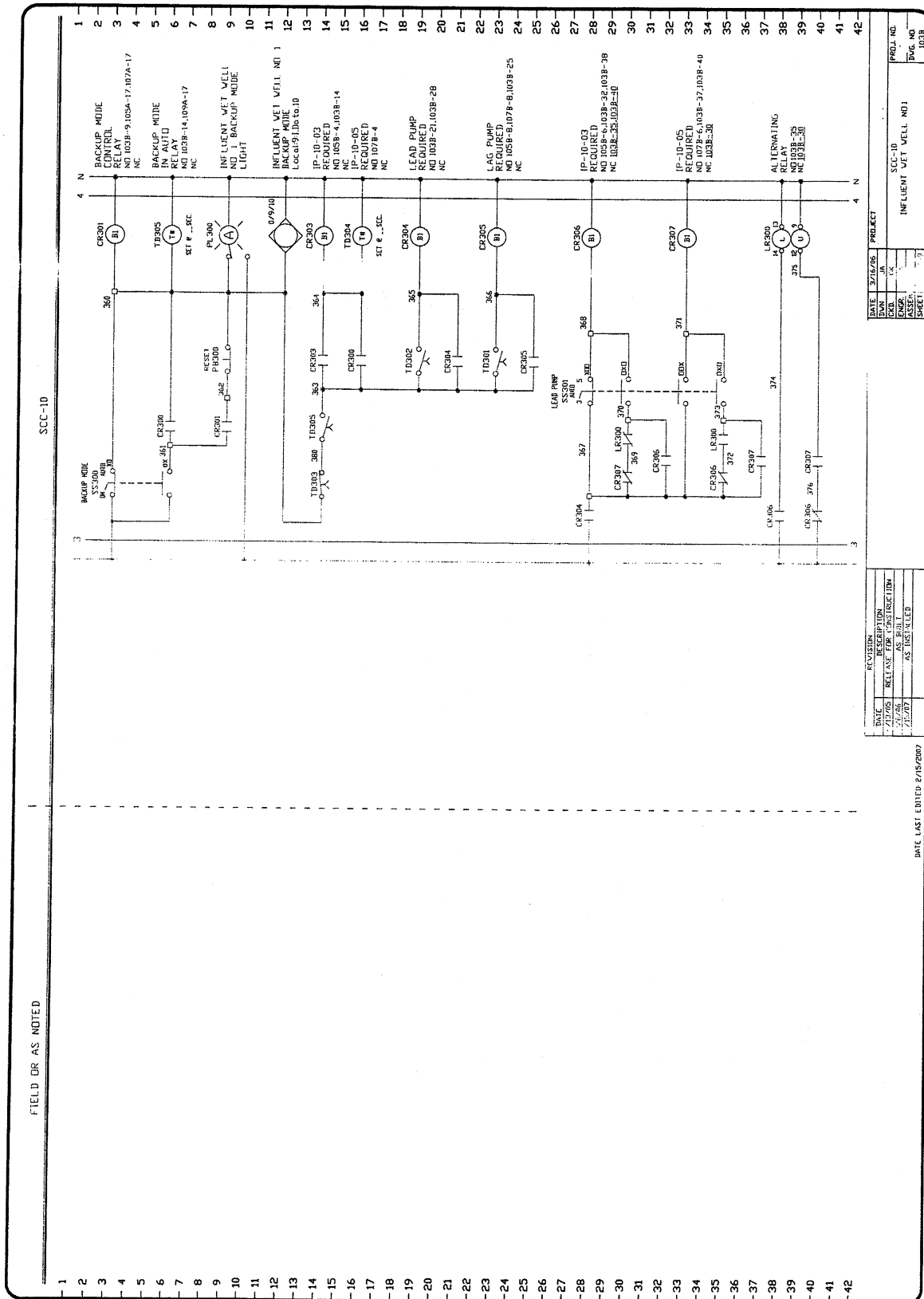
DATE	REVISION	DESCRIPTION

SUBMITTAL USE ONLY
 NOT FOR
 CONSTRUCTION
 DATE LAST CHANGED 10/22/2007









Sample Elementary
 Schematic











SAMPLE HMI SCREEN

Note: The information contained within this **SAMPLE HMI SCREEN** section is intended for illustrative purposed only. It is not intended to be used for construction, installation, or operation of any specific SCADA system.

Station Status

IDOT P54 - FactoryTalk View SE Client

Indiana Department of Transportation

Current User: default

IDOT Pump Station 4 - Station Status

9/19/2022 3:26:43 PM

Menu

< Previous

Low Flow Pump 1 (LFP-01)	Low Flow Pump 2 (LFP-02)	Main Pump 1 (MP-01)	Main Pump 2 (MP-02)	Main Pump 3 (MP-03)	Main Pump 4 (MP-04)	Main Pump 5 (MP-05)	Main Pump 6 (MP-06)	Main Pump 7 (MP-07)
Stopped	Stopped	Stopped	Under Maintenance	Stopped	Stopped	Stopped	Stopped	Stopped
In Auto At MFC	In Auto At MFC	In Auto At MFC	In Auto At MFC	In Auto At MFC	In Auto At MFC	In Auto At MFC	In Auto At MFC	In Auto At MFC
Circuit Breaker Open	Circuit Breaker Open	Circuit Breaker Open	Circuit Breaker Open	Circuit Breaker Open	Circuit Breaker Open	Circuit Breaker Open	Circuit Breaker Open	Circuit Breaker Open
Float Call To Run	Float Call To Run	Float Call To Run	Float Call To Run	Float Call To Run	Float Call To Run	Float Call To Run	Float Call To Run	Float Call To Run
Overload Tripped	Overload Tripped	MPH Tripped	MPH Tripped	MPH Tripped	MPH Tripped	MPH Tripped	MPH Tripped	MPH Tripped
High Temperature	High Temperature	High Temperature	High Temperature	High Temperature	High Temperature	High Temperature	High Temperature	High Temperature
Moisture Detected	Moisture Detected	Moisture Detected	Moisture Detected	Moisture Detected	Moisture Detected	Moisture Detected	Moisture Detected	Moisture Detected
Fail To Start - Float Mode	Fail To Start - Float Mode	Fail To Start - Float Mode	Fail To Start - Float Mode	Fail To Start - Float Mode	Fail To Start - Float Mode	Fail To Start - Float Mode	Fail To Start - Float Mode	Fail To Start - Float Mode
Fail To Start - Auto Mode	Fail To Start - Auto Mode	Fail To Start - Auto Mode	Fail To Start - Auto Mode	Fail To Start - Auto Mode	Fail To Start - Auto Mode	Fail To Start - Auto Mode	Fail To Start - Auto Mode	Fail To Start - Auto Mode
High Amperage	High Amperage	High Amperage	High Amperage	High Amperage	High Amperage	High Amperage	High Amperage	High Amperage
Low Amperage	Low Amperage	Low Amperage	Low Amperage	Low Amperage	Low Amperage	Low Amperage	Low Amperage	Low Amperage
Fail To Stop	Fail To Stop	Fail To Stop	Fail To Stop	Fail To Stop	Fail To Stop	Fail To Stop	Fail To Stop	Fail To Stop

Main Pump 8 (MP-08)	Main Pump 9 (MP-09)	Main Pump 10 (MP-10)
Stopped	Stopped	Stopped
In Auto At MFC	In Auto At MFC	In Auto At MFC
Circuit Breaker Open	Circuit Breaker Open	Circuit Breaker Open
Float Call To Run	Float Call To Run	Float Call To Run
MPH Tripped	MPH Tripped	MPH Tripped
High Temperature	High Temperature	High Temperature
Moisture Detected	Moisture Detected	Moisture Detected
Fail To Start - Float Mode	Fail To Start - Float Mode	Fail To Start - Float Mode
Fail To Start - Auto Mode	Fail To Start - Auto Mode	Fail To Start - Auto Mode
High Amperage	High Amperage	High Amperage
Low Amperage	Low Amperage	Low Amperage
Fail To Stop	Fail To Stop	Fail To Stop

Mechanical Screen (SRN-01)	East Influent Gate (IG-01)	East Recirculation Gate (RG-02)	East Discharge Gate (DG-01)
Stopped	In Discharge	In Discharge	In Discharge
In Auto	In Remote	In Remote	In Remote
Fail To Start			
Over Rotate			
Over Torque			
Overload / High Temp			
Clogged			

Influent Equalization Gate (IG-03)

In Discharge
In Remote

Mechanical Screen (SRN-02)	West Influent Gate (IG-02)	West Recirculation Gate (RG-01)	West Discharge Gate (DG-02)
Stopped	In Discharge	In Discharge	In Discharge
In Auto	In Remote	In Remote	In Remote
Fail To Start			
Over Rotate			
Over Torque			
Overload / High Temp			
Clogged			

9/19/2022 9:51:20 AM West Wet Well Low Level Detected From Level Device (LT-412B1)

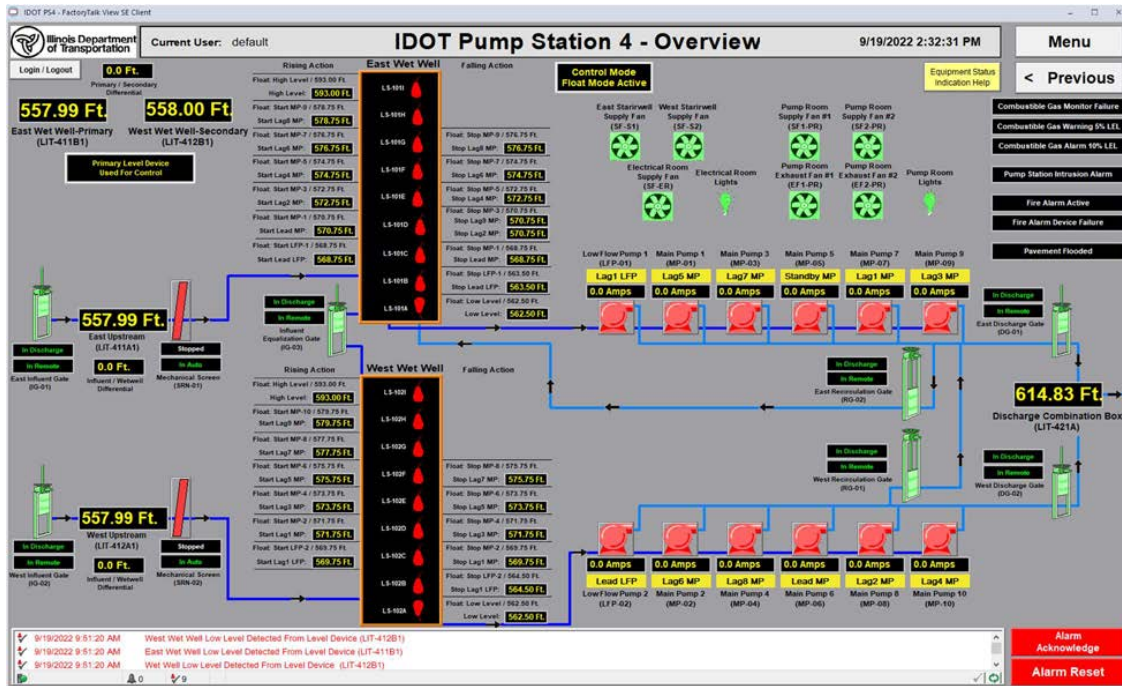
9/19/2022 9:51:20 AM East Wet Well Low Level Detected From Level Device (LT-411B1)

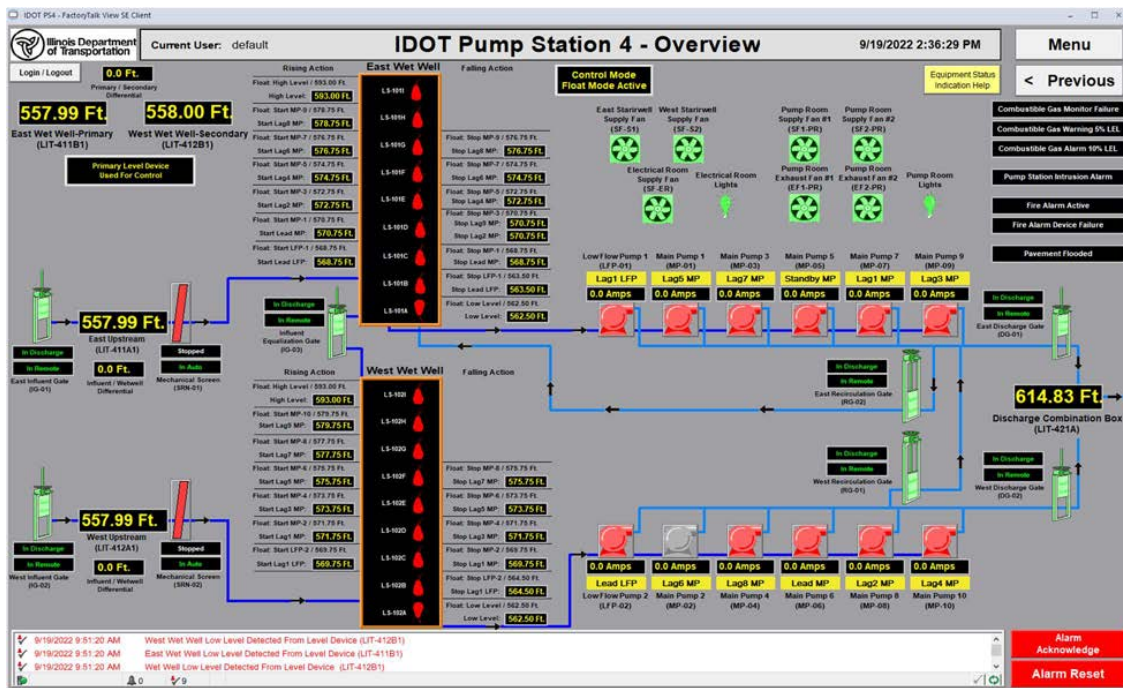
9/19/2022 9:51:20 AM West Wet Well Low Level Detected From Level Device (LT-412B1)

Alarm Acknowledge

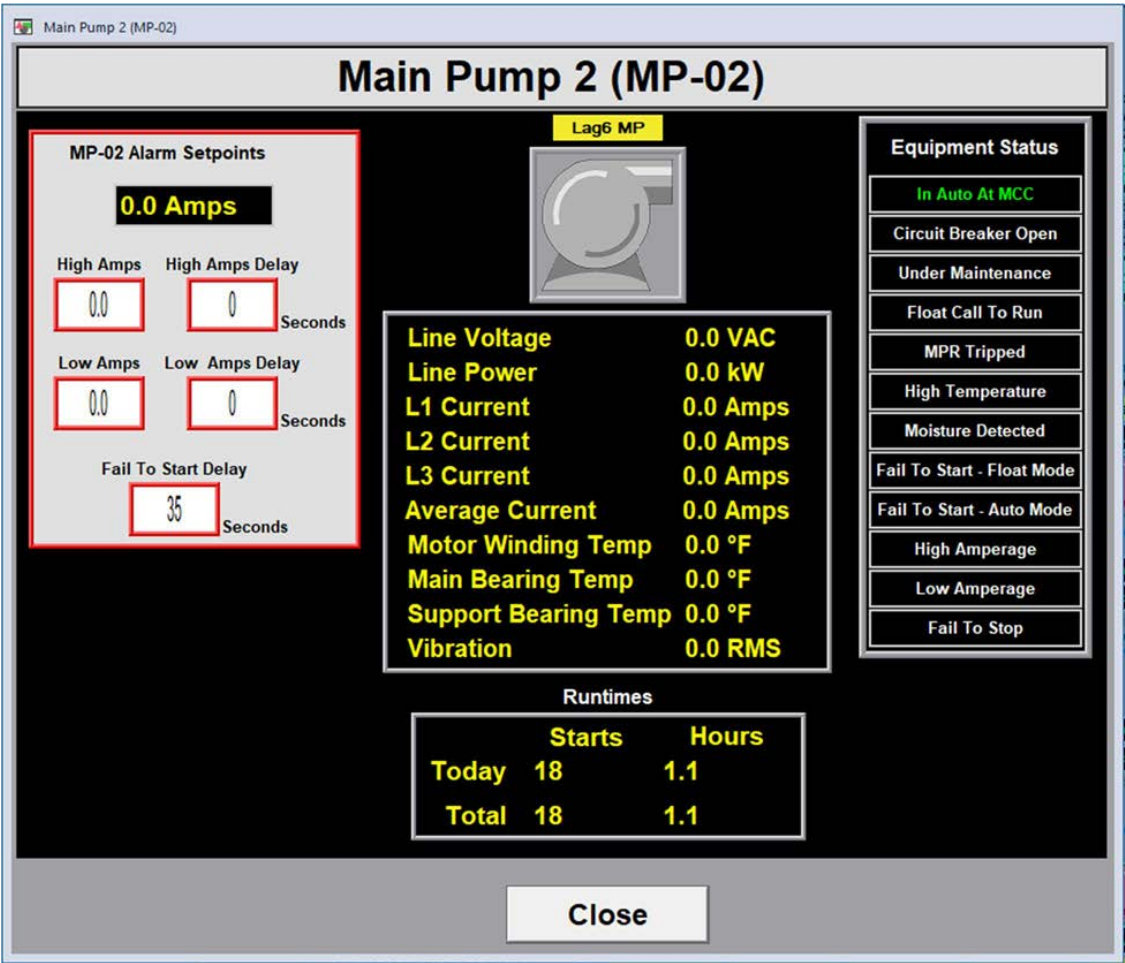
Alarm Reset

Overview





Pressing the pump object on the overview will call the pump popup. The pump popup shows more detailed information about selected pump. The pump popup example is shown below.



Low Flow Pump 1 (LFP-01)

Low Flow Pump 1 (LFP-01)

LFP-01 Alarm Setpoints


0.0 Amps

High Amps High Amps Delay Seconds

Low Amps Low Amps Delay Seconds

Fail To Start Delay Seconds

Lag1 LFP



Equipment Status

In Auto At MCC

Circuit Breaker Open

Under Maintenance

Float Call To Run

Overload Tripped

High Temperature

Moisture Detected

Fail To Start - Float Mode

Fail To Start - Auto Mode

High Amperage

Low Amperage

Fail To Stop

Line Voltage 0.0 VAC

Line Power 0.0 kW

L1 Current 0.0 Amps

L2 Current 0.0 Amps

L3 Current 0.0 Amps

Average Current 0.0 Amps

Motor Winding Temp 0.0 °F

Main Bearing Temp 0.0 °F

Support Bearing Temp 0.0 °F

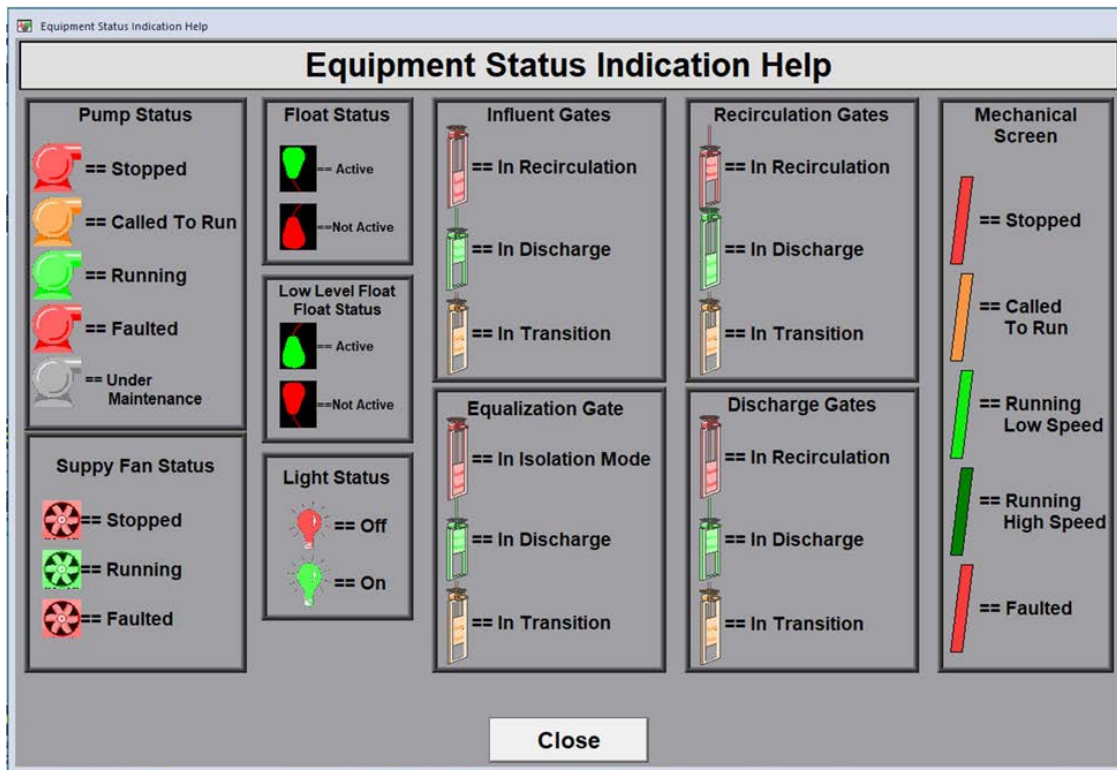
Vibration 0.0 RMS

Runtimes

	Starts	Hours
Today	40	1.6
Total	40	1.6

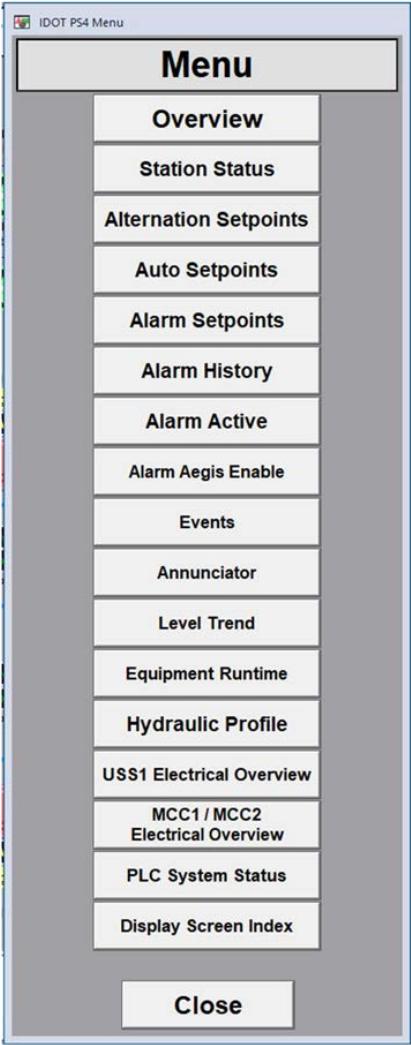
Close

Equipment Status



Faulted status will blink between dark red and light red when alarm is active.

Menu



Alternation Setpoints – Auto Alternation Selected

IDOT PSA - FactoryTalk View SE Client

Illinois Department of Transportation

Current User: default

IDOT Pump Station 4 - Alternation Selection 6/24/2022 2:00:18 PM

Menu

< Previous

Low Flow Pumps

Alternation Method Selection

Use Alternation Use Runtime Alternation Use Starts Alternation

Current Alternation

Low Flow Pump 1 (LFP-01) **Lead LFP**

Low Flow Pump 2 (LFP-02) **Lead LFP**

LFP Lead / Lag - Auto Alternation Selection

Auto Alternation

Lead Low Flow Pump #1 Lead Low Flow Pump #2

Main Pumps

Alternation Method Selection

Use Alternation Use Runtime Alternation Use Starts Alternation

Current Alternation

Main Pump 1 (MP-01)	Main Pump 2 (MP-02)	Main Pump 3 (MP-03)	Main Pump 4 (MP-04)	Main Pump 5 (MP-05)
Lead MP	Lag1 MP	Lag2 MP	Lag3 MP	Lag4 MP

Main Pump 6 (MP-06)	Main Pump 7 (MP-07)	Main Pump 8 (MP-08)	Main Pump 9 (MP-09)	Main Pump 10 (MP-10)
Lag5 MP	Lag6 MP	Lag7 MP	Lag8 MP	Standby MP

MP Lead / Lag - Auto Alternation Selection

Auto Alternation

Manual Selection

6/24/2022 10:13:20 AM Main Pump #9 Not In Auto
6/24/2022 10:27:36 AM Main Pump #9 Circuit Breaker Open
6/24/2022 10:13:20 AM Main Pump #9 Not In Auto

Alarm Reset

Alternation Setpoints – Manual Selection

IDOT PSA - FactoryTalk View SE Client

Illinois Department of Transportation

Current User: default

IDOT Pump Station 4 - Alternation Selection 6/24/2022 2:00:52 PM

Menu

< Previous

Low Flow Pumps

Alternation Method Selection

Use Alternation Use Runtime Alternation Use Starts Alternation

Current Alternation

Low Flow Pump 1 (LFP-01) **Lead LFP**

Low Flow Pump 2 (LFP-02) **Lead LFP**

LFP Lead / Lag - Auto Alternation Selection

Auto Alternation

Lead Low Flow Pump #1 Lead Low Flow Pump #2

Main Pumps

Alternation Method Selection

Use Alternation Use Runtime Alternation Use Starts Alternation

Current Alternation

Main Pump 1 (MP-01)	Main Pump 2 (MP-02)	Main Pump 3 (MP-03)	Main Pump 4 (MP-04)	Main Pump 5 (MP-05)
Lead MP	Lag1 MP	Lag2 MP	Lag3 MP	Lag4 MP

Main Pump 6 (MP-06)	Main Pump 7 (MP-07)	Main Pump 8 (MP-08)	Main Pump 9 (MP-09)	Main Pump 10 (MP-10)
Lag5 MP	Lag6 MP	Lag7 MP	Lag8 MP	Standby MP

MP Lead / Lag - Auto Alternation Selection

Auto Alternation

Manual Selection

Lead MP Selection	Lag1 MP Selection	Lag2 MP Selection	Lag3 MP Selection	Lag4 MP Selection	Lag5 MP Selection	Lag6 MP Selection	Lag7 MP Selection	Lag8 MP Selection	Standby MP Selection
MP #1	MP #1	MP #1	MP #1	MP #1	MP #1	MP #1	MP #1	MP #1	MP #1
MP #2	MP #2	MP #2	MP #2	MP #2	MP #2	MP #2	MP #2	MP #2	MP #2
MP #3	MP #3	MP #3	MP #3	MP #3	MP #3	MP #3	MP #3	MP #3	MP #3
MP #4	MP #4	MP #4	MP #4	MP #4	MP #4	MP #4	MP #4	MP #4	MP #4
MP #5	MP #5	MP #5	MP #5	MP #5	MP #5	MP #5	MP #5	MP #5	MP #5
MP #6	MP #6	MP #6	MP #6	MP #6	MP #6	MP #6	MP #6	MP #6	MP #6
MP #7	MP #7	MP #7	MP #7	MP #7	MP #7	MP #7	MP #7	MP #7	MP #7
MP #8	MP #8	MP #8	MP #8	MP #8	MP #8	MP #8	MP #8	MP #8	MP #8
MP #9	MP #9	MP #9	MP #9	MP #9	MP #9	MP #9	MP #9	MP #9	MP #9
MP #10	MP #10	MP #10	MP #10	MP #10	MP #10	MP #10	MP #10	MP #10	MP #10

Submit Manual Alternation Selection

Valid Selection

Alarm Reset

Alternation Setpoints – Runtime Selection

The screenshot displays the 'IDOT Pump Station 4 - Alternation Selection' interface. The top bar shows the current user as 'default' and the date/time as '6/24/2022 2:01:32 PM'. The interface is divided into two main sections: 'Low Flow Pumps' and 'Main Pumps', each with an 'Alternation Method Selection' area.

Low Flow Pumps (LFP) Alternation Method Selection:

- Buttons: Use Alternation, Use Runtime Alternation (highlighted), Use Starts Alternation.
- Low Flow Pump 1 (LFP-01): Lead LFP.
- Low Flow Pump 2 (LFP-02): Lead LFP.

LFP Runtime Alternation:

LFP #1 Hours Remaining	LFP #2 Hours Remaining
0.0	0.0
Hours	Hours

Main Pumps (MP) Alternation Method Selection:

- Buttons: Use Alternation, Use Runtime Alternation (highlighted), Use Starts Alternation.

Current Alternation:

Main Pump 1 (MP-01)	Main Pump 2 (MP-02)	Main Pump 3 (MP-03)	Main Pump 4 (MP-04)	Main Pump 5 (MP-05)
Lead MP	Lag1 MP	Lag2 MP	Lag3 MP	Lag4 MP

MP Runtime Alternation:

MP #1 Hours Remaining	MP #2 Hours Remaining	MP #3 Hours Remaining	MP #4 Hours Remaining	MP #5 Hours Remaining
0.0	0.0	0.0	0.0	0.0
Hours	Hours	Hours	Hours	Hours

MP #6 Hours Remaining: 0.0, **MP #7 Hours Remaining:** 0.0, **MP #8 Hours Remaining:** 0.0, **MP #9 Hours Remaining:** 0.0, **MP #10 Hours Remaining:** 0.0.

Hours: 0, 0, 0, 0, 0.

Log:

- 6/24/2022 10:13:20 AM Main Pump #9 Not In Auto
- 6/24/2022 10:27:36 AM Main Pump #9 Circuit Breaker Open
- 6/24/2022 10:13:20 AM Main Pump #9 Not In Auto

Alarm Reset

Alternation Setpoints – Starts Selection

The screenshot displays the 'IDOT Pump Station 4 - Alternation Selection' interface. The top bar shows the current user as 'default' and the date/time as '6/24/2022 2:02:06 PM'. The interface is divided into two main sections: 'Low Flow Pumps' and 'Main Pumps', each with an 'Alternation Method Selection' area.

Low Flow Pumps (LFP) Alternation Method Selection:

- Buttons: Use Alternation, Use Runtime Alternation, Use Starts Alternation (highlighted).
- Low Flow Pump 1 (LFP-01): Lead LFP.
- Low Flow Pump 2 (LFP-02): Lead LFP.

LFP Starts Alternation:

LFP #1 Starts Remaining	LFP #2 Starts Remaining
0	0
Starts	Starts

Main Pumps (MP) Alternation Method Selection:

- Buttons: Use Alternation, Use Runtime Alternation, Use Starts Alternation (highlighted).

Current Alternation:

Main Pump 1 (MP-01)	Main Pump 2 (MP-02)	Main Pump 3 (MP-03)	Main Pump 4 (MP-04)	Main Pump 5 (MP-05)
Lead MP	Lag1 MP	Lag2 MP	Lag3 MP	Lag4 MP

MP Starts Alternation:

MP #1 Starts Remaining	MP #2 Starts Remaining	MP #3 Starts Remaining	MP #4 Starts Remaining	MP #5 Starts Remaining
0	0	0	0	0
Starts	Starts	Starts	Starts	Starts

MP #6 Starts Remaining: 0, **MP #7 Starts Remaining:** 0, **MP #8 Starts Remaining:** 0, **MP #9 Starts Remaining:** 0, **MP #10 Starts Remaining:** 0.

Starts: 0, 0, 0, 0, 0.

Log:

- 6/24/2022 10:13:20 AM Main Pump #9 Not In Auto
- 6/24/2022 10:27:36 AM Main Pump #9 Circuit Breaker Open
- 6/24/2022 10:13:20 AM Main Pump #9 Not In Auto

Alarm Reset

Alternation selections shown above: The selected items are highlighted in green. Operator adjustable setpoints are within the amber setpoint entry objects. Example of operator adjustable set point popup is shown below.

The popup window is titled "Main Pump #3 Runtime Hours Alt". It contains a text field with "Current: 0". Below the text field is a numeric keypad with buttons for digits 0-9, a decimal point, and a +/- sign. There are also buttons for "Clear", "Back", "Exp", and "+/-". At the bottom are "OK" and "Cancel" buttons.

Auto Setpoints

Selectable Level Control Buttons – Selected Method Highlighted In Green

The screenshot shows the "IDOT Pump Station 4 - Auto Setpoints" interface. The top bar includes the IDOT logo, current user "default", date/time "9/19/2022 2:45:55 PM", and a "Menu" button. The main area is divided into several sections:

- Level Control Device Selection:** A central area with three buttons: "Primary in Use" (highlighted in green), "Use Secondary", and "Manual Override".
- East Wet Well:** A vertical list of level sensors (LS-1001 to LS-1010) with their respective setpoints and status indicators.
- West Wet Well:** A vertical list of level sensors (LS-1001 to LS-1010) with their respective setpoints and status indicators.
- Low Flow Pumps:** A table with columns for "Lead Start", "Lead Stop", "Lag1 Start", "Lag1 Stop", "Lag2 Start", and "Lag2 Stop", each with a value in feet and seconds.
- Main Pumps:** A table with columns for "Lead Start", "Lead Stop", "Lag1 Start", "Lag1 Stop", "Lag2 Start", "Lag2 Stop", "Lag3 Start", "Lag3 Stop", "Lag4 Start", and "Lag4 Stop", each with a value in feet and seconds.
- East Mechanical Screen:** A section with "Low Speed" and "High Speed" differential delay settings (100.0 feet, 10 seconds).
- West Mechanical Screen:** A section with "Low Speed" and "High Speed" differential delay settings (100.0 feet, 10 seconds).
- Primary/Secondary Differential (Clogged Screen):** A section with "Low Speed" and "High Speed" differential delay settings (100.0 feet, 10 seconds).
- Idle Time Exercise:** A section with "Low Speed" and "High Speed" differential delay settings (999 minutes, 30 seconds).

The bottom of the screen shows a status bar with alarm messages and an "Alarm Reset" button.

Operator adjustable setpoints are within the amber setpoint entry objects. Example of operator adjustable set point popup is shown below.

The image shows a screenshot of a control interface. At the top, there are three 'Hours' labels, each above a numeric input field containing the value '0'. Below these is a yellow-bordered popup window titled 'Main Pump #3 Runtime Hours Alt'. Inside the popup, the text 'Current: 0' is displayed above a text input field. Below the input field is a numeric keypad with buttons for digits 0-9, a decimal point, a sign toggle (+/-), and function buttons 'Clear', 'Back', and 'Exp'. At the bottom of the popup are 'OK' and 'Cancel' buttons.

Manual Level Entry Popup

IDOT PS4 - FactoryTalk View SE Client

Illinois Department of Transportation

Current User: default

IDOT Pump Station 4 - Auto Se

0.0 Ft. East Wet Well-Primary (LIT-411B1) **Manual Override Entry Used For Control** **0.0 Ft.** West Wet Well-Secondary (LIT-412B1)

Level Control Device Selection

Use Primary Use Secondary **Manual Override** Manual Level Entry

Low Flow Pumps

Lead Start	Lead Start Delay
10.8 Feet	3 Seconds
Lead Stop	Lead Stop Delay
5.5 Feet	3 Seconds
Lag1 Start	Lag1 Start Delay
11.8 Feet	3 Seconds
Lag1 Stop	Lag1 Stop Delay
6.5 Feet	3 Seconds

Manual Level Entry

Pop_Manual_Level - /IDOT_PS4//

0.0 Ft. East Wet Well-Primary (LIT-411B1) **Manual Override Entry Used For Control** **0.0 Ft.** West Wet Well-Secondary (LIT-412B1)

Manual Level

0.0 Feet

Close

Pump Control

Lag3 Start Lag3 Start Delay Lag8 Start Lag8 Start Delay

Pump Control Setpoints Default Popup

Pop_Default_Setpoints_Elevation - /IDOT_PS4//

Default Pump Control Setpoints

Action	Setpoint	Delay
Start Lead Low Flow Pump	568.75 Feet	3 Seconds
Stop Lead Low Flow Pump	563.50 Feet	3 Seconds
Start Lag1 Low Flow Pump	569.75 Feet	3 Seconds
Stop Lag1 Low Flow Pump	564.50 Feet	3 Seconds
Start Lead Main Pump	570.75 Feet	3 Seconds
Stop Lead Main Pump	568.75 Feet	3 Seconds
Start Lag1 Main Pump	571.75 Feet	3 Seconds
Stop Lag1 Main Pump	569.75 Feet	3 Seconds
Start Lag2 Main Pump	572.75 Feet	3 Seconds
Stop Lag2 Main Pump	570.75 Feet	3 Seconds
Start Lag3 Main Pump	573.75 Feet	3 Seconds
Stop Lag3 Main Pump	571.75 Feet	3 Seconds
Start Lag4 Main Pump	574.75 Feet	3 Seconds
Stop Lag4 Main Pump	572.75 Feet	3 Seconds
Start Lag5 Main Pump	575.75 Feet	3 Seconds
Stop Lag5 Main Pump	573.75 Feet	3 Seconds
Start Lag6 Main Pump	576.75 Feet	3 Seconds
Stop Lag6 Main Pump	574.75 Feet	3 Seconds
Start Lag7 Main Pump	577.75 Feet	3 Seconds
Stop Lag7 Main Pump	575.75 Feet	3 Seconds
Start Lag8 Main Pump	578.75 Feet	3 Seconds
Stop Lag8 Main Pump	576.75 Feet	3 Seconds
Start Lag9 Main Pump	579.75 Feet	3 Seconds
Stop Lag9 Main Pump	570.75 Feet	3 Seconds

Reset Control Setpoints
To Default Shown Above

Close

Pop_Default_Setpoints_Elevation - /IDOT_PS4//

Default Pump Control Setpoints

Action	Setpoint	Delay
Start Lead Low Flow Pump	568.75 Feet	3 Seconds
Stop Lead Low Flow Pump	563.50 Feet	3 Seconds
Start Lag1 Low Flow Pump	569.75 Feet	3 Seconds
Stop Lag1 Low Flow Pump	564.50 Feet	3 Seconds
Start Lead Main Pump	570.75 Feet	3 Seconds
Stop Lead Main Pump	568.75 Feet	3 Seconds
Start Lag1 Main Pump	571.75 Feet	3 Seconds
Stop Lag1 Main Pump	569.75 Feet	3 Seconds
Start Lag2 Main Pump	572.75 Feet	3 Seconds
Stop Lag2 Main Pump	570.75 Feet	3 Seconds
Start Lag3 Main Pump	573.75 Feet	3 Seconds
Stop Lag3 Main Pump	571.75 Feet	3 Seconds
Start Lag4 Main Pump	574.75 Feet	3 Seconds
Stop Lag4 Main Pump	572.75 Feet	3 Seconds
Start Lag5 Main Pump	575.75 Feet	3 Seconds
Stop Lag5 Main Pump	573.75 Feet	3 Seconds
Start Lag6 Main Pump	576.75 Feet	3 Seconds
Stop Lag6 Main Pump	574.75 Feet	3 Seconds
Start Lag7 Main Pump	577.75 Feet	3 Seconds
Stop Lag7 Main Pump	575.75 Feet	3 Seconds
Start Lag8 Main Pump	578.75 Feet	3 Seconds
Stop Lag8 Main Pump	576.75 Feet	3 Seconds
Start Lag9 Main Pump	579.75 Feet	3 Seconds
Stop Lag9 Main Pump	570.75 Feet	3 Seconds

Reset Control Setpoints
To Default Shown Above

Close

Confirmation

ARE YOU SURE YOU WANT TO SET ALL PUMP
CONTROL SETPOINTS TO DEFAULT?

Yes No

Auto Se

sed For

Selection

Manual Overri

Main Pumps

Delay

Lag5 St

575.7

Seconds

Delay

Lag5 St

573.7

Seconds

Delay

Lag6 St

570.7

Seconds

Delay

Lag8 St

578.7

Seconds

Delay

Lag8 St

576.7

Seconds

Delay

Lag9 St

579.7

Seconds

Delay

Lag9 St

570.7

Alarm Setpoints

DOT P54 - FactoryTalk View SE Client

Current User: default

IDOT Pump Station 4 - Alarm Setpoints 9/19/2022 2:50:22 PM

Menu < Previous

Low Flow Pump #1		Low Flow Pump #2		Main Pump #1		Main Pump #2		Main Pump #3		Main Pump #4		Main Pump #5	
High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay
0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	Low Amps	Low Amps Delay
0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Fail To Start Delay		Fail To Start Delay		Fail To Start Delay		Fail To Start Delay		Fail To Start Delay		Fail To Start Delay		Fail To Start Delay	
10	Sec	15	Sec	20	Sec	35	Sec	50	Sec	65	Sec	80	Sec

Main Pump #6		Main Pump #7		Main Pump #8		Main Pump #9		Main Pump #10		Primary/Secondary Level Differential Alarm		Wet Well Level Device High Level / Low Level	
High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay	High Amps	High Amps Delay	High Level	High Level Delay
0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.01 Ft.		557.99 F	
Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	Low Amps	Low Amps Delay	557.99 F		558.00 F	
0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	East Wet Well Primary (LT-41181)		West Wet Well Secondary (LT-41281)	
Fail To Start Delay		Fail To Start Delay		Fail To Start Delay		Fail To Start Delay		Fail To Start Delay		Differential		Control Level	
95	Sec	110	Sec	125	Sec	140	Sec	155	Sec	4.0	Sec	553.00	10

East Mechanical Screen		East Mechanical Screen Clogged Alarm		West Mechanical Screen		West Mechanical Screen Clogged Alarm		Pavement Flooded Alarm		Discharge Chamber High Level - Blockage		Wet Well Level Control Mode In Manual Override To Long	
Fail To Start Delay				Fail To Start Delay				Level		High Level		Delay	
5	Sec	0.00 Ft.		5	Sec	0.01 Ft.		557.99 F		614.63 F		1440	Minute
Over Rotate Delay		557.99 F		Over Rotate Delay		557.99 F		558.00 F		Discharge Chamber Level		Lights/Ventilation On Alarm	
5	Sec	East Wet Well Primary (LT-41181)		5	Sec	West Wet Well Secondary (LT-41281)		558.00 F		Delay		4	Hours
Over Torque Delay		Differential		Over Torque Delay		Differential		Level		10	Min	Missed Patrol Interval	
5	Sec	10.0	Sec	5	Sec	10.0	Sec	558.00	10			15	Days

US51 Electrical Service #1		US51 Electrical Service #2	
High Voltage	High Voltage Delay	High Voltage	High Voltage Delay
4576.0	10	4576.0	10
Low Voltage	Low Voltage Delay	Low Voltage	Low Voltage Delay
3744.0	10	3744.0	10

9/19/2022 9:51:20 AM West Wet Well Low Level Detected From Level Device (LT-41281)
9/19/2022 9:51:20 AM East Wet Well Low Level Detected From Level Device (LT-41181)
9/19/2022 9:51:20 AM West Wet Well Low Level Detected From Level Device (LT-41281)

Alarm Acknowledge
Alarm Reset

Operator adjustable setpoints are within the red setpoint entry objects. Example of operator adjustable set point popup is shown below.

The image shows a screenshot of a control interface. At the top, there are four red-bordered boxes labeled 'Low Amps', 'Low Amps Delay', 'Low Amps', and 'Low Amps'. Below these is a yellow-bordered popup window titled 'Main Pump #1 Low Amp Alarm'. Inside the popup, it displays 'Current: 0.0' next to a numeric input field. Below the input field is a numeric keypad with buttons for digits 0-9, a decimal point, a sign toggle (+/-), and function buttons 'Clear', 'Back', and 'Exp'. At the bottom of the popup are 'OK' and 'Cancel' buttons. The background of the interface is partially visible, showing various status indicators and labels.

Alarm History

IDOT PS4 - FactoryTalk View SE Client

Current User: default

IDOT Pump Station 4 - Alarms History

9/19/2022 2:53:55 PM

Menu

< Previous

Event Time	Message
9/19/2022 1:51:46 PM	Electrical Room Supply Fan #1 Extended Run (SF-ER)
9/19/2022 1:51:46 PM	Electrical Room Lights Extended On
9/19/2022 1:51:46 PM	East Stairwell Supply Fan #1 Extended Run (SF-S1)
9/19/2022 1:51:46 PM	Pump Room Supply Fan #2 Extended Run (SF2-PR)
9/19/2022 1:51:46 PM	West Stairwell Supply Fan #1 Extended Run (SF-S2)
9/19/2022 1:51:46 PM	Pump Room Exhaust Fan #2 Extended Run (SF2-PR)
9/19/2022 1:51:46 PM	Pump Room Supply Fan #1 Extended Run (SF1-PR)
9/19/2022 1:51:46 PM	Pump Room Exhaust Fan #1 Extended Run (EF1-PR)
9/19/2022 1:51:46 PM	Pump Room Lights Extended On
9/19/2022 1:51:26 PM	Electrical Room Supply Fan #1 Extended Run (SF-ER)
9/19/2022 1:51:26 PM	Pump Room Lights Extended On
9/19/2022 1:51:26 PM	Pump Room Supply Fan #1 Extended Run (SF1-PR)
9/19/2022 1:51:26 PM	Pump Room Supply Fan #2 Extended Run (SF2-PR)
9/19/2022 1:51:26 PM	Pump Room Exhaust Fan #2 Extended Run (SF2-PR)
9/19/2022 1:51:26 PM	West Stairwell Supply Fan #1 Extended Run (SF-S2)
9/19/2022 1:51:26 PM	Electrical Room Lights Extended On
9/19/2022 1:51:26 PM	East Stairwell Supply Fan #1 Extended Run (SF-S1)
9/19/2022 1:51:26 PM	Pump Room Exhaust Fan #1 Extended Run (EF1-PR)
9/19/2022 1:51:16 PM	Electrical Room Supply Fan #1 Extended Run (SF-ER)
9/19/2022 1:51:16 PM	Electrical Room Lights Extended On
9/19/2022 1:51:16 PM	East Stairwell Supply Fan #1 Extended Run (SF-S1)
9/19/2022 1:51:16 PM	Pump Room Supply Fan #2 Extended Run (SF2-PR)
9/19/2022 1:51:16 PM	West Stairwell Supply Fan #1 Extended Run (SF-S2)
9/19/2022 1:51:16 PM	Pump Room Exhaust Fan #2 Extended Run (SF2-PR)
9/19/2022 1:51:16 PM	Pump Room Supply Fan #1 Extended Run (SF1-PR)
9/19/2022 1:51:16 PM	Pump Room Exhaust Fan #1 Extended Run (EF1-PR)
9/19/2022 1:51:16 PM	Pump Room Lights Extended On
9/19/2022 9:58:38 AM	East Wet Well Low Level Detected From Level Device (LIT-411B1)
9/19/2022 9:58:38 AM	West Wet Well Low Level Detected From Level Device (LIT-412B1)
9/19/2022 9:58:38 AM	Electrical Service #2 Faulted (83-2)
9/19/2022 9:58:38 AM	Low Flow Pump #1 Amperage Device Analog Open Wire Detected (LFP-01)
9/19/2022 9:58:38 AM	Low Flow Pump #2 Amperage Device Analog Open Wire Detected (LFP-02)
9/19/2022 9:58:38 AM	Discharge Combination Box Level Device Analog Open Wire Detected (LIT-421A)
9/19/2022 9:58:38 AM	Wet Well Low Level Detected From Level Device (LIT-412B1)

Events: 3767 Filter: All Alarms

Alarm Indications


- Equipment in Alarm Un Acknowledged
- Equipment in Alarm Acknowledged
- Equipment NOT in Alarm Un Acknowledged
- Equipment NOT in Alarm Acknowledged

Alarm Acknowledge

Alarm Reset

Alarm history will display and retain all alarms.

Alarms Active



Current User: default

IDOT Pump Station 4 - Alarms Active


9/19/2022 2:56:33 PM


Menu

< Previous

In Alarm Time	Acknowledge Time	Message
9/19/2022 9:51:30 AM	9/19/2022 9:58:38 AM	Low Flow Pump #1 Amperage Device Analog Open Wire Detected (LFP-01)
9/19/2022 9:51:30 AM	9/19/2022 9:58:38 AM	Low Flow Pump #2 Amperage Device Analog Open Wire Detected (LFP-02)
9/19/2022 9:51:30 AM	9/19/2022 9:58:38 AM	Discharge Combination Box Level Device Analog Open Wire Detected (LIT-421A)
9/19/2022 9:51:20 AM	9/19/2022 9:58:38 AM	Wet Well Low Level Detected From Level Device (LIT-412B1)
9/19/2022 9:51:20 AM	9/19/2022 9:58:38 AM	East Wet Well Low Level Detected From Level Device (LIT-411B1)
9/19/2022 9:51:20 AM	9/19/2022 9:58:38 AM	West Wet Well Low Level Detected From Level Device (LIT-412B1)
8/29/2022 3:28:22 PM	8/29/2022 3:29:32 PM	Float Mode Activated
8/29/2022 8:41:55 AM	8/29/2022 8:57:19 AM	East LS-101A Float Fail (LS-101A)
8/29/2022 8:41:55 AM	8/29/2022 8:57:19 AM	West LS-102A Float Fail (LS-102A)

Alarm Indications

 Equipment in Alarm Un Acknowledged

 Equipment in Alarm Acknowledged

Alarm Acknowledge

Alarm Reset

Alarms active will only display active alarms. When alarm condition is cleared and reset it will be removed from this list.

Alarm Aegis Enable

The alarm Aegis enable will allow the operator to select which alarms will be sent to Aegis as a SCADA common alarm.

Alarm Aegis Enable – page1

Current User: default

9/19/2022 2:59:35 PM

Menu

Alarm Aegis Enable page 2

< Previous

Legend:
○ = Alarm NOT Enabled For Aegis Dial Out
● = Alarm Enabled For Aegis Dial Out

East Mechanical Screen

- East Mechanical Screen Fail To Run
- East Mechanical Screen Over Rotate
- East Mechanical Screen Over Torque
- East Mech Screen Overload/High Temp
- East Mechanical Screen Not In Auto
- East Mechanical Screen Clogged

West Mechanical Screen

- West Mechanical Screen Fail To Run
- West Mechanical Screen Over Rotate
- West Mechanical Screen Over Torque
- West Mech Screen Overload/High Temp
- West Mechanical Screen Not In Auto
- West Mechanical Screen Clogged

Fire Alarm

- Fire Alarm Active
- Fire Alarm Device Trouble

Gas Monitoring

- Combustible Gas Monitor Device Failure
- Combustible Gas Level Alarm
- Combustible Gas Level Warning

Ventilation

- Pump Room Supply Fan #1 Extended Run
- Pump Room Supply Fan #1 Faulted
- Pump Room Supply Fan #2 Extended Run
- Pump Room Supply Fan #2 Faulted
- Pump Room Exhaust Fan #1 Extended Run
- Pump Room Exhaust Fan #1 Faulted
- Pump Room Exhaust Fan #2 Extended Run
- Pump Room Exhaust Fan #2 Faulted
- Electrical Room Supply Fan #1 Extended Run
- Electrical Room Supply Fan #1 Faulted
- East Stairwell Supply Fan #1 Extended Run
- East Stairwell Supply Fan #1 Faulted
- West Stairwell Supply Fan #1 Extended Run
- West Stairwell Supply Fan #1 Faulted

Lights

- Pump Room Lights Extended On
- Electrical Room Lights Extended On

Float Fail

- East LS-101A Float Fail
- West LS-102E Float Fail
- West LS-101F Float Fail
- East LS-101B Float Fail
- West LS-102F Float Fail
- East LS-101G Float Fail
- West LS-101C Float Fail
- West LS-102G Float Fail
- West LS-102C Float Fail
- East LS-101H Float Fail
- East LS-101D Float Fail
- West LS-102H Float Fail
- West LS-102D Float Fail
- East LS-101I Float Fail
- East LS-101E Float Fail
- West LS-102I Float Fail

Miscellaneous

- Level Control Mode Left In Manual Override
- Level Control Has Switched To Float Mode
- Bridge Crane System Failure
- Missed Patrol

Log:

- 9/19/2022 9:51:20 AM West Wet Well Low Level Detected From Level Device (LT-412B1)
- 9/19/2022 9:51:20 AM East Wet Well Low Level Detected From Level Device (LT-411B1)
- 9/19/2022 9:51:20 AM West Wet Well Low Level Detected From Level Device (LT-412B1)

Alarm Acknowledge

Alarm Reset

Alarm Aegis Enable – page2

DOT P54 - FactoryTalk View SE Client

Indiana Department of Transportation

Current User: default

IDOT Pump Station 4 - Alarm Aegis Enable - page2

9/19/2022 2:59:59 PM

Menu

Alarm Aegis Enable page 1

< Previous

☐ = Alarm NOT Enabled For Aegis Dial Out ☒ = Alarm Enabled For Aegis Dial Out

East Gates	Electrical	Control Panel	Analog Device Fail / Open Wire
East Influent Gate Fault <input type="radio"/>	Electrical Utility Service #1 Faulted <input type="radio"/>	PLC Redundancy Switchover Occurred <input type="radio"/>	East Upstream Level Device Analog <input type="radio"/>
East Recirculation Gate Fault <input type="radio"/>	Electrical Utility Service #1 Ground Fault <input type="radio"/>	Control Panel UPS #1 Faulted <input type="radio"/>	East Wet Well Level Device Analog <input type="radio"/>
East Discharge Gate Fault <input type="radio"/>	Electrical Utility Service #2 Faulted <input type="radio"/>	Control Panel UPS #1 Low Battery <input type="radio"/>	East Wet Well Level Device Out Of Range <input type="radio"/>
	Electrical Utility Service #2 Ground Fault <input type="radio"/>	Control Panel UPS #2 Faulted <input type="radio"/>	West Upstream Level Device Analog <input type="radio"/>
West Gates	USS1 Main Circuit Breaker #1 Open <input type="radio"/>	Control Panel UPS #2 Low Battery <input type="radio"/>	West Wet Well Level Device Analog <input type="radio"/>
West Influent Gate Fault <input type="radio"/>	USS1 Main Circuit Breaker #1 Tripped <input type="radio"/>	Control Panel Line Filter #1 Fail <input type="radio"/>	West Wet Well Level Device Out Of Range <input type="radio"/>
West Recirculation Gate Fault <input type="radio"/>	USS1 Main Circuit Breaker #2 Open <input type="radio"/>	Control Panel Line Filter #2 Fail <input type="radio"/>	Discharge Level Device Analog <input type="radio"/>
West Discharge Gate Fault <input type="radio"/>	USS1 Main Circuit Breaker #2 Tripped <input type="radio"/>	Control Panel 120 VAC Power Supply #1 Loss <input type="radio"/>	Low Flow Pump #1 Amperage Device Analog <input type="radio"/>
	USS1 Tie Circuit Breaker Open <input type="radio"/>	Control Panel 120 VAC Power Supply #2 Loss <input type="radio"/>	Low Flow Pump #2 Amperage Device Analog <input type="radio"/>
	USS1 Tie Circuit Breaker Tripped <input type="radio"/>	Control Panel 24 VDC Power Supply #1 Loss <input type="radio"/>	
	USS1 Transformer #1 Circuit Breaker Open <input type="radio"/>	Control Panel 24 VDC Power Supply #2 Loss <input type="radio"/>	
Equalization Gate	USS1 Transformer #1 Circuit Breaker Tripped <input type="radio"/>	Float Mode Activated <input type="radio"/>	
Equalization Gate Not In Discharge <input type="radio"/>	USS1 Transformer #2 Circuit Breaker Open <input type="radio"/>		
Equalization Gate Fault <input type="radio"/>	USS1 Transformer #2 Circuit Breaker Tripped <input type="radio"/>		
System In Isolation Mode <input type="radio"/>	MCC1 Tie Circuit Breaker Open <input type="radio"/>	Wet Well High / Low Level	
	MCC1 Main Circuit Breaker #1 Open <input type="radio"/>	Wet Well High Detected From Level Device <input type="radio"/>	
	MCC1 Main Circuit Breaker #1 Tripped <input type="radio"/>	Wet Well Low Detected From Level Device <input type="radio"/>	
	MCC1 Main Circuit Breaker #2 Open <input type="radio"/>	Wet Well East High Level Float Activated <input type="radio"/>	
	MCC1 Main Circuit Breaker #2 Tripped <input type="radio"/>	Wet Well East Low Level Float Activated <input type="radio"/>	
	USS1 Generator Circuit Breaker Open <input type="radio"/>	Wet Well West High Level Float Activated <input type="radio"/>	
Station In Non-Discharge Mode <input type="radio"/>	USS1 Generator Circuit Breaker Tripped <input type="radio"/>	Wet Well West Low Level Float Activated <input type="radio"/>	
	USS1 Automatic Transfer System Fail <input type="radio"/>		
	USS1 Electrical Service #1 High Voltage <input type="radio"/>		
	USS1 Electrical Service #1 Low Voltage <input type="radio"/>		
	USS1 Electrical Service #2 High Voltage <input type="radio"/>		
	USS1 Electrical Service #2 Low Voltage <input type="radio"/>		

9/19/2022 9:51:20 AM West Wet Well Low Level Detected From Level Device (LT-412B1)

9/19/2022 9:51:20 AM East Wet Well Low Level Detected From Level Device (LT-411B1)

9/19/2022 9:51:20 AM Wet Well Low Level Detected From Level Device (LT-412B1)

Alarm Acknowledge

Alarm Reset

Events

DOT P54 - FactoryTalk View SE Client

Indiana Department of Transportation

Current User: default

IDOT Pump Station 4 -Events

9/19/2022 3:02:18 PM

Menu

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Event Time	Message
9/15/2022 12:07:23 PM	East Mechanical Screen Stopped (SRN-01)
9/15/2022 12:07:23 PM	East Mechanical Screen Running (SRN-01)
9/15/2022 12:07:23 PM	West Mechanical Screen Stopped (SRN-02)
9/15/2022 12:07:23 PM	West Mechanical Screen Running (SRN-02)
9/15/2022 12:06:53 PM	East Mechanical Screen Stopped (SRN-01)
9/15/2022 12:06:53 PM	East Mechanical Screen Running (SRN-01)
9/15/2022 12:06:53 PM	West Mechanical Screen Stopped (SRN-02)
9/15/2022 12:06:53 PM	West Mechanical Screen Running (SRN-02)
9/14/2022 3:12:18 PM	East Influent Gate In Discharge Position (IG-01)
9/14/2022 3:12:18 PM	East Discharge Gate In Discharge Position (DG-01)
9/14/2022 3:12:18 PM	East Recirculation Gate In Discharge Position (RG-02)
9/14/2022 3:05:59 PM	East Influent Gate In Discharge Position (IG-01)
9/14/2022 3:05:59 PM	East Discharge Gate In Discharge Position (DG-01)
9/14/2022 3:05:59 PM	East Recirculation Gate In Discharge Position (RG-02)
8/29/2022 8:41:55 AM	East Mechanical Screen Stopped (SRN-01)
8/29/2022 8:41:55 AM	Equalization Gate In Discharge Position (IG-03)
8/29/2022 8:41:55 AM	East Influent Gate In Discharge Position (IG-01)
8/29/2022 8:41:55 AM	East Discharge Gate In Discharge Position (DG-01)
8/29/2022 8:41:55 AM	East Recirculation Gate In Discharge Position (RG-02)
8/29/2022 8:41:55 AM	West Influent Gate In Discharge Position (IG-02)
8/29/2022 8:41:55 AM	Main Pump #8 Stopped (MP-08)
8/29/2022 8:41:55 AM	Main Pump #9 Stopped (MP-09)
8/29/2022 8:41:55 AM	West Recirculation Gate In Discharge Position (RG-01)
8/29/2022 8:41:55 AM	West Discharge Gate In Discharge Position (DG-02)
8/29/2022 8:41:55 AM	West Mechanical Screen Stopped (SRN-02)
8/29/2022 8:41:55 AM	Main Pump #4 Stopped (MP-04)
8/29/2022 8:41:55 AM	Main Pump #3 Stopped (MP-03)
8/29/2022 8:41:55 AM	Main Pump #5 Stopped (MP-05)
8/29/2022 8:41:55 AM	Main Pump #7 Stopped (MP-07)
8/29/2022 8:41:55 AM	Main Pump #6 Stopped (MP-06)
8/29/2022 8:41:55 AM	Main Pump #10 Stopped (MP-10)
8/29/2022 8:41:55 AM	Main Pump #2 Stopped (MP-02)
8/29/2022 8:41:55 AM	Main Pump #1 Stopped (MP-01)
8/29/2022 8:41:55 AM	Low Flow Pump #2 Stopped (LFP-02)

Event Indications

Event Switch To Active

Event Switch To Inactive

Alarm Acknowledge

Alarm Reset

Events will timestamp and historically log pump running, pump stopped, mechanical screen running, mechanical screen stopped and position of the gates.

Annunciator

DOT P54 - FactoryTalk View SE Client

Current User: default

IDOT Pump Station 4 - Annunciator

9/19/2022 3:06:04 PM

Menu

Low Flow Pump #1 Fail To Start	Low Flow Pump #2 Fail To Start	Main Pump #1 Fail To Start	Main Pump #2 Fail To Start	Main Pump #3 Fail To Start	Main Pump #4 Fail To Start	Main Pump #5 Fail To Start	Main Pump #6 Fail To Start	Main Pump #7 Fail To Start	Main Pump #8 Fail To Start	Main Pump #9 Fail To Start	Main Pump #10 Fail To Start
Low Flow Pump #1 Overtemp/Moisture	Low Flow Pump #2 Overtemp/Moisture	Main Pump #1 Overtemp/Moisture	Main Pump #2 Overtemp/Moisture	Main Pump #3 Overtemp/Moisture	Main Pump #4 Overtemp/Moisture	Main Pump #5 Overtemp/Moisture	Main Pump #6 Overtemp/Moisture	Main Pump #7 Overtemp/Moisture	Main Pump #8 Overtemp/Moisture	Main Pump #9 Overtemp/Moisture	Main Pump #10 Overtemp/Moisture
Low Flow Pump #1 MPN Tripped/Out	Low Flow Pump #2 MPN Tripped/Out	Main Pump #1 MPN Tripped/Out	Main Pump #2 MPN Tripped/Out	Main Pump #3 MPN Tripped/Out	Main Pump #4 MPN Tripped/Out	Main Pump #5 MPN Tripped/Out	Main Pump #6 MPN Tripped/Out	Main Pump #7 MPN Tripped/Out	Main Pump #8 MPN Tripped/Out	Main Pump #9 MPN Tripped/Out	Main Pump #10 MPN Tripped/Out
Low Flow Pump #1 NOT In Auto	Low Flow Pump #2 NOT In Auto	Main Pump #1 NOT In Auto	Main Pump #2 NOT In Auto	Main Pump #3 NOT In Auto	Main Pump #4 NOT In Auto	Main Pump #5 NOT In Auto	Main Pump #6 NOT In Auto	Main Pump #7 NOT In Auto	Main Pump #8 NOT In Auto	Main Pump #9 NOT In Auto	Main Pump #10 NOT In Auto
Low Flow Pump #1 Under Maintenance	Low Flow Pump #2 Under Maintenance	Main Pump #1 Under Maintenance	Main Pump #2 Under Maintenance	Main Pump #3 Under Maintenance	Main Pump #4 Under Maintenance	Main Pump #5 Under Maintenance	Main Pump #6 Under Maintenance	Main Pump #7 Under Maintenance	Main Pump #8 Under Maintenance	Main Pump #9 Under Maintenance	Main Pump #10 Under Maintenance
Electrical Room Ventilation Failure	Intrusion Alarm	Combustible Gas Panel Trouble	USST Electrical Service #1 Failure	USST Electrical Service #2 Failure	East Mechanical Screen Fault	Station In Non-Discharge Mode	East Wet Well (Primary) Level Device Failure	West Wet Well High Level	SCADA Common Alarm	SFD MCC1 Failure	
Electrical Room Lights On	Pump Station Occupied	Combustible Gas Warning (5% LEL)	USST Electrical Service #1 High Voltage	USST Electrical Service #2 High Voltage	East Mechanical Screen Clogged	Station In Isolation Mode	East Upstream Level Device Failure	West Wet Well Low Level	SCADA UPS #1 Low Battery	SCADA UPS #2 Low Battery	MCC1 Main Circuit Breaker Fail
Pump Room Ventilation Failure	Fire Alarm	Combustible Gas Alarm (10% LEL)	USST Electrical Service #1 Low Voltage	USST Electrical Service #2 Low Voltage	West Mechanical Screen Fault		West Upstream Level Device Failure	Paravert Flooded	SCADA UPS #1 Faulted	SCADA UPS #2 Faulted	SFD MCC2 Failure
Pump Room Lights On	Fire Alarm Panel Trouble		USST TX #1 Alarm	USST TX #2 Alarm	West Mechanical Screen Clogged		West Wet Well (Secondary) Level Device Failure	Float Mode Active	SCADA Line Filter #1 Fail	SCADA Line Filter #2 Fail	MCC2 Main Circuit Breaker Fail
East Stairwell Ventilation Failure							Discharge Chamber Level Device Failure	Float Failure	SCADA 120 VAC Power Supply #1 Loss	SCADA 120 VAC Power Supply #2 Loss	
West Stairwell Ventilation Failure							West Wet Well Level Device Calibration		SCADA 24 VDC Power Supply #1 Loss	SCADA 24 VDC Power Supply #2 Loss	
									Missed Patrol	PLC Failure	Bridge Crane System Failure

9/19/2022 9:51:20 AM

West Wet Well Low Level Detected From Level Device (LIT-412B1)

9/19/2022 9:51:20 AM

East Wet Well Low Level Detected From Level Device (LIT-411B1)

9/19/2022 9:51:20 AM

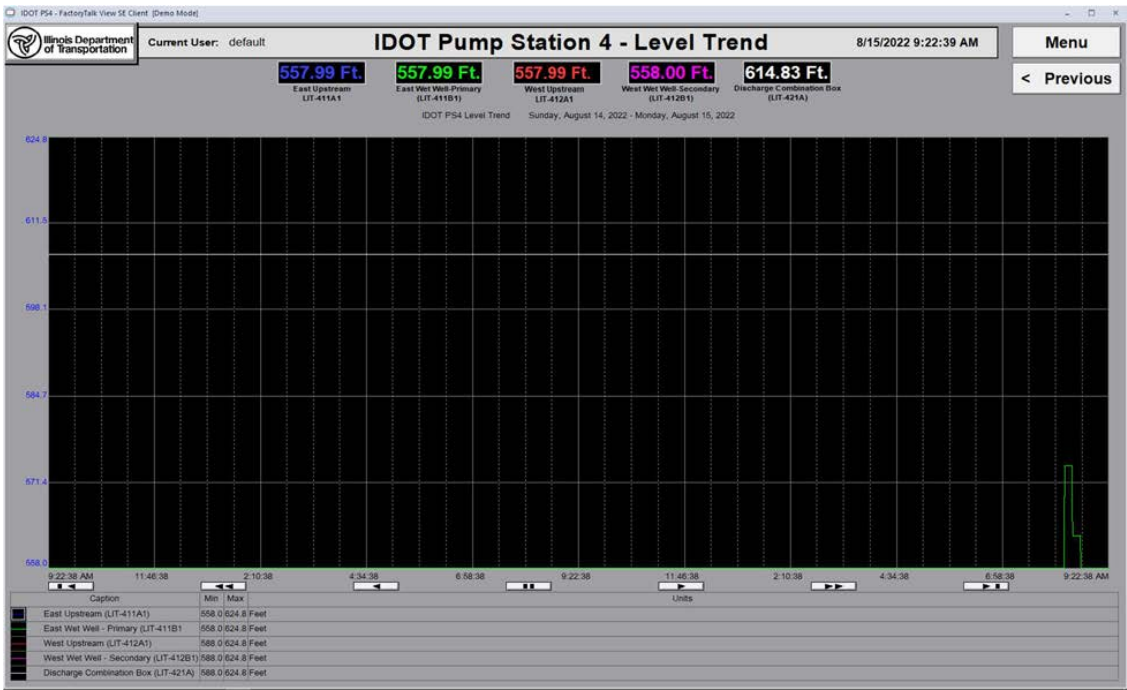
West Wet Well Low Level Detected From Level Device (LIT-412B1)

Alarm Acknowledge

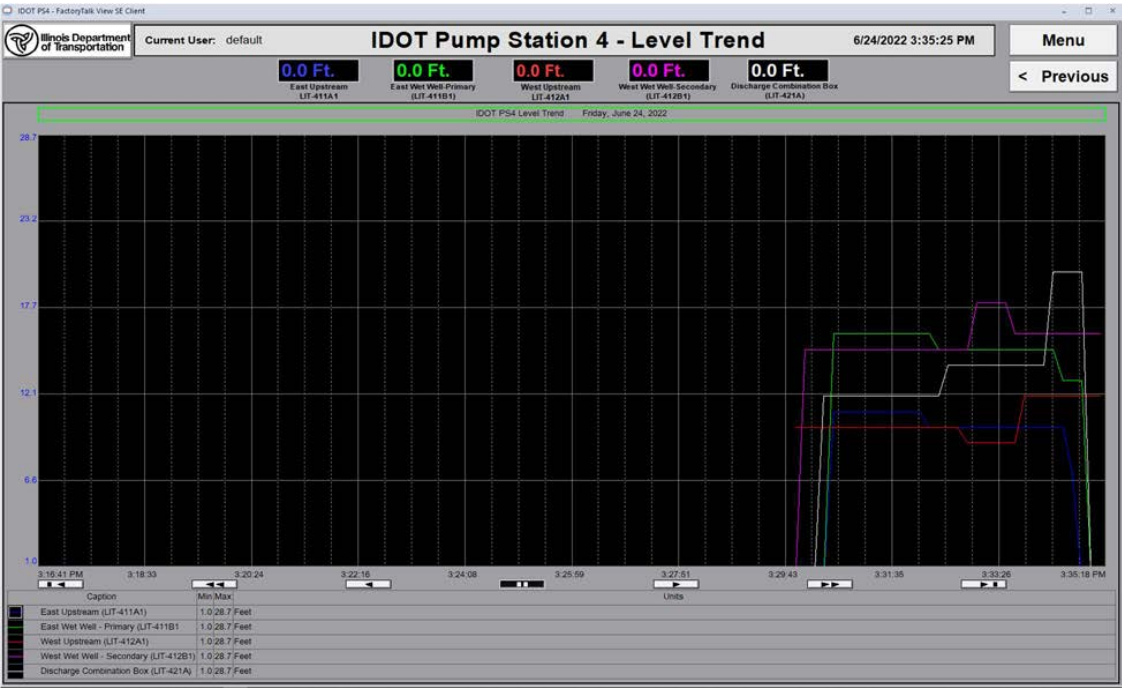
Alarm Reset

Active alarms will blink red.

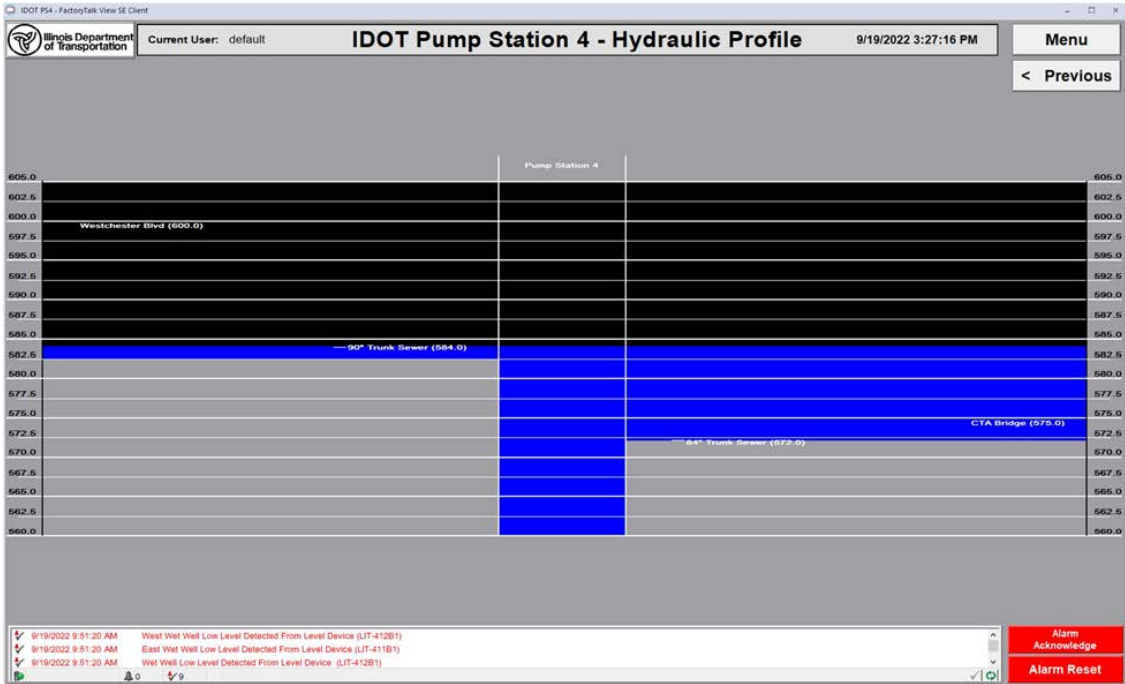
Level Trend



Historical logged analog values will be stored and accessible to view from the level trend. An example of the trend line data is shown below.

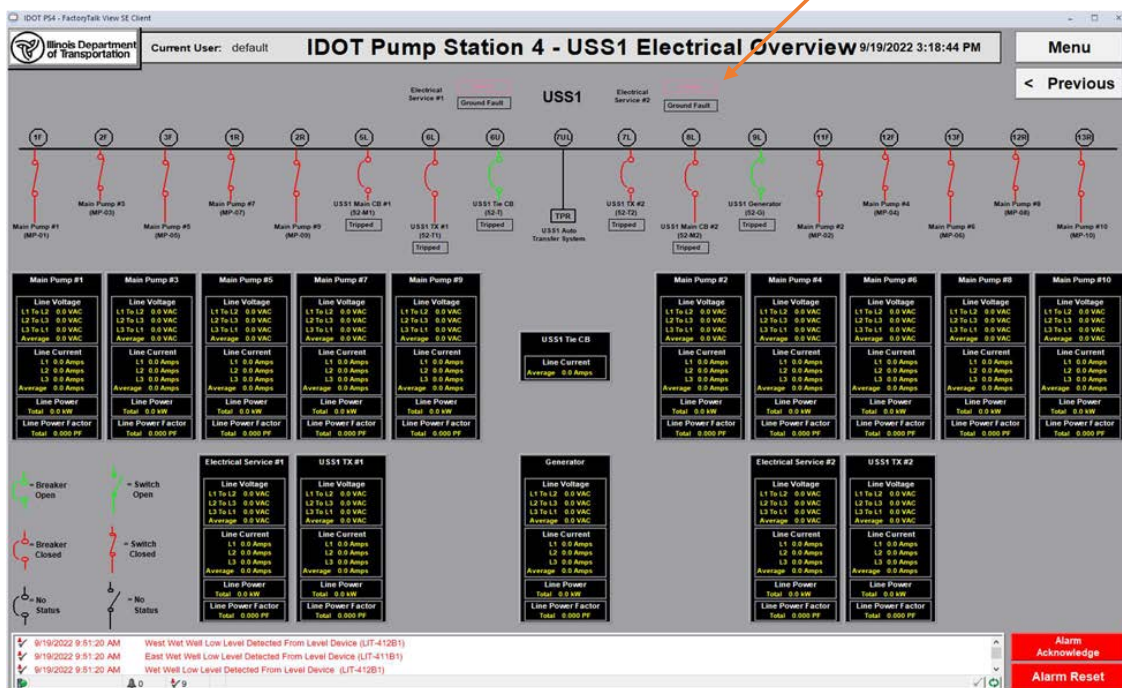


Hydraulic Profile

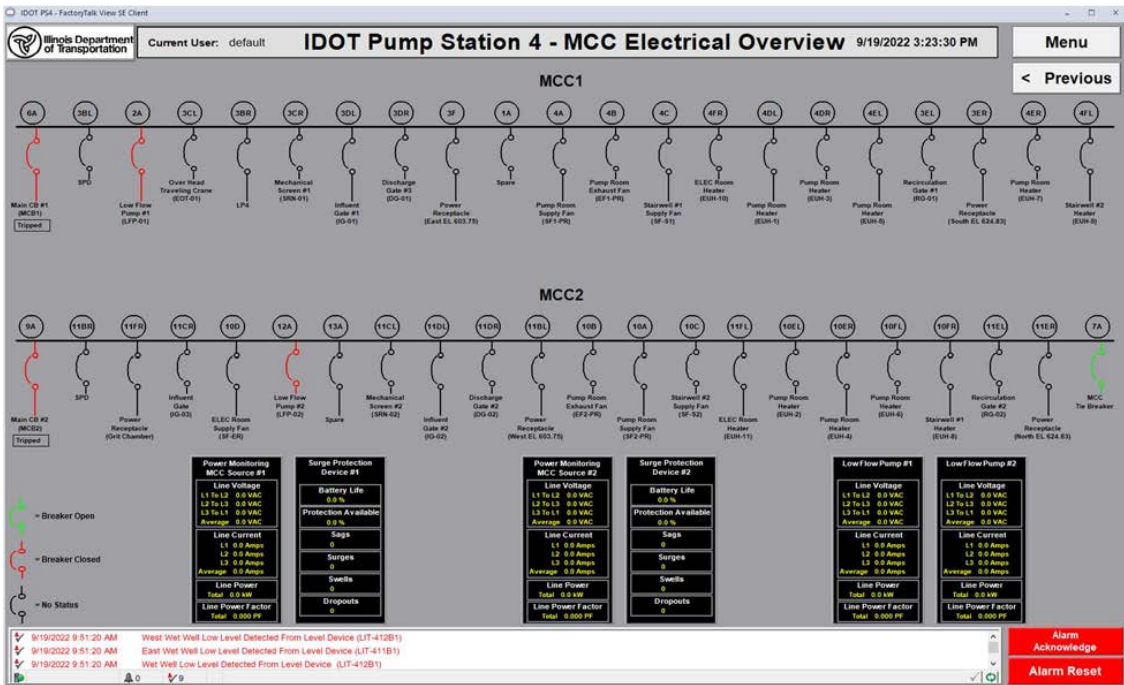


USS1 Electrical Overview

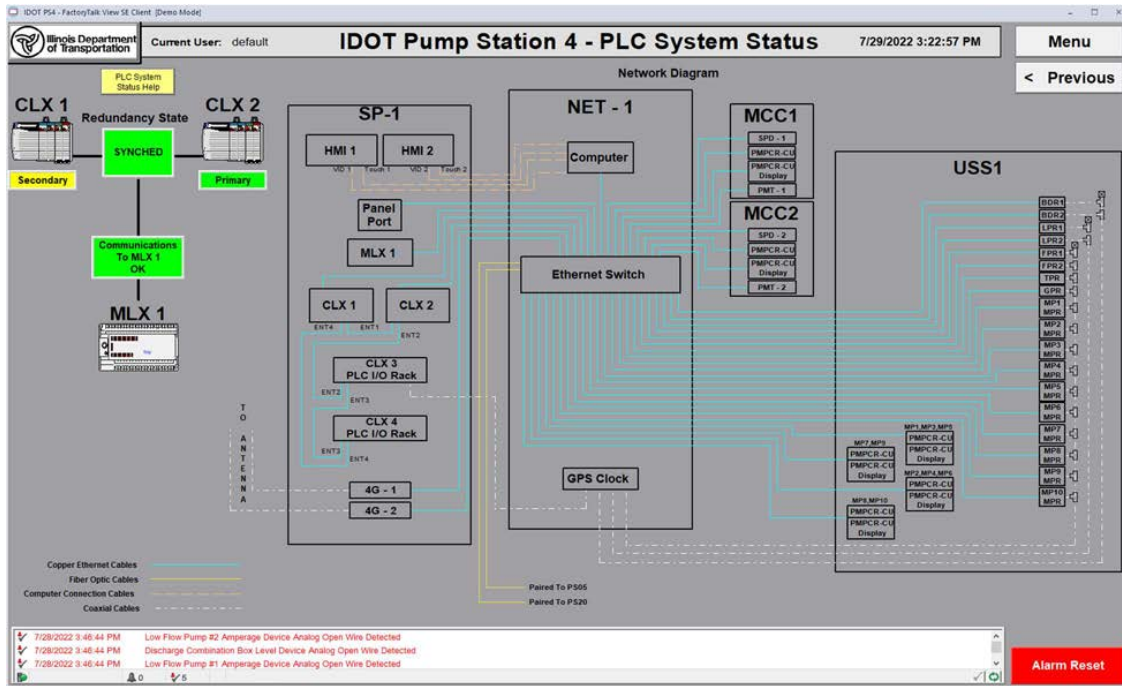
Indicators will blink between red and light red when alarm condition is active.



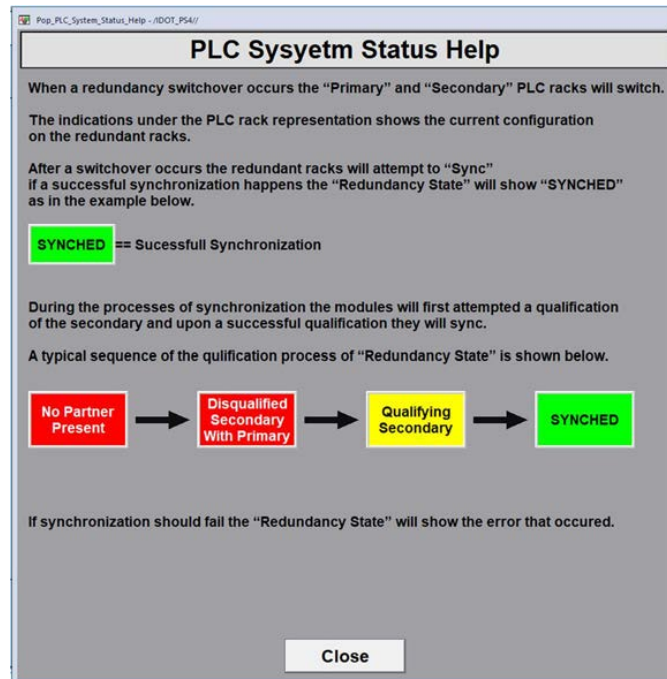
MCC 1 / MCC 2 Electrical Overview



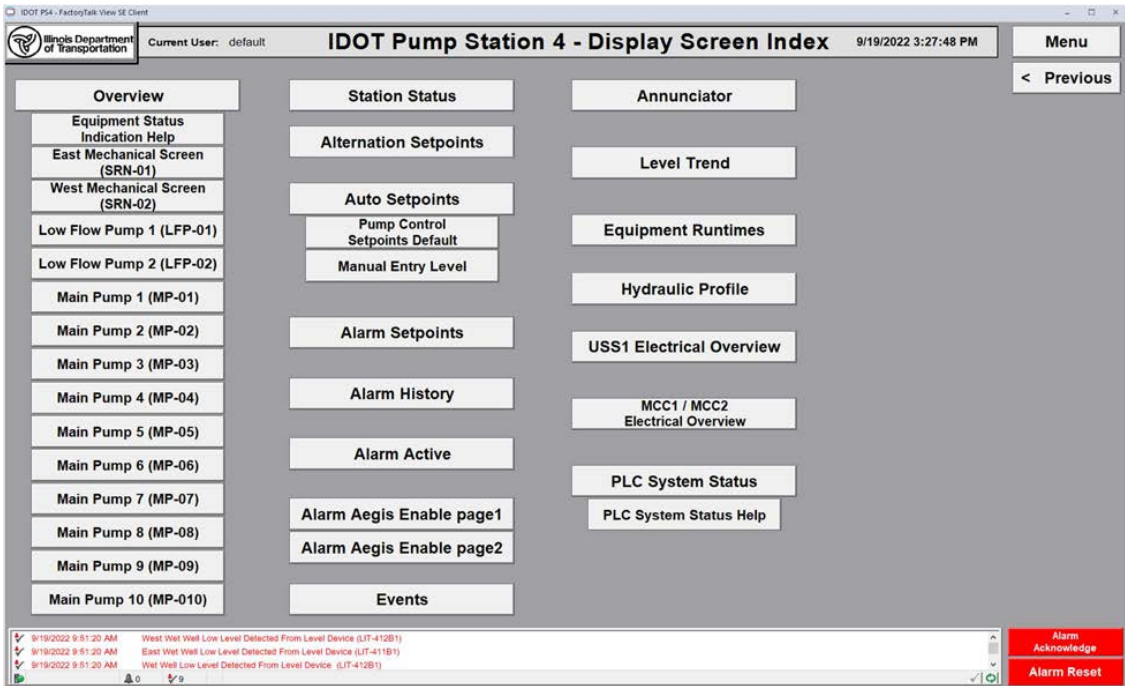
PLC System Status Overview



PLC Status Help Popup



Display Screen Index



IDOT TRAINING PROGRAM GRADUATE ON-THE-JOB TRAINING SPECIAL PROVISION

Effective: August 1, 2012 Revised: February 2, 2017

In addition to the Contractor's equal employment opportunity (EEO) affirmative action efforts undertaken as required by this Contract, the Contractor is encouraged to participate in the incentive program described below to provide additional on-the-job training to certified graduates of the IDOT pre-apprenticeship training program, as outlined in this Special Provision.

IDOT funds, and various Illinois community colleges operate, pre-apprenticeship training programs throughout the State to provide training and skill-improvement opportunities to promote the increased employment of minority groups, disadvantaged persons and women in all aspects of the highway construction industry. The intent of this IDOT Pre-Apprenticeship Training Program Graduate (TPG) special provision (Special Provision) is to place these certified program graduates on the project site for this Contract in order to provide the graduates with meaningful on-the-job training. Pursuant to this Special Provision, the Contractor must make every reasonable effort to recruit and employ certified TPG trainees to the extent such individuals are available within a practicable distance of the project site.

Specifically, participation of the Contractor or its subcontractor in the Program entitles the participant to reimbursement for graduates' hourly wages at \$15.00 per hour per utilized TPG trainee, subject to the terms of this Special Provision. Reimbursement payment will be made even though the Contractor or subcontractor may also receive additional training program funds from other non-IDOT sources for other non-TPG trainees on the Contract, provided such other source does not specifically prohibit the Contractor or subcontractor from receiving reimbursement from another entity through another program, such as IDOT through the TPG program. With regard to any IDOT funded construction training program other than TPG, however, additional reimbursement for other IDOT programs will not be made beyond the TPG Program described in this Special Provision when the TPG Program is utilized.

No payment will be made to the Contractor if the Contractor or subcontractor fails to provide the required on-site training to TPG trainees, as solely determined by IDOT. A TPG trainee must begin training on the project as soon as the start of work that utilizes the relevant trade skill and the TPG trainee must remain on the project site through completion of the Contract, so long as training opportunities continue to exist in the relevant work classification. Should a TPG trainee's employment end in advance of the completion of the Contract, the Contractor must promptly notify the IDOT District EEO Officer for the Contract that the TPG's involvement in the Contract has ended. The Contractor must supply a written report for the reason the TPG trainee involvement terminated, the hours completed by the TPG trainee on the Contract, and the number of hours for which the incentive payment provided under this Special Provision will be, or has been claimed for the separated TPG trainee.

Finally, the Contractor must maintain all records it creates as a result of participation in the Program on the Contract, and furnish periodic written reports to the IDOT District EEO Officer that document its contractual performance under and compliance with this Special Provision. Finally, through participation in the Program and reimbursement of wages, the Contractor is not relieved of, and IDOT has not waived, the requirements of any federal or state labor or employment law applicable to TPG workers, including compliance with the Illinois Prevailing Wage Act.

METHOD OF MEASUREMENT: The unit of measurement is in hours.

BASIS OF PAYMENT: This work will be paid for at the contract unit price of \$15.00 per hour for each utilized certified TPG Program trainee (TRAINEES TRAINING PROGRAM GRADUATE). The estimated total number of hours, unit price, and total price must be included in the schedule of prices

for the Contract submitted by Contractor prior to beginning work. The initial number of TPG trainees for which the incentive is available for this contract is 4 .

The Department has contracted with several educational institutions to provide screening, tutoring and pre-training to individuals interested in working as a TPG trainee in various areas of common construction trade work. Only individuals who have successfully completed a Pre-Apprenticeship Training Program at these IDOT approved institutions are eligible to be TPG trainees. To obtain a list of institutions that can connect the Contractor with eligible TPG trainees, the Contractor may contact: HCCTP TPG Program Coordinator, Office of Business and Workforce Diversity (IDOT OBWD), Room 319, Illinois Department of Transportation, 2300 S. Dirksen Parkway, Springfield, Illinois 62764. Prior to commencing construction with the utilization of a TPG trainee, the Contractor must submit documentation to the IDOT District EEO Officer for the Contract that provides the names and contact information of the TPG trainee(s) to be trained in each selected work classification, proof that the TPG trainee(s) has successfully completed a Pre-Apprenticeship Training Program, proof that the TPG is in an Apprenticeship Training Program approved by the U.S. Department of Labor Bureau of Apprenticeship Training, and the start date for training in each of the applicable work classifications.

To receive payment, the Contractor must provide training opportunities aimed at developing a full journeyworker in the type of trade or job classification involved. During the course of performance of the Contract, the Contractor may seek approval from the IDOT District EEO Officer to employ additional eligible TPG trainees. In the event the Contractor subcontracts a portion of the contracted work, it must determine how many, if any, of the TPGs will be trained by the subcontractor. Though a subcontractor may conduct training, the Contractor retains the responsibility for meeting all requirements imposed by this Special Provision. The Contractor must also include this Special Provision in any subcontract where payment for contracted work performed by a TPG trainee will be passed on to a subcontractor.

Training through the Program is intended to move TPGs toward journeyman status, which is the primary objective of this Special Provision. Accordingly, the Contractor must make every effort to enroll TPG trainees by recruitment through the Program participant educational institutions to the extent eligible TPGs are available within a reasonable geographic area of the project. The Contractor is responsible for demonstrating, through documentation, the recruitment efforts it has undertaken prior to the determination by IDOT whether the Contractor is in compliance with this Special Provision, and therefore, entitled to the Training Program Graduate reimbursement of \$15.00 per hour.

Notwithstanding the on-the-job training requirement of this TPG Special Provision, some minimal off-site training is permissible as long as the offsite training is an integral part of the work of the contract, and does not compromise or conflict with the required on-site training that is central to the purpose of the Program. No individual may be employed as a TPG trainee in any work classification in which he/she has previously successfully completed a training program leading to journeyman status in any trade, or in which he/she has worked at a journeyman level or higher.

State of Illinois
Department of Transportation
Bureau of Local Roads and Streets

SPECIAL PROVISION
FOR
INSURANCE

Effective: February 1, 2007

Revised: August 1, 2007

All references to Sections or Articles in this specification shall be construed to mean specific Section or Article of the Standard Specifications for Road and Bridge Construction, adopted by the Department of Transportation.

The Contractor shall name the following entities as additional insured under the Contractor's general liability insurance policy in accordance with Article 107.27:

Village of Barrington

The entities listed above and their officers, employees, and agents shall be indemnified and held harmless in accordance with Article 107.26.

State of Illinois
DEPARTMENT OF TRANSPORTATION
Bureau of Local Roads & Streets
SPECIAL PROVISION
FOR
LOCAL QUALITY ASSURANCE/ QUALITY MANAGEMENT QC/QA
Effective: January 1, 2022

Replace the first five paragraphs of Article 1030.06 of the Standard Specifications with the following:

“1030.06 Quality Management Program. The Quality Management Program (QMP) will be Quality Control / Quality Assurance (QC/QA) according to the following.”

Delete Article 1030.06(d)(1) of the Standard Specifications.

Revise Article 1030.09(g)(3) of the Standard Specifications to read:

“(3) If core testing is the density verification method, the Contractor shall provide personnel and equipment to collect density verification cores for the Engineer. Core locations will be determined by the Engineer following the document “Hot-Mix Asphalt QC/QA Procedure for Determining Random Density Locations” at density verification intervals defined in Article 1030.09(b). After the Engineer identifies a density verification location and prior to opening to traffic, the Contractor shall cut a 4 in. (100 mm) diameter core. With the approval of the Engineer, the cores may be cut at a later time.”

Revise Article 1030.09(h)(2) of the Standard Specifications to read:

“(2) After final rolling and prior to paving subsequent lifts, the Engineer will identify the random density verification test locations. Cores or nuclear density gauge testing will be used for density verification. The method used for density verification will be as selected below.

Density Verification Method	
<input checked="" type="checkbox"/>	Cores
<input type="checkbox"/>	Nuclear Density Gauge (Correlated when paving ≥ 3,000 tons per mixture)

Density verification test locations will be determined according to the document “Hot-Mix Asphalt QC/QA Procedure for Determining Random Density Locations”. The density testing interval for paving wider than or equal to 3 ft (1 m) will be 0.5 miles (800 m) for lift thicknesses of 3 in. (75 mm) or less and 0.2 miles (320 m) for lift thicknesses greater than 3 in. (75 mm). The density testing interval for paving less than 3 ft (1 m) wide will be 1 mile (1,600 m). If a day’s paving will be less than the prescribed density testing interval, the length of the day’s paving will be the interval for that day. The density testing interval for mixtures used for patching will be 50 patches with a minimum of one test per mixture per project.

If core testing is the density verification method, the Engineer will witness the Contractor coring, and secure and take possession of all density samples at the

density verification locations. The Engineer will test the cores collected by the Contractor for density according to Illinois Modified AASHTO T 166 or AASHTO T 275.

If nuclear density gauge testing is the density verification method, the Engineer will conduct nuclear density gauge tests. The Engineer will follow the density testing procedure detailed in the document "Illinois Modified ASTM D 2950, Standard Test Method for Density of Bituminous Concrete In-Place by Nuclear Method".

A density verification test will be the result of a single core or the average of the nuclear density tests at one location. The results of each density test must be within acceptable limits. The Engineer will promptly notify the Contractor of observed deficiencies."

Revise the seventh paragraph and all subsequent paragraphs in Section D. of the document "Hot-Mix Asphalt QC/QA Initial Daily Plant and Random Samples" to read:

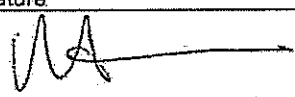
"Mixtures shall be sampled from the truck at the plant by the Contractor following the same procedure used to collect QC mixture samples (Section A). This process will be witnessed by the Engineer who will take custody of the verification sample. Each sample bag with a verification mixture sample will be secured by the Engineer using a locking ID tag. Sample boxes containing the verification mixture sample will be sealed/taped by the Engineer using a security ID label."



Route	Marked Route	Section Number
US Route 14	Northwest Highway	11-00087-00-GS
Project Number	County	Contract Number
WVIF(253)	Lake	C-91-053-25

This plan has been prepared to comply with the provisions of the National Pollutant Discharge Elimination System (NPDES) Permit No. ILR10 (Permit ILR10), issued by the Illinois Environmental Protection Agency (IEPA) for storm water discharges from construction site activities.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature	Date
	3/4/24

Print Name	Title	Agency
Marie Hansen, P.E., CFM	Director of Development Services	Village of Barrington

Note: Guidance on preparing each section of BDE 2342 can be found in Chapter 41 of the IDOT Bureau of Design and Environment (BDE) Manual. Chapter 41 and this form also reference the IDOT Drainage Manual which should be readily available.

I. Site Description:

A. Provide a description of the project location; include latitude and longitude, section, town, and range:

The project is located in the Village of Barrington, Lake County, Illinois. Roadway improvements extend along US Route 14 from IL Route 59 to Valencia Ave., along Lake Zurich Road from US Route 14 to the Citizens Park entrance road, and at the intersection of IL Route 59 and Lions Dr. To accommodate the roadway improvements, Flint Creek Tributary will be relocated along the north side of US Route 14 and the west side of Route 59. (Section 36, Township 42 N, Range 9 E) (Latitude 42.161536 N, Longitude 88.132181 W)

B. Provide a description of the construction activity which is the subject of this plan. Include the number of construction stages, drainage improvements, in-stream work, installation, maintenance, removal of erosion measures, and permanent stabilization:

This project consists of a grade separation between US Route 14 and the WCL/CN railway. Flint Creek Tributary will be rerouted around the grade separation, crossing US Route 14 and IL Route 59 through proposed box culverts. Lake Zurich Road will be lowered to meet the grade at US Route 14 and Willow Road will be removed.

The specific construction stages are as follows:

*PRESTAGE - EXCAVATION

*STAGE 1 - GRADING

*STAGE 1A - SHOOFLY RAILROAD CONSTRUCTION, BEGIN PUMP STATION CONSTRUCTION, BEGIN TEMP US ROUTE 14 AND LAKE ZURICH ROAD CONSTRUCTION

*STAGE 1B - INSTALL SANITARY SEWER AND WATER MAIN, CONSTRUCT STORM SEWER TO DIVERT FLOW EAST OF FLINT CREEK

*STAGE 1C - CLOSE US ROUTE 14, INITIATE REGIONAL DETOUR, FINISH SHOOFLY AND TEMP PAVEMENT CONSTRUCTION

*STAGE 2 - SHIFT TRAFFIC TO TEMP US ROUTE 14 AND TEMP LAKE ZURICH ROAD, CONSTRUCT REMAINING STORM, FINISH PUMP STATION, DIVERT FLINT CREEK TO TEMP ALIGNMENT, CONSTRUCT RAILROAD STRUCTURE, RAIL, AND RETAINING WALLS, CONSTRUCT US ROUTE 14 AND LAKE ZURICH

ROAD

*STAGE 2A - SHIFT SB TRAFFIC TO PR US ROUTE 14, CONSTRUCT PAVEMENT GAPS

*STAGE 2B - CONSTRUCT PAVEMENT GAPS

*STAGE 3 - MOVE TRAFFIC TO PR US ROUTE 14, CONSTRUCT PR FLINT CREEK, LANDSCAPING AND RESTORATION

C. Provide the estimated duration of this project:

The project construction is expected to last approximately 24 months.

D. The total area of the construction site is estimated to be 31.6 acres.

The total area of the site estimated to be disturbed by excavation, grading or other activities is 31.6 acres.

E. The following are weighted averages of the runoff coefficient for this project before and after construction activities are completed; see Section 4-102 of the IDOT Drainage Manual:

Existing C = 0.7, proposed C = 0.73

F. List all soils found within project boundaries; include map unit name, slope information, and erosivity:

Please see the attached NRCS Soil Maps

G. If wetlands were delineated for this project, provide an extent of wetland acreage at the site; see Phase I report:

Please see the attached wetland exhibit.

H. Provide a description of potentially erosive areas associated with this project:

Please see the attached NRCS Soil Maps that include maps for soil K-factors and soil wind erodibility groups. These soil types are slightly susceptible to erosion; the erosion and sediment control measures shown in the plans and specifications should be sufficient to restrict soil erosion.

I. The following is a description of soil disturbing activities by stages, their locations, and their erosive factors (e.g., steepness of slopes, length of slopes, etc.):

J. See the erosion control plans and/or drainage plans for this contract for information regarding drainage patterns, approximate slopes anticipated before and after major grading activities, locations where vehicles enter or exit the site and controls to prevent offsite sediment tracking (to be added after contractor identifies locations), areas of soil disturbance, the location of major structural and non-structural controls identified in the plan, the location of areas where stabilization practices are expected to occur, surface waters (including wetlands) , and locations where storm water is discharged to surface water including wetlands.

K. Identify who owns the drainage system (municipality or agency) this project will drain into:

IDOT and the Village of Barrington

L. The following is a list of General NPDES ILR40 permittees within whose reporting jurisdiction this project is located:

IDOT and the Village of Barrington

M. The following is a list of receiving water(s) and the ultimate receiving water(s) for this site. In addition, include receiving waters that are listed as Biologically Significant Streams by the Illinois Department of Natural Resources (IDNR). The location of the receiving waters can be found on the erosion and sediment control plans:

Flint Creek Tributary and ultimately to Flint Creek and then the Fox River

N. Describe areas of the site that are to be protected or remain undisturbed. These areas may include steep slopes (i.e., 1:3 or steeper), highly erodible soils, streams, stream buffers, specimen trees, natural vegetation, nature preserves, etc. Include any commitments or requirements to protect adjacent wetlands.

For any storm water discharges from construction activities within 50-feet of Waters of the U.S. (except for activities for water-dependent structures authorized by a Section 404 permit, describe: a) How a 50-foot undisturbed natural buffer will be provided between the construction activity and the Waters of the U.S. or b) How additional erosion and sediment controls will be provided within that area.

O. Per the Phase I document, the following sensitive environmental resources are associated with this project and may have the potential to be impacted by the proposed development. Further guidance on these resources is available in Section 41-4 of the BDE Manual.

- ☐ 303(d) Listed receiving waters for suspended solids, turbidity, or siltation.
The name(s) of the listed water body, and identification of all pollutants causing impairment:

Provide a description of how erosion and sediment control practices will prevent a discharge of sediment resulting from a storm event equal to or greater than a twenty-five (25) year, twenty-four (24) hour rainfall event:

Provide a description of the location(s) of direct discharge from the project site to the 303(d) water body:

Provide a description of the location(s) of any dewatering discharges to the MS4 and/or water body:

- ☐ Applicable Federal, Tribal, State, or Local Programs

- ☒ Floodplain

A FEMA mapped Zone AE floodplain for Flint Creek Tributary exists within the project limits. Due to relocation of the creek as part of the project, a letter of map revision will be obtained.

- ☐ Historic Preservation

- ☐ Receiving waters with Total Maximum Daily Load (TMDL) for sediment, total suspended solids, turbidity or siltation

TMDL (fill out this section if checked above)

The name(s) of the listed water body:

Provide a description of the erosion and sediment control strategy that will be incorporated into the site design that is consistent with the assumptions and requirements of the TMDL:

If a specific numeric waste load allocation has been established that would apply to the project's discharges, provide a description of the necessary steps to meet that allocation:

- ☐ Threatened and Endangered Species/Illinois Natural Areas (INAI)/Nature Preserves

- ☐ Other

☒ Wetland

P. The following pollutants of concern will be associated with this construction project:

- | | |
|--|---|
| <input checked="" type="checkbox"/> Antifreeze / Coolants | <input checked="" type="checkbox"/> Solid Waste Debris |
| <input checked="" type="checkbox"/> Concrete | <input type="checkbox"/> Solvents |
| <input checked="" type="checkbox"/> Concrete Curing Compounds | <input checked="" type="checkbox"/> Waste water from cleaning construction equipments |
| <input checked="" type="checkbox"/> Concrete Truck Waste | <input type="checkbox"/> Other (Specify) _____ |
| <input checked="" type="checkbox"/> Fertilizers / Pesticides | <input type="checkbox"/> Other (Specify) _____ |
| <input checked="" type="checkbox"/> Paints | <input type="checkbox"/> Other (Specify) _____ |
| <input checked="" type="checkbox"/> Petroleum (gas, diesel, oil, kerosene, hydraulic oil / fluids) | <input type="checkbox"/> Other (Specify) _____ |
| <input checked="" type="checkbox"/> Soil Sediment | <input type="checkbox"/> Other (Specify) _____ |

II. Controls:

This section of the plan addresses the controls that will be implemented for each of the major construction activities described in Section I.C above and for all use areas, borrow sites, and waste sites. For each measure discussed, the Contractor will be responsible for its implementation as indicated. The Contractor shall provide to the Resident Engineer a plan for the implementation of the measures indicated. The Contractor, and subcontractors, will notify the Resident Engineer of any proposed changes, maintenance, or modifications to keep construction activities compliant with the Permit ILR10. Each such Contractor has signed the required certification on forms which are attached to, and are a part of, this plan:

A. **Erosion and Sediment Controls:** At a minimum, controls must be coordinated, installed and maintained to:

1. Minimize the amount of soil exposed during construction activity;
2. Minimize the disturbance of steep slopes;
3. Maintain natural buffers around surface waters, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration, unless infeasible;
4. Minimize soil compaction and, unless infeasible, preserve topsoil.

B. **Stabilization Practices:** Provided below is a description of interim and permanent stabilization practices, including site- specific scheduling of the implementation of the practices. Site plans will ensure that existing vegetation is preserved where attainable and disturbed portions of the site will be stabilized. Stabilization practices may include but are not limited to: temporary seeding, permanent seeding, mulching, geotextiles, sodding, vegetative buffer strips, protection of trees, preservation of mature vegetation, and other appropriate measures. Except as provided below in II.B.1 and II.B.2, stabilization measures shall be initiated **immediately** where construction activities have temporarily or permanently ceased, but in no case more than **one (1) day** after the construction activity in that portion of the site has temporarily or permanently ceases on all disturbed portions of the site where construction will not occur for a period of fourteen (14) or more calendar days.

1. Where the initiation of stabilization measures is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.
2. On areas where construction activity has temporarily ceased and will resume after fourteen (14) days, a temporary stabilization method can be used.

The following stabilization practices will be used for this project:

- | | |
|--|--|
| <input checked="" type="checkbox"/> Erosion Control Blanket / Mulching | <input type="checkbox"/> Temporary Turf (Seeding, Class 7) |
| <input type="checkbox"/> Geotextiles | <input type="checkbox"/> Temporary Mulching |
| <input checked="" type="checkbox"/> Permanent Seeding | <input type="checkbox"/> Vegetated Buffer Strips |
| <input checked="" type="checkbox"/> Preservation of Mature Seeding | <input type="checkbox"/> Other (Specify) _____ |
| <input checked="" type="checkbox"/> Protection of Trees | <input type="checkbox"/> Other (Specify) _____ |
| <input checked="" type="checkbox"/> Sodding | <input type="checkbox"/> Other (Specify) _____ |
| <input checked="" type="checkbox"/> Temporary Erosion Control Seeding | <input type="checkbox"/> Other (Specify) _____ |

Describe how the stabilization practices listed above will be utilized during construction:

Mature vegetation will be preserved by perimeter erosion barrier, which will act not only as an erosion control

measure to contain sediment, but also as a limits of construction barrier to preserve and protect all vegetation outside the construction area.

Temporary seeding will be applied to all bare soil areas every seven days to minimize the amount of exposed surface area.

Mulch will be used when temporary seeding is applied to prevent erosion until seeding is established.

Describe how the stabilization practices listed above will be utilized after construction activities have been completed:

Permanent seeding & sodding will be placed according to landscaping plans at the end of each major stage of construction to permanently stabilize the disturbed areas.

C. Structural Practices: Provided below is a description of structural practices that will be implemented, to the degree attainable, to divert flows from exposed soils, store flows or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Such practices may include but are not limited to: perimeter erosion barrier, earth dikes, drainage swales, sediment traps, ditch checks, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and temporary or permanent sediment basins. The installation of these devices may be subject to Section 404 of the Clean Water Act.

- | | |
|--|--|
| <input type="checkbox"/> Aggregate Ditch | <input checked="" type="checkbox"/> Stabilized Construction Exits |
| <input type="checkbox"/> Concrete Revetment Mats | <input type="checkbox"/> Stabilized Trench Flow |
| <input type="checkbox"/> Dust Suppression | <input type="checkbox"/> Slope Mattress |
| <input type="checkbox"/> Dewatering Filtering | <input type="checkbox"/> Slope Walls |
| <input type="checkbox"/> Gabions | <input checked="" type="checkbox"/> Temporary Ditch Check |
| <input checked="" type="checkbox"/> In-Stream or Wetland Work | <input type="checkbox"/> Temporary Pipe Slope Drain |
| <input type="checkbox"/> Level Spreaders | <input checked="" type="checkbox"/> Temporary Sediment Basin |
| <input type="checkbox"/> Paved Ditch | <input type="checkbox"/> Temporary Stream Crossing |
| <input type="checkbox"/> Permanent Check Dams | <input type="checkbox"/> Turf Reinforcement Mats |
| <input checked="" type="checkbox"/> Perimeter Erosion Barrier | <input checked="" type="checkbox"/> Other (Specify) Streambank revetment |
| <input type="checkbox"/> Permanent Sediment Basin | <input type="checkbox"/> Other (Specify) |
| <input checked="" type="checkbox"/> Retaining Walls | <input type="checkbox"/> Other (Specify) |
| <input type="checkbox"/> Riprap | <input type="checkbox"/> Other (Specify) |
| <input checked="" type="checkbox"/> Rock Outlet Protection | <input type="checkbox"/> Other (Specify) |
| <input checked="" type="checkbox"/> Sediment Trap | <input type="checkbox"/> Other (Specify) |
| <input checked="" type="checkbox"/> Storm Drain Inlet Protection | <input type="checkbox"/> Other (Specify) |

Describe how the structural practices listed above will be utilized during construction:

Perimeter erosion barrier will be used to prevent uncontrolled sheet flow from discharging off the job site. The barrier will also serve as a construction limits barrier to limit the Contractor from disturbing any unnecessary areas.

Storm drain inlet protection will be used in all catchment structures to prevent silt and sediment from entering the drainage system.

Temporary ditch checks will be placed at multiple points along the temporary creek to reduce flow velocities, prevent erosion, and trap some sediment.

Temporary sediment basins will be placed just upstream of the culvert entrances to trap and store sediment before it enters and collects in the box culverts.

Describe how the structural practices listed above will be utilized after construction activities have been completed:

Retaining walls will contain portions of the creek exposed to sharp changes in flow direction or close to

development to eliminate side slope erosion.

Rock outlet protection will consist of riprap down the side slopes of the creek at storm sewer discharge points to prevent erosion.

D. Treatment Chemicals

Will polymer flocculants or treatment chemicals be utilized on this project: ☐ Yes ☒ No

If yes above, identify where and how polymer flocculants or treatment chemicals will be utilized on this project.

E. Permanent (i.e., Post-Construction) Storm Water Management Controls: Provided below is a description of measures that will be installed during the construction process to control volume and pollutants in storm water discharges that will occur after construction operations have been completed. The installation of these devices may be subject to Section 404 of the Clean Water Act.

1. Such practices may include but are not limited to: storm water detention structures (including wet ponds), storm water retention structures, flow attenuation by use of open vegetated swales and natural depressions, infiltration of runoff on site, and sequential systems (which combine several practices).

The practices selected for implementation were determined based on the technical guidance in Chapter 41 (Construction Site Storm Water Pollution Control) of the IDOT BDE Manual. If practices other than those discussed in Chapter 41 are selected for implementation or if practices are applied to situations different from those covered in Chapter 41, the technical basis for such decisions will be explained below.

2. Velocity dissipation devices will be placed at discharge locations and along the length of any outfall channel as necessary to provide a non-erosive velocity flow from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., maintenance of hydrologic conditions such as the hydroperiod and hydrodynamics present prior to the initiation of construction activities).

Description of permanent storm water management controls:

A detention basin with a restricted outlet will be constructed to compensate for existing detention filled by construction

Discharge from the pump station will flow through a vegetated ditch before flowing into the creek.

Streambank revetment will be utilized on the outside banks of the proposed creek at bends to prevent erosion.

F. Approved State or Local Laws: The management practices, controls and provisions contained in this plan will be in accordance with IDOT specifications, which are at least as protective as the requirements contained in the IEPA's Illinois Urban Manual. Procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials shall be described or incorporated by reference in the space provided below. Requirements specified in sediment and erosion site plans, site permits, storm water management site plans or site permits approved by local officials that are applicable to protecting surface water resources are, upon submittal of an NOI, to be authorized to discharge under the Permit ILR10 incorporated by reference and are enforceable under this permit even if they are not specifically included in the plan.

Description of procedures and requirements specified in applicable sediment and erosion site plans or storm water management plans approved by local officials:

G. Contractor Required Submittals: Prior to conducting any professional services at the site covered by this plan, the Contractor and each subcontractor responsible for compliance with the permit shall submit to the Resident Engineer a Contractor Certification Statement, BDE 2342A.

1. The Contractor shall provide a construction schedule containing an adequate level of detail to show major activities with implementation of pollution prevention BMPs, including the following items:

- Approximate duration of the project, including each stage of the project
- Rainy season, dry season, and winter shutdown dates
- Temporary stabilization measures to be employed by contract phases
- Mobilization time-frame
- Mass clearing and grubbing/roadside clearing dates

- Deployment of Erosion Control Practices
 - Deployment of Sediment Control Practices (including stabilized cons
-
- Deployment of Construction Site Management Practices (including concrete washout facilities, chemical storage, refueling locations, etc.)
 - Paving, saw-cutting, and any other pavement related operations
 - Major planned stockpiling operation
 - Time frame for other significant long-term operations or activities that may plan non-storm water discharges as dewatering, grinding, etc
 - Permanent stabilization activities for each area of the project
2. During the pre-construction meeting, the Contractor and each subcontractor shall provide, as an attachment to their signed Contractor Certification Statement, a discussion of how they will comply with the requirements of the permit in regard to the following items and provide a graphical representation showing location and type of BMPs to be used when applicable:
- Temporary Ditch Checks - Identify what type and the source of Temporary Ditch Checks that will be installed as part of the project. The installation details will then be included with the SWPPP.
 - Vehicle Entrances and Exits - Identify type and location of stabilized construction entrances and exits to be used and how they will be maintained.
 - Material Delivery, Storage and Use - Discuss where and how materials including chemicals, concrete curing compounds, petroleum products, etc. will be stored for this project.
 - Stockpile Management - Identify the location of both on-site and off-site stockpiles. Discuss what BMPs will be used to prevent pollution of storm water from stockpiles.
 - Waste Disposal - Discuss methods of waste disposal that will be used for this project.
 - Spill Prevention and Control - Discuss steps that will be taken in the event of a material spill (chemicals, concrete curing compounds, petroleum, etc.)
 - Concrete Residuals and Washout Wastes - Discuss the location and type of concrete washout facilities to be used on this project and how they will be signed and maintained.
 - Litter Management - Discuss how litter will be maintained for this project (education of employees, number of dumpsters, frequency of dumpster pick-up, etc.).
 - Vehicle and Equipment Fueling - Identify equipment fueling locations for this project and what BMPs will be used to ensure containment and spill prevention.
 - Vehicle and Equipment Cleaning and Maintenance - Identify where equipment cleaning and maintenance locations for this project and what BMPs will be used to ensure containment and spill prevention.
 - Dewatering Activities - Identify the controls which will be used during dewatering operations to ensure sediments will not leave the construction site.
 - Polymer Flocculants and Treatment Chemicals - Identify the use and dosage of treatment chemicals and provide the Resident Engineer with Material Safety Data Sheets. Describe procedures on how the chemicals will be used and identify who will be responsible for the use and application of these chemicals. The selected individual must be trained on the established procedures.
 - Additional measures indicated in the plan.

III. Maintenance:

When requested by the Contractor, the Resident Engineer will provide general maintenance guides (e.g., IDOT Erosion and Sediment Control Field Guide) to the Contractor for the practices associated with this project. Describe how all items will be checked for structural integrity, sediment accumulation and functionality. Any damage or undermining shall be repaired immediately. Provide specifics on how repairs will be made. The following additional procedures will be used to maintain, in good and effective operating conditions, the vegetation, erosion and sediment control measures and other protective measures identified in this plan. It will be the Contractor's responsibility to attain maintenance guidelines for any manufactured BMPs which are to be installed and maintained per manufacture's specifications.

IV. Inspections:

Qualified personnel shall inspect disturbed areas of the construction site including Borrow, Waste, and Use Areas, which have not yet been finally stabilized, structural control measures, and locations where vehicles and equipment enter and exit the site using IDOT Storm Water Pollution Prevention Plan Erosion Control Inspection Report, BC 2259. Such inspections shall be conducted at least once every seven (7) calendar days and within twenty-four (24) hours of the end of a storm or by the end of the following business or work day that is 0.5 inch or greater or equivalent snowfall.

Inspections may be reduced to once per month when construction activities have ceased due to frozen conditions. Weekly inspections will recommence when construction activities are conducted, or if there is 0.5" or greater rain event, or a discharge due to snowmelt occurs.

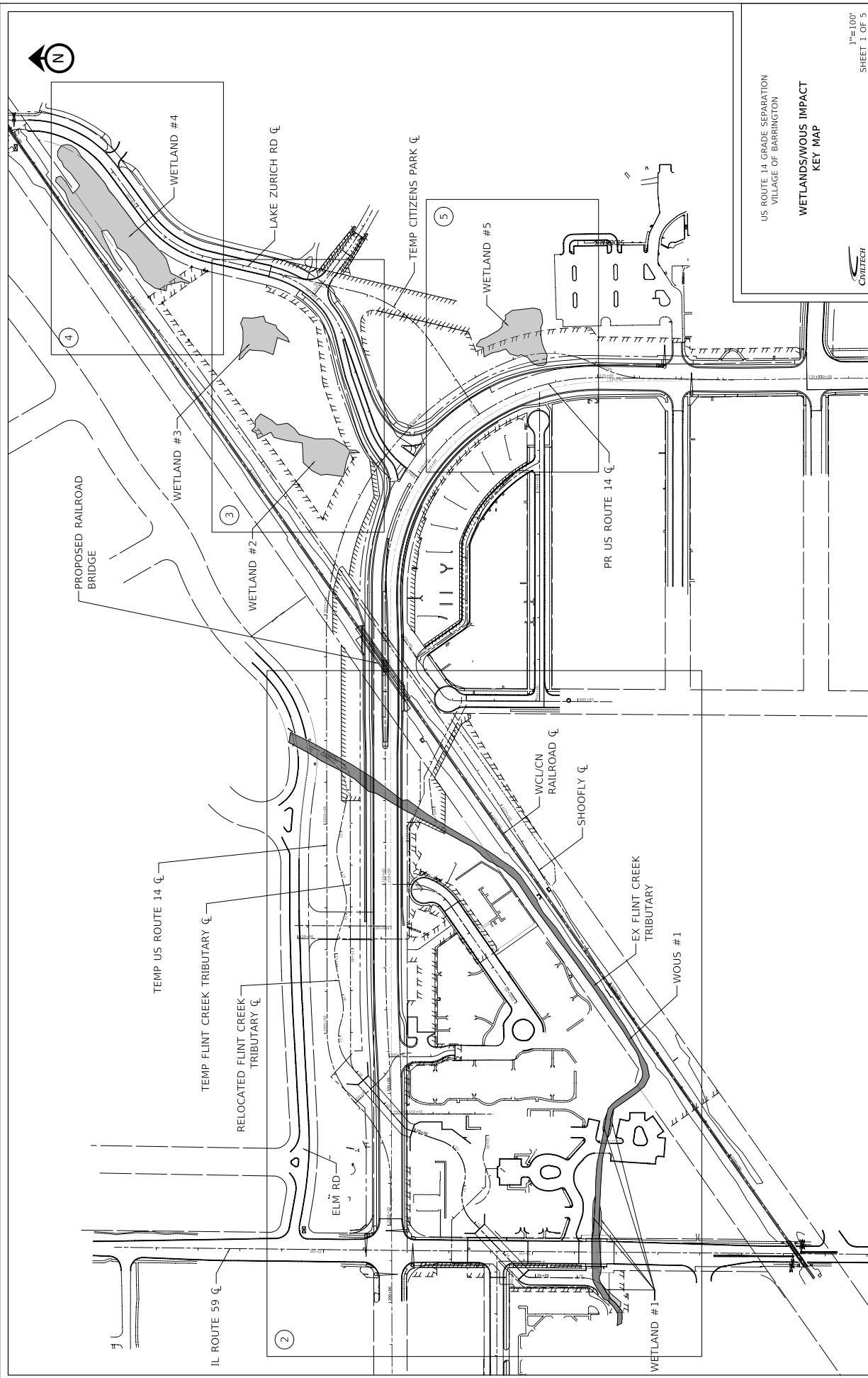
If any violation of the provisions of this plan is identified during the conduct of the construction work covered by this plan, the Resident Engineer shall notify the appropriate IEPA Field Operations Section office by email at: epa.swnoncomp@illinois.gov, telephone or fax within twenty-four (24) hours of the incident. The Resident Engineer shall then complete and submit an "Incidence of Non-Compliance" (ION) report for the identified violation within five (5) days of the incident. The Resident Engineer shall use forms provided by IEPA and shall include specific information on the cause of noncompliance, actions which were taken to prevent any further causes of noncompliance, and a statement detailing any environmental impact which may have resulted from the noncompliance. All reports of non-compliance shall be signed by a responsible authority in accordance with Part VI. G of the Permit ILR10.

The Incidence of Non-Compliance shall be mailed to the following address:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Attn: Compliance Assurance Section
1021 North Grand East
Post Office Box 19276
Springfield, Illinois 62794-9276

V. Failure to Comply:

Failure to comply with any provisions of this Storm Water Pollution Prevention Plan will result in the implementation of a National Pollutant Discharge Elimination System/Erosion and Sediment Control Deficiency Deduction against the Contractor and/or penalties under the Permit ILR10 which could be passed on to the Contractor.

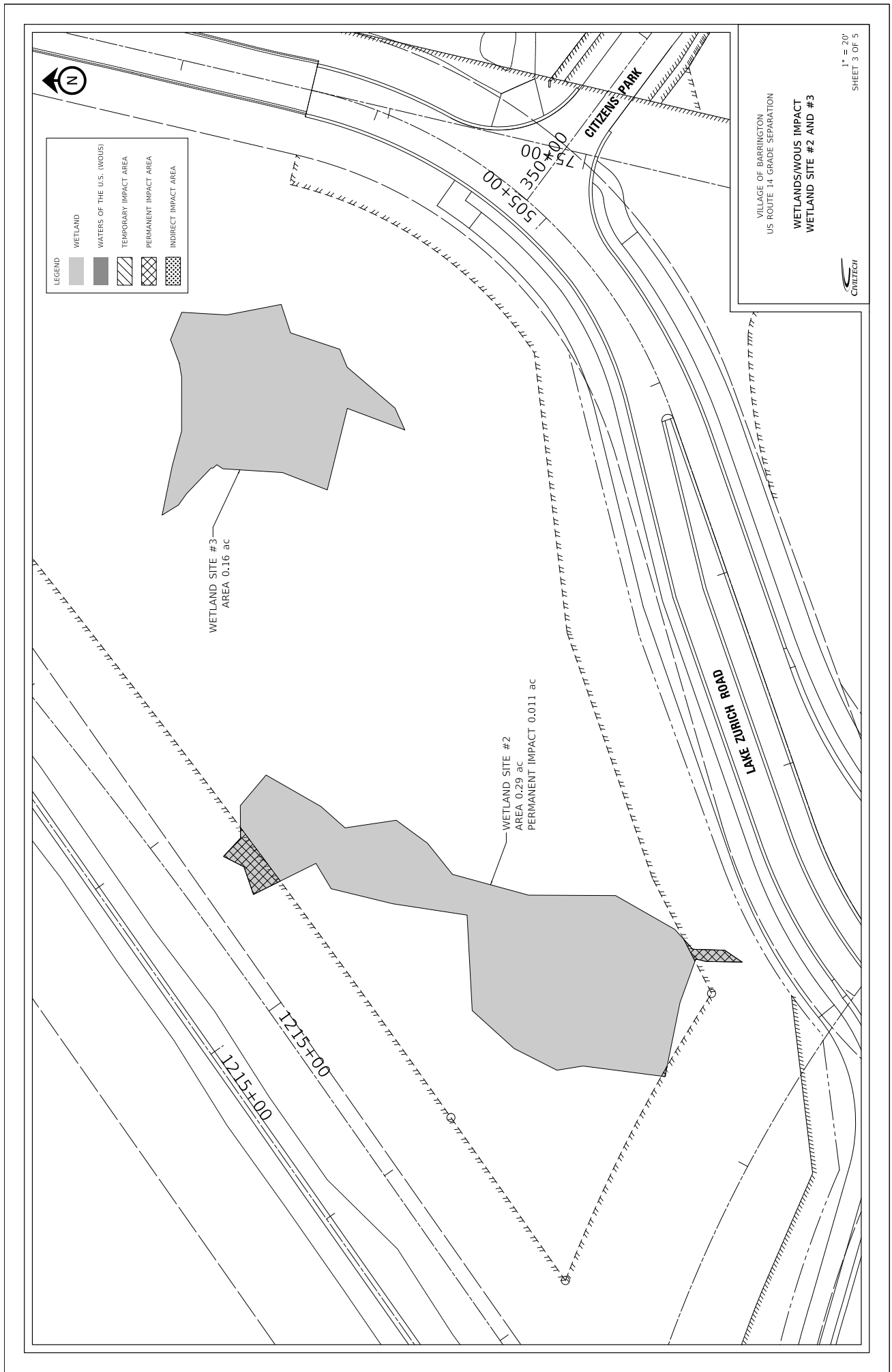


US ROUTE 14 GRADE SEPARATION
VILLAGE OF BARRINGTON

WETLANDS/WOUs IMPACT
KEY MAP

1"=100'
SHEET 1 OF 5



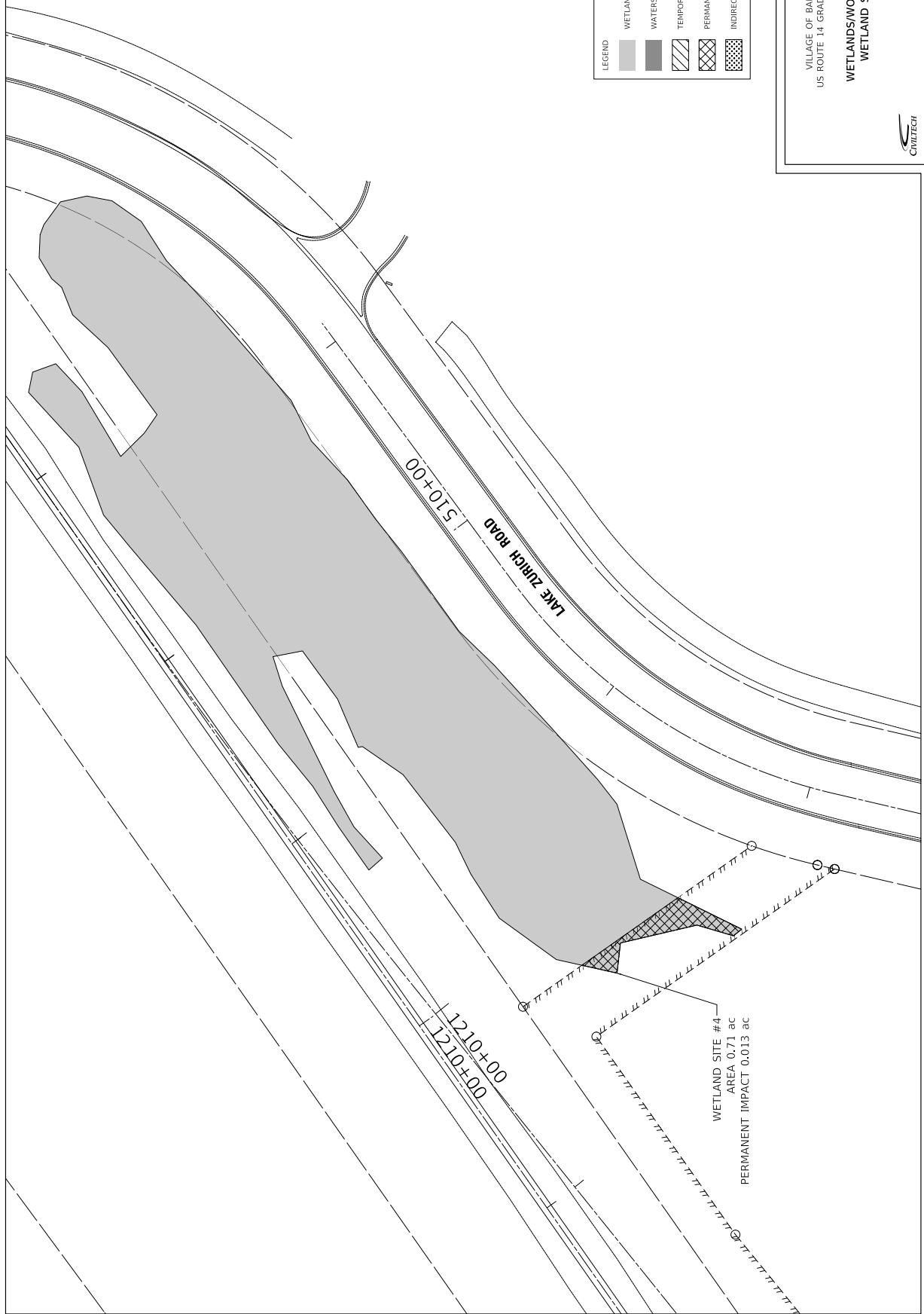




LEGEND	
WETLAND	
WATERS OF THE U.S. (WOUIS)	
TEMPORARY IMPACT AREA	
PERMANENT IMPACT AREA	
INDIRECT IMPACT AREA	

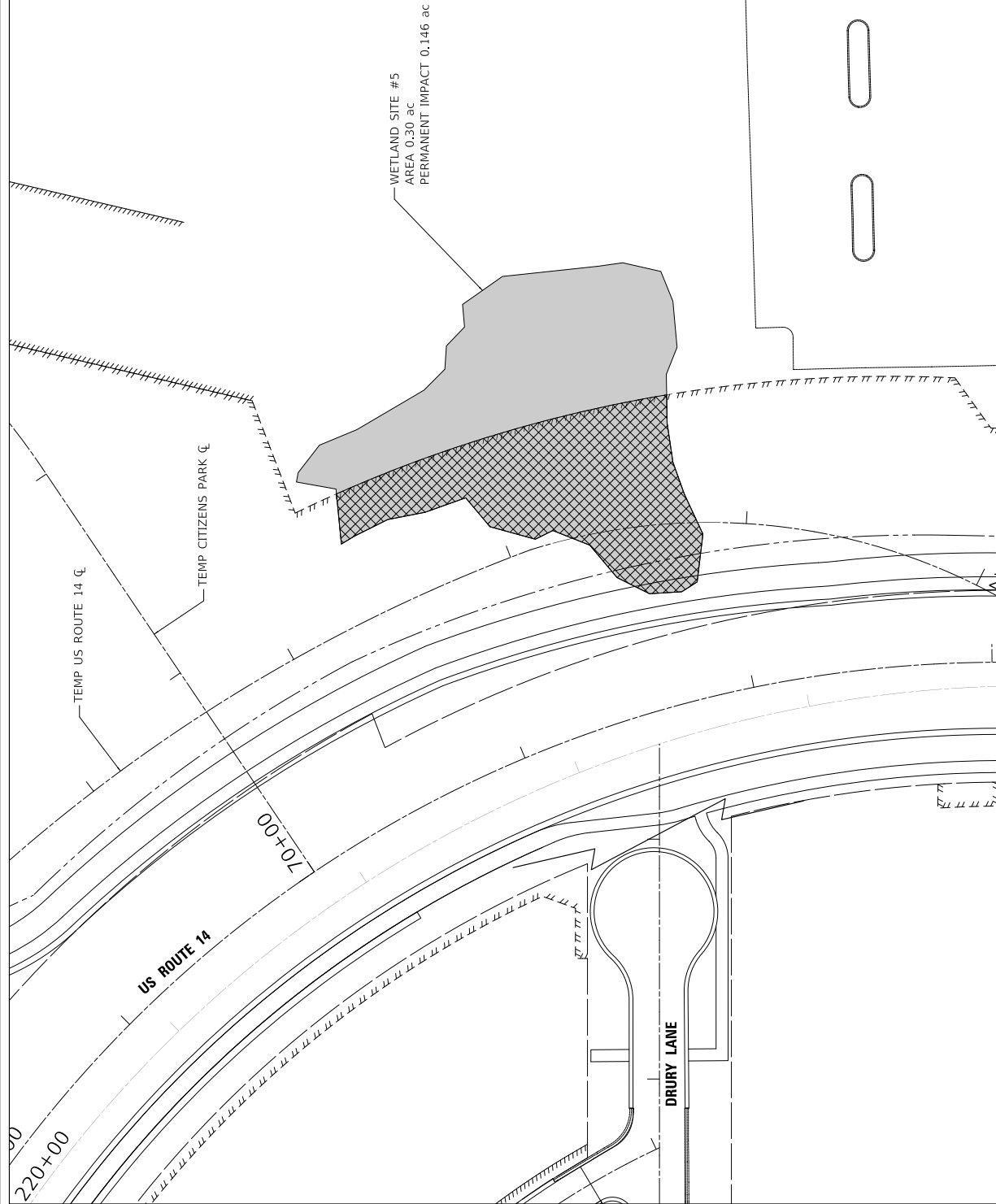
VILLAGE OF BARRINGTON
US ROUTE 14 GRADE SEPARATION
WETLANDS/WOUS IMPACT
WETLAND SITE #4

1" = 20'
SHEET 4 OF 5





LEGEND	
	WETLAND
	WATERS OF THE U.S. (WOUS)
	TEMPORARY IMPACT AREA
	PERMANENT IMPACT AREA
	INDIRECT IMPACT AREA



WETLAND SITE #5
AREA 0.30 ac
PERMANENT IMPACT 0.146 ac

VILLAGE OF BARRINGTON
US ROUTE 14 GRADE SEPARATION
WETLANDS/WOUS IMPACT
WETLAND SITE #5

1" = 20'
SHEET 5 OF 5





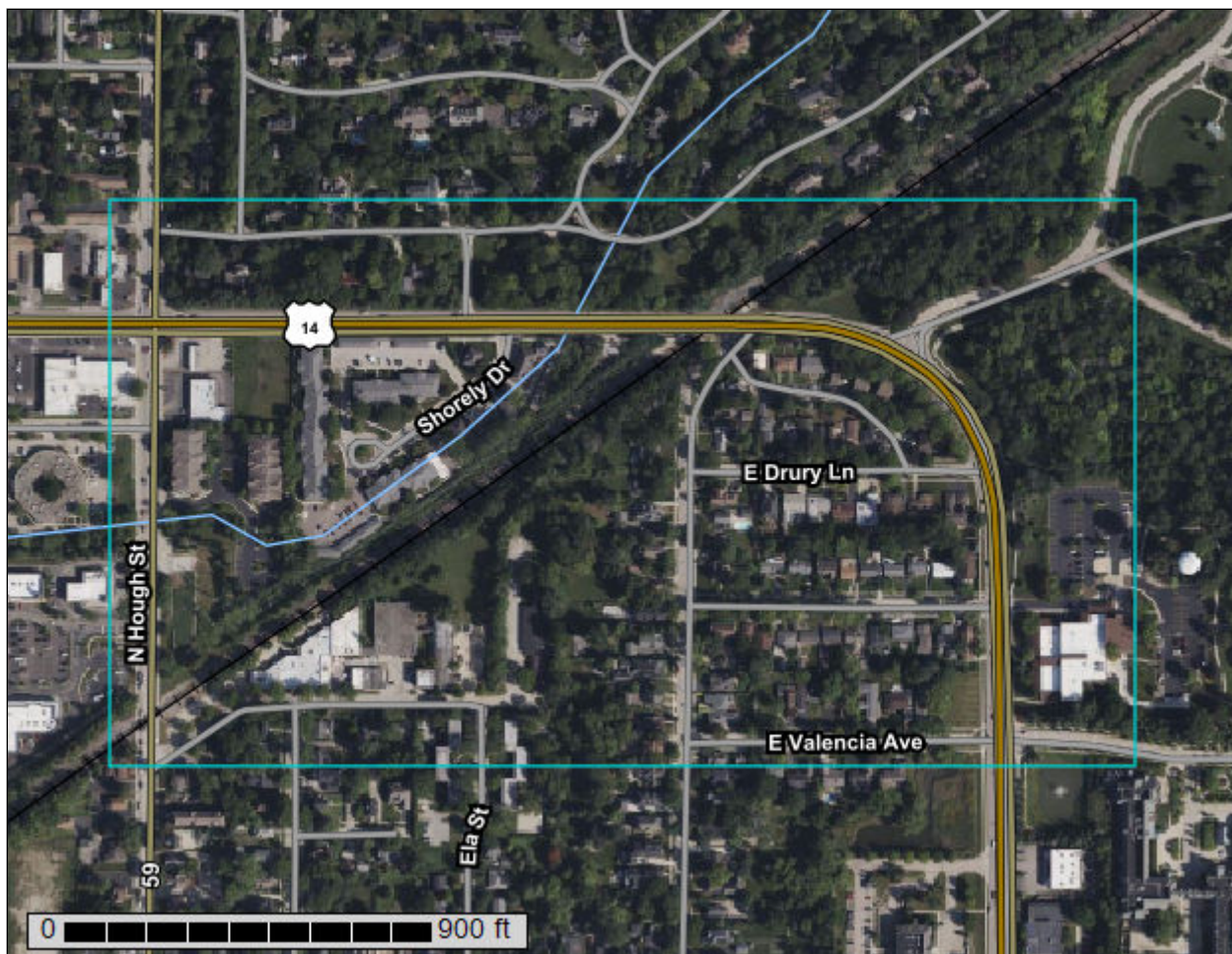
United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Lake County, Illinois**



September 21, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
232A	Ashkum silty clay loam, 0 to 2 percent slopes	32.7	40.8%
298A	Beecher silt loam, 0 to 2 percent slopes	35.2	43.9%
298B	Beecher silt loam, 2 to 4 percent slopes	8.5	10.6%
330A	Peotone silty clay loam, 0 to 2 percent slopes	0.0	0.0%
531B	Markham silt loam, 2 to 4 percent slopes	2.3	2.9%
531C2	Markham silt loam, 4 to 6 percent slopes, eroded	1.5	1.9%
Totals for Area of Interest		80.2	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Lake County, Illinois

232A—Ashkum silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2ssrw
Elevation: 520 to 930 feet
Mean annual precipitation: 33 to 41 inches
Mean annual air temperature: 46 to 54 degrees F
Frost-free period: 160 to 190 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Ashkum, drained, and similar soils: 92 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ashkum, Drained

Setting

Landform: End moraines, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Clayey colluvium over till

Typical profile

Ap - 0 to 12 inches: silty clay loam
Bg1 - 12 to 29 inches: silty clay
2Bg2 - 29 to 54 inches: silty clay loam
2Cg - 54 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 25 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: R110XY024IL - Ponded Depressional Sedge Meadow
Hydric soil rating: Yes

Minor Components

Peotone, drained

Percent of map unit: 5 percent

Landform: Depressions on ground moraines

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip

Down-slope shape: Concave

Across-slope shape: Concave

Ecological site: R110XY024IL - Ponded Depressional Sedge Meadow

Hydric soil rating: Yes

Orthents, clayey

Percent of map unit: 2 percent

Landform: Ground moraines, lake plains

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: F095XB010WI - Loamy and Clayey Upland

Hydric soil rating: No

Urban land

Percent of map unit: 1 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

298A—Beecher silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2ytq0

Elevation: 520 to 900 feet

Mean annual precipitation: 34 to 41 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 160 to 180 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Beecher and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beecher

Setting

Landform: End moraines, ground moraines

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Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Loess over silty clay loam or clay loam till

Typical profile

Ap - 0 to 13 inches: silt loam

2Bt1 - 13 to 21 inches: silty clay loam

2Bt2 - 21 to 37 inches: silty clay loam

2Cd - 37 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: 24 to 45 inches to densic material

Drainage class: Somewhat poorly drained

Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 6 to 24 inches

Frequency of flooding: None

Frequency of ponding: None

Calcium carbonate, maximum content: 35 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: D

Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland

Hydric soil rating: No

Minor Components

Ashkum, drained

Percent of map unit: 6 percent

Landform: Ground moraines, end moraines

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Linear

Across-slope shape: Concave

Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland

Hydric soil rating: Yes

Urban land

Percent of map unit: 2 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Orthents, clayey

Percent of map unit: 2 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F095XB010WI - Loamy and Clayey Upland
Hydric soil rating: No

298B—Beecher silt loam, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2ytq1
Elevation: 520 to 960 feet
Mean annual precipitation: 34 to 41 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 160 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Beecher and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Beecher

Setting

Landform: End moraines, ground moraines
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over silty clay loam or clay loam till

Typical profile

Ap - 0 to 13 inches: silt loam
2Bt1 - 13 to 21 inches: silty clay loam
2Bt2 - 21 to 37 inches: silty clay loam
2Cd - 37 to 60 inches: silty clay loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: 24 to 45 inches to densic material
Drainage class: Somewhat poorly drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 35 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

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Available water supply, 0 to 60 inches: Low (about 5.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e

Hydrologic Soil Group: D

Ecological site: F095XB005WI - Moist Loamy or Clayey Lowland

Hydric soil rating: No

Minor Components

Ashkum, drained

Percent of map unit: 6 percent

Landform: Ground moraines, end moraines

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Linear

Across-slope shape: Concave

Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland

Hydric soil rating: Yes

Urban land

Percent of map unit: 2 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Orthents, clayey

Percent of map unit: 2 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Interfluve

Down-slope shape: Convex

Across-slope shape: Convex

Ecological site: F095XB010WI - Loamy and Clayey Upland

Hydric soil rating: No

330A—Peotone silty clay loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2sn05

Elevation: 500 to 1,020 feet

Mean annual precipitation: 33 to 43 inches

Mean annual air temperature: 46 to 55 degrees F

Frost-free period: 140 to 195 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Peotone, drained, and similar soils: 95 percent

Minor components: 5 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Peotone, Drained

Setting

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip

Down-slope shape: Concave

Across-slope shape: Concave

Parent material: Silty and clayey colluvium

Typical profile

Ap - 0 to 7 inches: silty clay loam

Bg1 - 7 to 27 inches: silty clay loam

Bg2 - 27 to 50 inches: silty clay

Cg - 50 to 60 inches: silty clay loam

Properties and qualities

Slope: 0 to 2 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Very poorly drained

Runoff class: Negligible

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)

Depth to water table: About 0 to 12 inches

Frequency of flooding: None

Frequency of ponding: Frequent

Calcium carbonate, maximum content: 20 percent

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 3w

Hydrologic Soil Group: C/D

Ecological site: R110XY024IL - Ponded Depressional Sedge Meadow

Hydric soil rating: Yes

Minor Components

Peotone, long duration ponding

Percent of map unit: 5 percent

Landform: Depressions

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip

Down-slope shape: Concave

Across-slope shape: Concave

Ecological site: F095XB004WI - Wet Loamy or Clayey Lowland

Hydric soil rating: Yes

531B—Markham silt loam, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2ytpr
Elevation: 540 to 900 feet
Mean annual precipitation: 34 to 41 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 160 to 180 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Markham and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Markham

Setting

Landform: End moraines, ground moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess over silty clay loam till

Typical profile

Ap - 0 to 8 inches: silt loam
2Bt1 - 8 to 21 inches: silty clay loam
2Bt2 - 21 to 32 inches: silty clay loam
2Cd - 32 to 60 inches: silty clay loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: 20 to 55 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R110XY010IL - Moist Glacial Drift Upland Savanna

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Hydric soil rating: No

Minor Components

Ashkum, drained

Percent of map unit: 6 percent

Landform: End moraines, ground moraines

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Linear

Across-slope shape: Concave

Ecological site: R110XY024IL - Ponded Depressional Sedge Meadow

Hydric soil rating: Yes

Urban land

Percent of map unit: 2 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Interfluve

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

Orthents, clayey

Percent of map unit: 2 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Interfluve

Down-slope shape: Convex

Across-slope shape: Convex

Ecological site: F095XB010WI - Loamy and Clayey Upland

Hydric soil rating: No

531C2—Markham silt loam, 4 to 6 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2ytps

Elevation: 620 to 920 feet

Mean annual precipitation: 34 to 41 inches

Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 160 to 180 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Markham, eroded, and similar soils: 90 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Markham, Eroded

Setting

Landform: End moraines, ground moraines
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Loess over silty clay loam till

Typical profile

Ap - 0 to 8 inches: silt loam
2Bt1 - 8 to 21 inches: silty clay loam
2Bt2 - 21 to 32 inches: silty clay loam
2Cd - 32 to 60 inches: silty clay loam

Properties and qualities

Slope: 4 to 6 percent
Depth to restrictive feature: 20 to 55 inches to densic material
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 24 to 42 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 30 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R110XY010IL - Moist Glacial Drift Upland Savanna
Hydric soil rating: No

Minor Components

Ashkum, drained

Percent of map unit: 6 percent
Landform: End moraines, ground moraines
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R110XY024IL - Ponded Depressional Sedge Meadow
Hydric soil rating: Yes

Urban land

Percent of map unit: 2 percent
Landform: Ground moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

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Hydric soil rating: No

Orthents, clayey

Percent of map unit: 2 percent

Landform: Ground moraines

Landform position (two-dimensional): Summit, backslope

Landform position (three-dimensional): Interfluve

Down-slope shape: Convex

Across-slope shape: Convex

Ecological site: F095XB010WI - Loamy and Clayey Upland

Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Erosion Factors

Soil Erosion Factors are soil properties and interpretations used in evaluating the soil for potential erosion. Example soil erosion factors can include K factor for the whole soil or on a rock free basis, T factor, wind erodibility group and wind erodibility index.

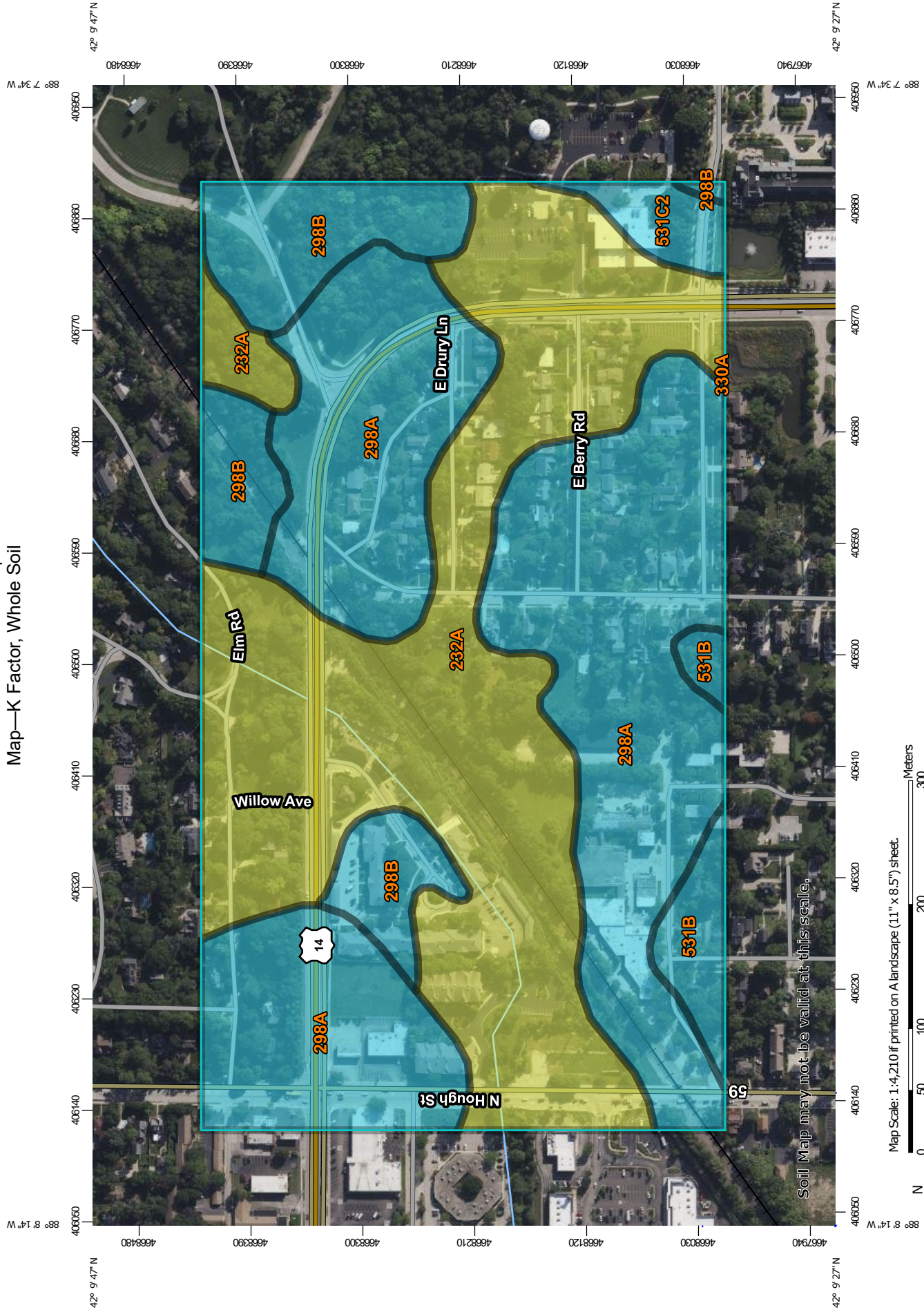
K Factor, Whole Soil

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Factor K does not apply to organic horizons and is not reported for those layers.

Custom Soil Resource Report Map—K Factor, Whole Soil



Table—K Factor, Whole Soil

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
232A	Ashkum silty clay loam, 0 to 2 percent slopes	.20	32.7	40.8%
298A	Beecher silt loam, 0 to 2 percent slopes	.37	35.2	43.9%
298B	Beecher silt loam, 2 to 4 percent slopes	.37	8.5	10.6%
330A	Peotone silty clay loam, 0 to 2 percent slopes	.24	0.0	0.0%
531B	Markham silt loam, 2 to 4 percent slopes	.37	2.3	2.9%
531C2	Markham silt loam, 4 to 6 percent slopes, eroded	.37	1.5	1.9%
Totals for Area of Interest			80.2	100.0%

Rating Options—K Factor, Whole Soil*Aggregation Method:* Dominant Condition*Component Percent Cutoff:* None Specified*Tie-break Rule:* Higher*Layer Options (Horizon Aggregation Method):* Surface Layer (Not applicable)

References

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- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

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Illinois
Department of
**Natural
Resources**

JB Pritzker, Governor • Natalie Phelps Finnie, Director
One Natural Resources Way • Springfield, Illinois 62702-1271
www.dnr.illinois.gov

Office of Water Resources • 2050 West Stearns Road • Bartlett, Illinois 60103

July 5, 2023

SUBJECT: Permit No. NE2023041
Chanel Relocation for US Route 14 Grade Separation Project
Flint Creek Tributary
Village of Barrington, Application No. N20210045

Marie Hansen
Village of Barrington
200 S. Hough Street
Barrington, Illinois 60010

Dear Ms. Hansen:

Enclosed is Illinois Department of Natural Resources, Office of Water Resources Permit No. NE2023041 authorizing the subject project. This permit does not supersede any other federal, state, or local authorizations that may be required for the project.

Please be advised that the Illinois Department of Natural Resources, Office of Realty & Capital Planning (ORCP) participates in the regulatory programs of the U.S. Army, Corps of Engineers (USACE) and may review this project if a USACE Section 10 or 404 permit is required. Issuance of a permit by the Office of Water Resources does not preclude ORCP's provision of comments and/or recommendations, primarily related to biological effects of the action, to the USACE and other federal agencies concerning your project

If any changes of the permitted work are found necessary, revised plans should be submitted promptly to this office for review and approval. Also, this permit expires on the date indicated in Condition (13). If you are unable to complete the work by that date, you must make a written request for a time extension.

Please contact Mark Hoskins at (847) 608-3116 if you have any questions.

Sincerely,

William T. Boyd, P.E.
Chief, Northeastern Illinois Regulatory Programs Section

WTB: MH: EW
Enclosure

cc: Chicago District, U.S. Army Corps of Engineers
Brian Frank, Lake County SMC
Joseph Abramson, CivilTech Engineering



PERMIT NO. NE2023041

DATE: July 5, 2023

State of Illinois
Department of Natural Resources, Office of Water Resources

Permission is hereby granted to:

**Village of Barrington
200 S. Hough Street
Barrington, Illinois 60010**

to relocate 1,670 feet of channel and to construct two roadway crossings as part of the grade separation of U.S. Route 14 and Canadian National Railroad project in the floodway of Flint Creek Tributary in the South Half of Section 36, Township 43 North, Range 9 East of the Third Principal Meridian in Lake County,

in accordance with an application dated March 16, 2021, and the plans and specifications entitled:

STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION, PLANS FOR PROPOSED FEDERAL AID HIGHWAY, F.A.P. ROUTE 0305 US 14 (NORTHWEST HIGHWAY), IL 59 (HOUGH STREET) TO VALENCIA AVENUE, ROADWAY RECONSTRUCTION AND GRADE SEPARATION, VOLUME 1 OF 2, COVER SHEET, AND SHEETS 31 TO 34 OF 457, SHEETS 36 TO 38 OF 457, SHEET 43 OF 457, SHEETS 45 TO 50 OF 457, US ROUTE 14, GRADING PLAN, SHEETS 168 TO 170 OF 457, GENERAL PLAN & LONGITUDINAL SECTION, US ROUTE 14 OVER RELOCATED FLINT CREEK, SHEET 1 OF 2, GENERAL PLAN & LONGITUDINAL SECTION, IL ROUTE 59 OVER RELOCATED FLINT CREEK SHEET 1 OF 3, TEMPORARY AND PROPOSED CROSS SECTIONS, SHEETS 315 TO 457 OF 457, ALL DATED MARCH 10, 2023, ALL RECEIVED MARCH 23, 2023.

Examined and Recommended:

William T. Boyd

**William T. Boyd, Chief
Northeastern IL Regulatory
Programs Section**

Approval Recommended:

Loren Wobig

**Loren Wobig, Director
Office of Water Resources**

Approved:

Natalie Finnie
**Natalie Finnie, Acting Director
Department of Natural Resources**

This PERMIT is subject to the terms and special conditions contained herein.

THIS PERMIT IS SUBJECT TO THE FOLLOWING CONDITIONS:

- 1) This permit is granted in accordance with the Rivers, Lakes, and Streams Act "615 ILCS 5."
- 2) This permit does not convey title to the permittee or recognize title of the permittee to any submerged or other lands, and furthermore, does not convey, lease or provide any right or rights of occupancy or use of the public or private property on which the activity or any part thereof will be located, or otherwise grant to the permittee any right or interest in or to the property, whether the property is owned or possessed by the State of Illinois or by any private or public party or parties.
- 3) This permit does not release the permittee from liability for damage to persons or property resulting from the work covered by this permit; and does not authorize any injury to private property or invasion of private rights.
- 4) This permit does not relieve the permittee of the responsibility to obtain other federal, state, or local authorizations required for the construction of the permitted activity; and if the permittee is required by law to obtain approvals from any federal or state agency to do the work, this permit is not effective until the federal and state approvals are obtained. If construction does not begin within two years of the date of this permit, the permittee must submit the project to EcoCat (<http://dnr.illinois.gov/EcoPublic/>) for an updated consultation under the Illinois Endangered Species Protection Act and the Illinois Natural Areas Preservation Act.
- 5) The permittee shall, at the permittee's own expense, remove all temporary piling, cofferdams, false work, and material incidental to the construction of the project. If the permittee fails to remove such structures or materials, the Department may have removal made at the expense of the permittee.
- 6) In public waters, if future need for public navigation or other public interest by the state or federal government necessitates changes in any part of the structure or structures, such changes shall be made by and at the expense of the permittee or the permittee's successors as required by the Department or other properly constituted agency, within sixty (60) days from receipt of written notice of the necessity from the Department or other agency, unless a longer period of time is specifically authorized.
- 7) The execution and details of the work authorized shall be subject to the review and approval of the Department. Department personnel shall have the right of access to accomplish this purpose.
- 8) Starting work on the activity authorized will be considered full acceptance by the permittee of the terms and conditions of the permit.
- 9) The Department in issuing this permit has relied upon the statements and representations made by the permittee; if any substantive statement or representation made by the permittee is found to be false, this permit will be revoked; and when revoked, all rights of the permittee under the permit are voided.
- 10) In public waters, the permittee and the permittee's successors shall make no claim whatsoever to any interest in any accretions caused by the activity.
- 11) In issuing this permit, the Department does not ensure the adequacy of the design or structural strength of the structure or improvement.
- 12) Noncompliance with the conditions of this permit will be considered grounds for revocation.
- 13) If the construction activity permitted is not completed on or before December 31, 2026, this permit shall cease and be null and void.

THIS PERMIT IS SUBJECT TO THE FOLLOWING SPECIAL CONDITIONS:

- a) The Permittee must submit to the Federal Emergency Management Agency all analyses, drawings, documents, or other information needed to process a Letter of Map Revision prior to the start of construction of the work herein authorized.
- b) Upon completion of the permitted construction activity, the Permittee shall submit "as-built" plans to the Illinois Department of Natural Resources, Office of Water Resources Bartlett office for review and approval.



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397

JB PRITZKER, GOVERNOR

JOHN J. KIM, DIRECTOR

JAN 10 2024

U.S. Army Corps of Engineers
Chicago District, Regulatory Branch
231 South LaSalle, Suite 1500
Chicago, IL 60604

Subject: Clean Water Act Section 401 Water Quality Certification
RE: US Route 14 Grade Separation at the Canadian National Railway, Lake County
Illinois EPA Log No.: C-0163-22 / Federal Agency Permit No.: LRC-2012-468
Bureau of Water ID#: W0974080028

Sir or Madam:

The Illinois Environmental Protection Agency (Agency) received a request for water quality certification subject to Section 401 of the federal Clean Water Act from Village of Barrington (Proponent) on Sunday, June 18, 2023, concerning the subject project. This request was submitted pursuant to a Department of the Army, Corps of Engineers permit request subject to the provisions of Section 404 of the Clean Water Act (33 U.S.C. 1344). The proposed activity would result in permanent impacts of 0.011 Ac. of wetland and 0.241 Ac. of waterway as a result of placement of the roadway embankment and pavement for the grade separation project. As a consequence of this activity, delays in transportation and pedestrian traffic caused by trains on the CN Railway that block the current US 14 crossing would be reduced. Protection of existing uses will be assured by the Corps of Engineers approved mitigation plan for construction of replacement channel and riparian buffer for the 1,700 linear feet (LF) of Flint Creek tributary impacts and wetland mitigation bank credit purchases. This activity is described in the application material titled:

"Section 401 Water Quality Certification, Village of Barrington, US Route 14 Grade Separation Lake County, Illinois", dated June 16, 2023; "PLANS FOR PROPOSED, FEDERAL AID HIGHWAY, F.A.P. ROUTE 0305 US 14 (NORTHWEST HIGHWAY)", dated March 10, 2023; "Joint Application Form for Illinois", signed March 16, 2021, all received on June 18, 2023.

Based on our review of the application material and finalization of this Agency's public participation process, it is the judgment of this office that the proposed project may be completed without causing water pollution as defined in the Illinois Environmental Protection Act and will comply with applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act, provided the project is carefully planned, supervised and is performed in compliance with conditions specified in this water quality certification.

This Agency hereby issues certification under Section 401 of the Clean Water Act (PL 95-217), subject to the conditions identified below. This certification becomes effective when the Department of the Army, Corps of Engineers includes the following conditions no. 1 through no. 6 as conditions of the requested permit pursuant to Section 404 of PL-95-217. These conditions are directed at the effect on water quality of the construction procedures involved in the above described project and are not an approval of any discharge resulting from the completed facility, nor an approval of the design of the facility. These conditions do not supplant any permit responsibilities of the applicant toward the Agency.

2125 S. First Street, Champaign, IL 61820 (217) 278-5800
2009 Mall Street Collinsville, IL 62234 (618) 346-5120
9511 Harrison Street, Des Plaines, IL 60016 (847) 294-4000
595 S. State Street, Elgin, IL 60123 (847) 608-3131

2309 W. Main Street, Suite 116, Marion, IL 62959 (618) 993-7200
412 SW Washington Street, Suite D, Peoria, IL 61602 (309) 671-3022
4302 N. Main Street, Rockford, IL 61103 (815) 987-7760

Any modifications to the proposed activity that is not described in the application material or covered by conditions below and 1) would not meet all the conditions of this certification or 2) may cause a new or an additional pollutant loading to waters of the State of Illinois are not approved.

Water Quality Condition No. 1. General.

The Proponent shall provide adequate planning and supervision for construction methods, processes, and cleanup procedures necessary to prevent water pollution and control erosion. The discharge and associated activity shall not cause:

- a. violation of applicable water quality standards of the Illinois Pollution Control Board, Title 35, Subtitle C, Water Pollution Rules and Regulations;
- b. water pollution defined and prohibited by the Illinois Environmental Protection Act;
- c. interference with water use practices near public recreation areas or water supply intakes; or
- d. violation of applicable provisions of the Illinois Environmental Protection Act.

Water Quality Condition No. 2. Existing Uses Protection Plan.

The wetland mitigation plan to compensate for the permanent loss of 0.011 acres of wetlands and 1,700 linear feet of tributary, consisting of purchase of mitigation bank credits and construction of new channel of equivalent length shall be implemented. Modifications to the mitigation plan must be submitted to the Agency for approval. The Proponent shall monitor the mitigation for 5 years after the completion of initial construction and shall submit annual reports by July 1 of each calendar year on the status of the mitigation. A final report shall be submitted within 90 days after completion of a 5-year monitoring period. Each annual report and the final report shall include the following: IEPA Log No., date of completion of initial construction, representative photographs, floristic quality index, updated topographic maps, description of work in the past year, the performance standards for the mitigation as stated in the mitigation plan, and the activities remaining to complete the mitigation plan. The Proponent shall submit reports to the address below. For mitigation accomplished through purchase of banking credits, the Proponent shall submit written proof that the wetland credits have been purchased within thirty (30) days of said purchase.

Illinois Environmental Protection Agency, Bureau of Water
Division of Water Pollution Control, Permit Section
1021 North Grand Avenue East
Post Office Box 19276
Springfield, Illinois 62794-9276

Water Quality Condition No. 3. Backfilled Materials.

All material excavated which is not being used as backfill in accordance with the application documents shall be stored or disposed of in self-contained areas with no discharges to waters of the State. Backfilled materials within excavations within waterbodies shall be covered with sufficient amounts of non-erodible cover so as prevent erosion of backfilled material caused by wave or currents within the water body.

Water Quality Condition No. 4. Construction Site Dewatering.

Dewatering of a construction site is authorized provided the dewatering activity is limited to the immediate work area within a cofferdam or otherwise isolated from waters of the State, and the work site is free from sources of contamination including those of natural origin. Dewatering activities shall incorporate Best Management Practices in accordance with the current edition of the "Illinois Urban Manual" <https://illinoisurbanmanual.org/> Practice Standard for Dewatering (no. 813) or as otherwise appropriate to ensure that return flows from the dewatering activity are free of unnatural turbidity and floating debris and meet applicable water quality standards. Dewatering

or discharge of flush water from construction of drilled piers or boreholes is not authorized and must be conducted in accordance with an NPDES permit issued by the Illinois EPA.

Water Quality Condition No. 5. NPDES Stormwater Construction Permit.

The Proponent shall be responsible for obtaining an NPDES Storm Water Permit required by the federal Clean Water Act prior to initiating construction if the construction activity associated with the project will result in the disturbance of 1 (one) or more acres, total land area. An NPDES Storm Water Permit may be obtained by submitting a properly completed Notice of Intent (NOI) form and application at <https://www2.illinois.gov/epa/topics/forms/water-permits/storm-water/Pages/construction.aspx>.

Water Quality Condition No. 6. Other Permits Required.

The Proponent is advised that the following permit(s) must be obtained from the Agency: The Proponent must obtain permits to construct sanitary sewers, water mains and related facilities prior to construction.

This Section 401 water quality certification does not grant immunity from any enforcement action found necessary by this Agency to meet its responsibilities in prevention, abatement, and control of water pollution.

If you have any questions about this final determination, please contact Darren Gove of my staff at either 217/782-3362 or Darren.Gove@illinois.gov.

Sincerely,



Darin E. LeCrone, P.E.
Manager, Permit Section
Division of Water Pollution Control
Illinois Environmental Protection Agency

CC: Applicant
USEPA
Consultant
IDNR
FOS
BOW_File

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 North Grand Avenue, East; Post Office Box 19276; Springfield, IL 62794-9276

Division of Public Water Supplies

Telephone 217/782-1724

PUBLIC WATER SUPPLY CONSTRUCTION PERMIT

SUBJECT: BARRINGTON (IL0974080)

Permit Issued to:
Village of Barrington
302 Raymond Drive
Barrington, IL 60010

PERMIT NUMBER: 1099-FY2024

DATE ISSUED: May 17, 2024

PERMIT TYPE: Water Main Extension

The issuance of this permit is based on plans and specifications prepared by the engineers/architects indicated and are identified as follows. This permit is issued for the construction and/or installation of the public water supply improvements described in this document, in accordance with the provisions of the Environmental Protection Act, Title IV, Sections 14 through 17, and Title X, Sections 39 and 40, and is subject to the conditions printed on the last page of this permit and the ADDITIONAL CONDITIONS listed below.

FIRM: Gewalt Hamilton Associates, Inc.
NUMBER OF PLAN SHEETS: 9
TITLE OF PLANS: "US 14 Grade Separation"
APPLICATION RECEIVED DATE: April 11, 2024

PROPOSED IMPROVEMENTS:

The installation of approximately 52 feet of 6-inch and 2,504 feet of 8-inch water main with necessary appurtenances located along US Rte 14 and connecting roads.

ADDITIONAL CONDITIONS:

1. All water mains shall be satisfactorily disinfected prior to use pursuant to Ill. Adm. Code, Title 35, Subtitle F, Section 602.310. Two consecutive sets of samples collected at least 24 hours apart must show the absence of coliform bacteria. The samples must be collected from every 1,200 feet of new water main along each branch and from the end of the line. An operating permit must be obtained before the project is placed in service. The application for operating permit and supporting documents can either be mailed to this office or emailed to EPA.PWSPermits@illinois.gov. Use of the email address is preferred.
2. When the owner or operator of a community water supply replaces a water main, the community water supply shall identify all lead service lines connected to the water main and shall comply with the requirements of Section 17.12 of the Act, 415 ILCS 5/17.12 for lead service line replacement. Galvanized service line must also be replaced if the galvanized service line is or was connected downstream to the lead piping. A statement must be submitted with the Application for Operating Permit indicating either that no full or partial lead service lines were identified or that Section 17.12 of the Act was complied with for this project.
3. When replacing water mains with lead service lines or partial lead service lines connected to them, the owner or operator of the community water supply shall provide the owner or operator of each potentially affected building that is serviced by the affected lead service lines or partial lead service lines, as well as

Barrington, IL0974080
US 14 Grade Separation
0325-FY2024
May 17, 2024
Page 2

the occupants of those buildings, with an individual written notice. The lead informational notice shall be provided at least 14 days prior to permitted water main work. The notification provided by the community water supply must satisfy the requirements of Section 17.12(jj) of the Act, 415 ILCS 5/17.12(jj). A copy of the notice used must be submitted to the Agency with the Application for Operating Permit.

4. The permit approval is for the Application, Schedule B and 11 plan sheets received on April 11, 2024. This includes the revised plan sheets received May 13, 2024 and all applicable emails.

DCC:CLB

cc: Gewalt Hamilton Associates, Inc.
Elgin Regional Office
Cook County Public Health Department
IDPH/DEH – Plumbing and Water Quality Program



David C. Cook, P.E.
Manager, Permit Section
Division of Public Water Supplies

STANDARD CONDITIONS FOR CONSTRUCTION/DEVELOPMENT PERMITS
ISSUED BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

The Illinois Environmental Protection Agency Act (415 ILCS 5/39) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

These standard conditions shall apply to all permits which the Agency issues for construction or development projects which require permits under the Division of Water Pollution Control, Air Pollution Control, Public Water Supplies and Land Pollution Control. Special conditions may also be imposed by the separate divisions in addition to these standard conditions.

1. Unless this permit has been extended or it has been voided by a newly issued permit, this permit will expire one year after this date of issuance unless construction or development on this project has started on or prior to that date. (See standard condition #8 below)
2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protection Act, and Rules and Regulations adopted the Illinois Pollution Control Board.
3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.
4. The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:
 - a. to enter at reasonable times the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit.
 - b. to have access to and copy at reasonable times any records required be kept under the terms and conditions of this permit.
 - c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit.
 - d. to obtain and remove at reasonable times samples of any discharge or emission of pollutants.
 - e. to enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.
5. The issuance of this permit:
 - a. shall not be considered as in any manner affecting the title of the permits upon which the permitted facilities are to be located;
 - b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;
 - c. does not release the permittee from compliance with the other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;
 - d. does not take into consideration or attest to the structural stability of any units or parts of the project;
 - e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability directly or indirectly for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.
6. These standard conditions shall prevail unless modified by special conditions.
7. The Agency may file a complaint with the Board for modification, suspension or revocation of a permit:
 - a. upon discovery that the permit application misrepresentation or false statements or that all relevant facts were not disclosed; or
 - b. upon finding that any standard or special conditions have been violated; or
 - c. upon any violation of the Environmental Protection Act or any Rules or Regulation effective thereunder as a result of the construction or development authorized by this permit.
8. Division of Public Water Supply Construction Permits expire one year from date of issuance or renewal, unless construction has started. If construction commences within one year from date of issuance or renewal, the permit expires five years from the date of permit issuance or renewal. A request for extension shall be filed prior to the permit expiration date.



Illinois Environmental Protection Agency

1021 North Grand Avenue East • P.O. Box 19276 • Springfield • Illinois • 62794-9276 • (217) 782-3397

Division of Public Water Supplies, Permit Section Application for Operating Permit

This form may be completed online, a copy saved locally and printed before it is signed. You may also complete a printed copy manually. Submit the completed and signed form to the Illinois EPA, Division of Public Water Supplies, Permit Section at the address listed above.

Facility Name: Barrington

Facility ID: IL0974080

Address 1: Village of Barrington

Construction Permit No.: 1099-FY2024

Address 2: 302 Raymond Drive

Permit Type: Water Main

City: Barrington

State: IL

Zip Code: 60010

Date Permit Issued: May 17, 2024

County: Cook

Project Title: US 14 Grade Separation

Firm Name: Gewalt Hamilton Associates, Inc.

Project Status: ☐ Final
☐ Partial

Partial A, B, C, etc.

Application Requirements (check when complete):

- ☐ Permit Number, Facility Number, and Facility Name identified on the Lab Report(s).
☐ Sample results attached to the Application.

(If a new well was constructed, provide a copy of the sample results as required by Section II, Part g of the C-I application).

For water main projects subject to Section 17.12 of the Act (415 ILCS 5/17.12),

- ☐ attach a statement on lead service lines and a copy of the lead informational notice (if one was distributed). See the instructions page for additional information.

If you select Partial, you must also submit the following items:

- ☐ Cover letter describing which sections were completed.
☐ General project layout plans.
☐ For water main projects, identify the length the Partial: _____ LF

Date of Project Completion: _____ (Provide the date construction was completed on the project or partial)

Certified Operator in Responsible Charge:

Name: _____ Classification: _____ Number: _____

Telephone: _____ Email (optional): _____

Owner of the Completed Project:

Name: _____ Title: _____ Telephone: _____

Address: _____ City: _____ State: _____ Zip Code: _____

The Owner hereby certifies that the project named and described has been constructed in accordance with plans and specifications approved by the Illinois EPA. See instructions for further information. For Verbal Approvals, please call 217-782-1724.

Owner/Authorized Personnel Signature

Date

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

FOR IEPA USE ONLY

This operating permit 1099-FY2024 issued on _____ is valid until revoked.

This permit is valid only for the work completed under the Construction Permit of the same number.

David C. Cook, P.E.
Manager, Permit Section
Division of Public Water Supplies

Instructions for Operating Permit Application

The Operating Permit Application must be submitted for all Public Water Supply projects that required a construction permit.
The Operating Permit must be obtained before the project is placed in service.

Fill out the top section using the corresponding Construction Permit for reference.

- **Facility Name** is the name of the village, city or entity distributing community water supplies.
- **Facility ID Number** can be found on the Construction Permit. This number is specific to your facility.
- **Address** is the same as the address on the Construction Permit.
- **Construction Permit Number** is the assigned permit number of the corresponding Construction Permit. The Operating Permit and the corresponding Construction Permit will have the same permit number.
- **Permit Type** identifies whether the project involved is a Water Main, a Plant Improvement or Both.
- **Date Permit Issued** is the date the Construction Permit was granted.
- **Date of Project Completion** is the date construction was completed for the section of project you are requesting the Operating Permit for. If you are requesting an Operating Permit for a Partial project, the Date of Project Completion is the date construction was completed on that partial section. The Date of Project Completion will never be a date in the future, and must be a date *after* the issue date of the Construction Permit.
- **Title of Project** is the same title of project listed on the corresponding Construction Permit. The Operating Permit and the Construction Permit will have the same Title of Project.
- **Firm Name** is the engineering entity that designed the project.

Project Status will either be Final or Partial.

- **Final:** If construction on the project is complete, you will select **Final**.
- **Partial:** If construction on the total project is only *partially* complete, but you want to operate the completed section, you will select **Partial**. If this is the first partial, you will identify it as "Partial A", if this is the second partial, you will identify it as "Partial B" and so forth. Once the last partial section has been completed, identify it as such and also select Final in the Project Status.

The **Certified Operator in Responsible Charge** and **Owner of the Completed Project** should fill out his/her respective section. Please print your name legibly and sign where appropriate. By signing the application, the owner hereby certifies that the project named and described has been constructed in accordance with plans and specifications approved by the Illinois EPA, including specifications for bacteriological samples, and that bacteriological samples (if required) were taken under the supervision of a representative from the Public Water Supply. The owner also certifies that the project will be operated in accordance with the provisions of the Illinois Environmental Protection Act and the Rules and Regulations adopted by the Illinois Pollution Control Board pursuant to provisions of the Act.

Requests for **Verbal Approval** and questions can be addressed at (217) 782-1724.

Disinfection and bacteriological analysis must be performed for the completed project in accordance with the requirements of AWWA C651, C652, C653 or C654. For projects requiring these procedures, the sample results must be attached to the application. The construction permit number should be clearly visible on the sample results. Two consecutive sets of samples collected at least 24 hours apart must show the absence of coliform bacteria and the presence of a 0.5 mg/L minimum free chlorine residual or a 1.0 mg/L minimum combined chlorine residual. Samples must be collected every 1,200 feet of new water main along each branch and from the end of the line unless otherwise approved by the Illinois EPA.

All operating permit applications for water main construction permits that have additional conditions for lead service line inventory, replacement, and notification must include a statement indicating either that no full or partial lead service lines were identified or that they were replaced in accordance with Section 17.12 of the Act, 415 ILCS 5/17.12. A copy of the **Lead Informational Notice** satisfying the requirements of Section 17.12(jj) of the Act, 415 ILCS 5/17.12(jj) must also be attached. The notice must contain the following statement translated in the Spanish, Polish, Chinese, Tagalog, Arabic, Korean, German, Urdu, and Gujarati languages: "This notice contains important information about your water service and may affect your rights. We encourage you to have this notice translated in full into a language you understand and before you make any decisions that may be required under this notice."

This form may be completed online, a copy saved locally and printed before it is signed. You may also complete a printed copy manually. Submit the completed form to the Illinois EPA, Bureau of Water, Permit Section at the following address:

**Illinois Environmental Protection Agency
Division of Public Water Supplies, Permit Section #13
1021 North Grand Avenue East, PO Box 19276
Springfield, IL 62794-9276**

Lead Informational Notice

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Our water system will soon begin a water line maintenance and/or construction project that may affect the lead concentrations in your drinking water. Lead, a metal found in natural deposits, is harmful to human health, especially young children, and pregnant women. It can cause damage to the brain and kidneys and can interfere with the production of red blood cells that can carry oxygen to all parts of your body. The most common exposure to lead is swallowing or breathing in lead paint chips and dust. However, lead in drinking water can also be a source of lead exposure. In the past, lead was used in some water service lines and household plumbing materials. Lead in water usually occurs through corrosion of plumbing products containing lead; however, disruption (construction or maintenance) of lead service lines may also temporarily increase lead levels in the water supply. This disruption may be sometimes caused by water main maintenance/replacement.

The purpose of this notice is for informational purposes only. While it's not known for certain whether this construction project will adversely affect the lead (if present) plumbing in and outside your home, below describes some information about the project and some preventative measures you can take to help reduce the amount of lead in drinking water.

Project Start Date: _____ Project expected to be completed by: _____

Project location and description: _____

What you can do to reduce lead exposure in drinking water during this construction project:

- *Run your water to flush out lead.* If the plumbing in your home is accessible; you may be able to inspect your own plumbing to determine whether you have a lead service line or lead solder. Otherwise, you will most likely have to hire a plumber.
 - If you do not have a lead service line, running the water for 1 – 2 minutes at the kitchen tap should clear the lead from your household plumbing to the kitchen tap. Once you have done this, fill a container with water and store it in the refrigerator for drinking, cooking, and preparing baby formula throughout the day.
 - If you do have a lead service line, flushing times can vary based on the length of your lead service line and the plumbing configuration in your home. The length of lead service lines varies considerably. Flushing for at least 3 – 5 minutes is recommended.
- *Use cold water for drinking, cooking, and preparing baby formula.* Do not cook with or drink water from the hot water tap; lead dissolves more easily into hot water. Do not use water from the hot water tap to make baby formula.
- *Look for alternative sources or treatment of water.* You may want to consider purchasing bottled water or a water filter that is certified to remove "total lead".
- *Clean and remove any debris from faucet aerators on a regular basis.*
- *Do not boil water to remove lead. Boiling water will not reduce lead.*
- *Purchase lead-free faucets and plumbing components.*
- *Remove the entire lead service line.*
- *Test your water for lead.* Call us at: _____ to find out how to get your water tested for lead. While we do not do the testing, we can provide a list of laboratories certified to do the testing. Laboratories will send you the bottles for sample collection. Please note that we are not affiliated with any laboratory, and they will charge you a fee.
 - If test results indicate a lead level above 15 ug/L, bottled water should be used by pregnant women, breast-feeding women, young children, and formula-fed infants.

Lead Informational Notice

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Dear Water Customer:

Today's Date: _____

This notice contains important information about your water service and may affect your rights. We encourage you to have this notice translated in full into a language you understand and before you make any decisions that may be required under this notice.

Diese Mitteilung beinhaltet wichtige Informationen über Ihre Wasserversorgung und könnte Ihre Rechte beeinflussen. Wir bitten Sie, dass Sie diese Mitteilung vollständig in eine Sprache übersetzen lassen, die Sie verstehen, bevor Sie eventuelle Entscheidungen treffen, welche im Zusammenhang mit dieser Benachrichtigung erforderlich sind.

Ang abisong ito ay naglalaman ng mahalagang impormasyon tungkol sa iyong serbisyo sa tubig at maaaring makaapekto sa iyong mga karapatan. Hinihikayat namin kayo na isalin nang buo ang abisong ito sa wikang naiintindihan ninyo at bago kayo gumawa ng anumang mga desisyon na maaaring kailanganin sa abisong ito.

આ સૂચનામાં તમારી પાણીની સેવા વિશે મહત્વપૂર્ણ માહિતી શામેલ છે અને તમારા અધિકારોને અસર કરી શકે છે. અમે તમને પ્રોત્સાહિત કરીએ છીએ કે તમે આ સૂચના હેઠળ જરૂરી હોય તેવા કોઈપણ નિર્ણયો લો તે પહેલાં તમે આ સૂચનાને તમે સમજો છો તે ભાષામાં સંપૂર્ણ ભાષાંતર કરો.

Niniejsze zawiadomienie zawiera ważne informacje na temat Państwa przyłącza wodociągowego i może mieć wpływ na Państwa prawa. Przed podjęciem jakichkolwiek decyzji, które mogą być wymagane na mocy niniejszego zawiadomienia, zachęcamy Państwa do przetłumaczenia całości niniejszego zawiadomienia na język, który będzie dla Państwa zrozumiały.

يحتوي هذا الإشعار على معلومات مهمة حول خدمة المياه لديك، وقد يؤثر على حقوقك. قبل اتخاذ أي قرارات قد تكون مطلوبة بموجب هذا الإشعار فإننا نشجعك على ترجمته بالكامل إلى لغة تفهمها.

اس نوٹس میں آپ کی پانی کی سروسز سے متعلق اہم ترین معلومات موجود ہیں اور یہ آپ کے حقوق کو متاثر کر سکتا ہے۔ ہم آپ کو ترغیب دیں گے کہ آپ اس نوٹس کا مکمل طور پر اس زبان میں ترجمہ کروائیں جو آپ سمجھتے ہوں اور ممکن ہے کہ آپ کے کوئی فیصلہ لینے سے قبل اس نوٹس کے تحت یہ درکار بھی ہو۔

Este aviso contiene información importante sobre su servicio de agua y puede afectar sus derechos. Lo animamos a que traduzca este aviso a un idioma que comprenda antes de tomar cualquier decisión que pueda ser necesaria en virtud del mismo.

이 통지서에는 귀하의 권리에 영향을 미칠 수 있는 수도 서비스에 관한 중요한 정보가 제시되어 있습니다. 이 통지서에서 요구하는 결정을 내리기 전에 이 통지서를 귀하가 이해할 수 있는 언어로 번역하시기 바랍니다.

本通知包含有关您的供水服务的重要信息，可能会影响到您的权利。在您做出本通知所要求的任何决定之前，我们鼓励您将本通知完整地翻译成您可理解的语言。

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBER: 2024-71274
BOW ID W0974080001

PERMIT NO.: 2024-HB-71274

FINAL PLANS, SPECIFICATIONS, APPLICATION
AND SUPPORTING DOCUMENTS

DATE ISSUED: MAY 14 2024

PREPARED BY: Gewalt Hamilton Associates, Inc.

SUBJECT: BARRINGTON – US 14 Grade Separation
(Village of Barrington Sewage Treatment Plant) – Sanitary Sewer Permit

PERMITTEE TO CONSTRUCT, OWN AND OPERATE

Village of Barrington
300 Raymond Avenue
Barrington, Illinois 60010

Permit is hereby granted to the above designated permittee(s) to construct and operate water pollution control facilities described as follows:

533 feet of 8 inch sanitary sewer, 160 feet of 18 inch sanitary sewer and 15 manholes to serve existing flow (0 P.E., 0 GPD, DAF) located at Illinois Route 59 and Lions Drive in the Village of Barrington with discharge to an existing 18 inch sanitary sewer tributary to the above indicated sewage treatment plant.

Unless the construction for which this permit is issued has been completed, this permit will expire two years after the date of issuance.

This Permit is issued subject to the following Special Condition(s). If such Special Condition(s) require(s) additional or revised facilities, satisfactory engineering plan documents must be submitted to this Agency for review and approval for issuance of a Supplemental Permit.

SPECIAL CONDITION 1: The Permittee to Construct shall be responsible for obtaining an NPDES Storm Water Permit prior to initiating construction if the construction activities associated with this project will result in the disturbance of one (1) or more acres total land area. Additional information is provided on the following webpage: <https://epa.illinois.gov/topics/forms/water-permits/storm-water/construction.html>

SPECIAL CONDITION 2: If this project is located within a wetland, the U.S. Army Corps of Engineers may require a permit for construction pursuant to Section 404 of the Clean Water Act (33 U.S.C. 1344).

SPECIAL CONDITION 3: Any connections to this sanitary sewer extension must be in accordance with the latest Revisions of Title 35, Subtitle C, Chapter 1. Permits must be obtained if required by said regulations.

SPECIAL CONDITION 4: The issuance of this permit does not release the permittee to construct from any obligation to comply with the requirements of the Illinois State Agency Historic Resources Preservation Act or the Illinois Historic Preservation Office.

THE STANDARD CONDITIONS OF ISSUANCE INDICATED ON THE REVERSE SIDE MUST BE COMPLIED WITH IN FULL. READ ALL CONDITIONS CAREFULLY.

BDF:MER:2024-71274

DIVISION OF WATER POLLUTION CONTROL

cc: EPA-Des Plaines FOS
Gewalt Hamilton Associates, Inc.
Records - Municipal



Brant D. Fleming, P.E.
Manager, Municipal Unit, Permit Section

READ ALL CONDITIONS CAREFULLY:
STANDARD CONDITIONS

The Illinois Environmental Protection Act (Illinois Revised statutes Chapter 111-12. Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

1. Unless the construction for which this permit is issued has been completed, this permit will expire (1) two years after the date of issuance for permits to construct sewers or wastewater sources or (2) three years after the date of issuance for permits to construct treatment works or pretreatment works.
2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protection Act, and Rules and Regulations adopted by the Illinois Pollution Control Board.
3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications to the Agency and a supplemental written permit issued.
4. The permittee shall allow any agent duly authorized by the Agency upon the presentations of credentials.
 - a. To enter at reasonable times, the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit;
 - b. To have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit;
 - c. To inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated, and maintained under this permit;
 - d. To obtain and remove at reasonable times samples of any discharge or emission of pollutants;
 - e. To enter at reasonable times and utilize any photographic, recording, testing, monitoring, or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit;
5. The assurance of this permit:
 - a. Shall not be considered as in any manner affecting the title of the premises upon which the permitted facilities are to be located;
 - b. Does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;
 - c. Does not release the permittee from compliance with other applicable statutes and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances, and regulations;
 - d. Does not take into consideration or attest to the structural stability of any units or parts of the project;
 - e. In no manner implies or suggests that the Agency (or its offices, agents, or employees) assumes any liability, directly or indirectly, for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility;
6. Unless a joint construction/operation permit has been issued, a permit for operating shall be obtained from the Agency before the facility or equipment covered by this permit is placed into operation.
7. These standard conditions shall prevail unless modified by special conditions.
8. The Agency may file a complaint with the Board for suspension or revocation of a permit;
 - a. Upon discovery that the permit application contained misrepresentations, misinformation, or false statement or that all relevant facts were not disclosed; or
 - b. Upon finding that any standard or special conditions have been violated; or
 - c. Upon any violation of the Environmental Protection Act or any Rules or Regulation effective thereunder as a result of the construction or development authorized by this permit.



STORMWATER MANAGEMENT COMMISSION

August 2, 2024

Marie Hansen
Village of Barrington
200 South Hough Street
Barrington, IL 60010

Subject: SMC Watershed Development Permit #WDP-23-647
US 14 Grade Separation (LRC-2012-468)

PERMIT ISSUANCE

Dear Ms. Hansen:

Accompanying this letter is the required Watershed Development Permit for the proposed road improvement. This approval is subject to the conditions on the back of the permit application including the following:

- Provide prior notification to Tim Cook (of the SMC) of the pre-construction meeting at least 5 calendar days in advance to enable SMC attendance.
- Please note that the erosion control measures indicated on the plans are the minimum requirements. Additional measures may be required, as directed by the engineer, enforcement officer, or other governing agency.
- Please coordinate all SE/SC modifications to the plan with the SMC Inspector.
- Discussion at the pre-construction meeting will include:
 - Notifying the SMC Inspector prior to start of dewatering operations
 - Designated Erosion Control Inspector (DECI) contact information
 - Maintenance of sediment and erosion control measures
- The DECI shall provide weekly reports to the SMC Inspector. At a minimum, the reports shall include photographs and evaluation of critical areas, as directed by the SMC Inspector.
- Please be advised that DECI inspections are required until final as-built approval.
- Upon completion, please provide SMC an as-built submittal according to the attached checklist.

- **Isolated Wetlands Conditional Approval:**

- 1) This letter represents conditional approval of Isolated Waters of Lake County (IWLC) impacts to 0.17 acres. No work is authorized in IWLC until SMC issues the final wetland approval. Upon receipt of mitigation documentation required per WDO §1009.01.B, SMC will issue an invoice for the Fox River Watershed Wetland Restoration Fund (WRF) fee amount of \$29,070 (0.17 acre impact * 1.5 = 0.255 acre mitigation * \$114,000/acre mitigation).
- 2) The project requires impacts to Waters of the U.S. (WOTUS). Please provide SMC with a copy of the U.S. Army Corps of Engineers (USACE) permit (LRC-2012-468), along with documentation with respect to mitigation required by the USACE. Per WDO §1004.01.D, mitigation for WOTUS impacts shall occur in Lake County, Illinois, at the ratio specified by the USACE. No work in WOTUS may occur until the USACE permit is issued.
- 3) No tree removal is to occur from April 1 through September 30 (consistent with the Findings of No Significant Impact report) to protect the Northern long-eared bat.

This approval is based on the plans entitled:

STATE OF ILLINOIS, DEPARTMENT OF TRANSPORTATION, PLANS FOR PROPOSED FEDERAL AID HIGHWAY, F.A.P. ROUTE 305 US 14 (NORTHWEST HIGHWAY), F.A.P. ROUTE 338 IL 59 (HOUGH STREET) TO VALENCIA AVENUE, ROADWAY RECONSTRUCTION AND GRADE SEPARATION, SECTION 11-00087-00-GS, PROJECT: WY2A(427), VILLAGE OF BARRINGTON, LAKE COUNTY, C-91-208-18, prepared by Civiltech Engineering, Inc., received by SMC July 23, 2024 805-sheets (Plans Dated 07/10/2024).

Please contact Tim Cook at tcook@lakecountyil.gov or (847)377-7703 if you have questions or would like to set up the pre-construction meeting.

Sincerely,

LAKE COUNTY STORMWATER MANAGEMENT COMMISSION



Philip Ruiz, P.E., CFM
Principal Permit Engineer



Brian Frank, P.E., CFM
Chief Engineer

Attachment As-built Review Checklist

C: Tim Cook – Lake County SMC
Juli Crane – Lake County SMC
Soren Hall – U.S. Army Corps of Engineers
Thomas Liliensiek – Civiltech Engineering, Inc.
Baron Stuedemann – Huff & Huff, Inc.



STORMWATER MANAGEMENT COMMISSION

As-built Review Checklist (Revised December 2021)

Please provide the following information as indicated when submitting as-built plans for approval. Please ensure that the as-built information is annotated onto the permitted construction plans and is not a stand-alone current conditions exhibit. Plans should be provided in a digital format (PDF).

- ☐ Spot elevations and/or contours for cut and fill areas located in the Regulatory Floodplain.
- ☒ Floodplain cut and fill calculations* based on the as-built survey.
(Benchmark – NAVD88 datum)
- ☒ Spot elevations and contours for all constructed detention and water quality treatment facilities, including:
 - 2-yr and 100-yr water elevation contours
 - Flared end section and restrictor sizes/invert elevations
 - Detailed topography for the emergency overflow spillway
 - Top of berm spot elevations surrounding detention facility
- ☒ Detention volume calculations* and summary (for both the 2-yr and 100-yr events) based on the as-built survey.
- ☒ Storm sewer locations, sizes, inverts and rim elevations. Provide storm sewer network information in a digital file (CAD and/or GIS file).
- ☐ Top of curb elevations at locations of overland flow paths.
- ☐ Overland flow path (swale) as-built cross-section survey (a minimum of two cross-sections, each with at least three points, i.e., one on either bank and one at the invert).
- ☐ Low-floor elevations/lowest adjacent grade elevations for structures adjacent to Regulatory Floodplain, overland flow paths, or detention facilities.
- ☐ Verification of at least 70% vegetative coverage by perennial species, on an aerial basis.
- ☐ Plants comprising a minimum of 50% native vegetation per approved seed/plant list on the permitted plan set.
- ☒ Verification of required native vegetation planted (seed tags, invoices) listing species by scientific name.

* As-built calculations need to be signed, sealed and dated by an Illinois Licensed Professional Engineer.



STORMWATER MANAGEMENT COMMISSION

**WATERSHED DEVELOPMENT PERMIT NUMBER
WDP-23-647
HAS BEEN SECURED**

Project: US 14 Grade Separation

Date Issued: August 2, 2024

Conditions: • See WDP application page 2 for standard permit conditions
• See permit letter for project specific permit conditions

Issued By: Philip Ruiz, P.E., CFM
Principal Permit Engineer

Notice to Contractors and Owners

Post this card at the site, visible from the street and so located as to permit the inspector to record the indicated inspections on the placard. Do not post in the interior of a building.

Inspectors and sheriff's deputies are instructed to stop all work where this permit card is not displayed.

Always mention the Watershed Development Permit number when referring to this project. If this card becomes mislaid or lost please contact Lake County Stormwater Management Commission for a replacement.

Lake County Stormwater Management Commission (847) 377-7700

**Manager Public Works**

Thomas L. Brasseur
700 Pershing Road
Pontiac, MI 48340

T 248-452-4854

Email: thomas.brasseur@cn.ca

Right of Entry (ROE) License Agreement Information

Railroad Company requires everyone (contractor, consultants, etc.) working on Railroad Company property to have a Right-of-Entry (ROE) License Agreement. No work may occur on Railroad Company property nor will flagging protection be provided until ROE License Agreement has been fully executed by both parties and returned. Follow these steps to obtain a ROE:

1. Applicant will **Email** this completed application to thomas.brasseur@cn.ca
2. Applicant will **mail** a check for the application fee \$1000.00* to the address listed at the end of this document
3. Applicant will **Email** a COI (Certificate of Insurance) meeting the requirements outlined in the Insurance requirements section of this document
4. Once steps 1-3 are completed, the Railroad Company will begin processing the ROE application
5. If approved, the Applicant will receive an electronic copy of the ROE agreement by email
6. Applicant will have the ROE agreement executed by Applicant's VP or president of Applicant's company
7. Applicant will return a **HARD COPY** of the partially executed ROE agreement by mail to the Railroad Company address listed at the end of this document
8. The Railroad Company will return a fully executed digital copy of the ROE License Agreement by email for the Applicants records.

Please use this form and return by email to submit application request for a Right of Entry agreement.

Contact name and Email address –

Name of Applicant/contractor and email address -

Street Address –

City, State, Zip –

Telephone –

Detailed Purpose for ROE –

Start and Completion Date of ROE –

Public Agency's Project No. –

Public Agency Easement No. (if known) –

Location of project –

Subdivision and Milepost –

FRA/AAR/DOT Crossing No. and Name –
(Nearest to jobsite)

If unable to locate this number at jobsite, please use following links to obtain:

<http://safetydata.fra.dot.gov/officeofsafety/publicsite/crossing/xingqryloc.aspx>

In Illinois

<http://www.icc.illinois.gov/railroad/advanced.aspx?>

Please attach an aerial snapshot and a Google Earth kmz file to help identify specific location.

FAQ

What time frame can I expect to begin work and have flagging protection for my work?

A **Right of Entry License Agreement usually takes 4 to 6 weeks to obtain.** Once you have a fully executed ROE agreement, you will receive a flagging request form. This flagging request form along with prepayment for flagging fees will need to be *mailed to the physical address listed on the flagging request form*. Once this flagging request form is received, it is usually about **10 days until a flagger can be scheduled**. These are normal time frames. **Time frames can vary substantially** based on many factors. Expedited time frames may be able to be requested at an additional fee.

A brief summary of time frame for each step toward obtaining flagging protection...

1. Right of Entry License Agreement usually takes **4 to 6 weeks to obtain**.
2. Send in flagging check and flagging request form...about **1 week**
3. Once this flagging request form is received, it is usually about **10 days** until a flagger can be scheduled

What are the insurance requirements?

Railroad Company allows outside parties to come onto Railroad Company property to perform work, such as survey or inspection work, installation of pipelines and wirelines, and other work for projects necessitating the occupancy of Railroad Company. Before commencing work, and until the license of allowing such occupancy ends or is terminated, outside parties shall provide and maintain the following insurance in form and amount with companies satisfactory to and as approved by Railroad Company.

1. Minimum insurance required of outside party:

- A. Statutory Workers Compensation and Employer's Liability Insurance.
- B. Automobile Liability Insurance in an amount not less than \$1,000,000 combined single limit.
- C. Commercial General Liability Insurance (Occurrence Form) in an amount not less than **\$5,000,000 per occurrence, with an aggregate limit of not less than \$10,000,000**. The policy must name Railroad Company and its Parents as additional insureds in the following form:

Wisconsin Central Ltd. and its Parents
Attn: Thomas Brasseur
700 Pershing Road
Pontiac, MI 48340
248-452-4854 (office)
Thomas.brasseur@cn.ca

The policy must remove any provisions excluding coverage for injury, loss or damage arising out of or resulting from doing business or undertaking construction or demolition on, near, or adjacent to railroad track or facilities using endorsement CG 2417 10 01 or equivalent approved by Railroad Company.

- D. When outside party is required by Railroad Company or Governing Authority to purchase Railroad Protective Liability Insurance to cover work on, near or adjacent to railroad track or facilities, and outside party is not being hired for this project by Railroad Company, outside party must procure Railroad Protective Liability Insurance in the following form;

This coverage shall be written on an Occurrence Form with limits of not less than \$5,000,000 per occurrence for Bodily Injury, Personal Injury and Physical Damage to Property, with an aggregate limit of not less than \$10,000,000. The policy must name:

Wisconsin Central Ltd. and its Parents
Attn: Thomas Brasseur
700 Pershing Road
Pontiac, MI 48340
248-452-4854 (office)
Thomas.brasseur@cn.ca

- E. In the event the privileges provided herein to Applicant involve any work that could result in the discharge, spillage, disposal, release or escape of any Hazardous Material or petroleum product onto the Railroad Company's property, Applicant shall purchase and maintain in effect at all times during the term of this License a Contractor's Pollution Liability policy in an amount not less than two million dollars (\$2,000,000) combined single limit (and with a deductible not to exceed \$50,000) insuring Railroad against any and all damages, costs, liabilities and expenses resulting from on- or off-site bodily injury (including death to any person), on or off-site loss, damage or destruction of property (including that belonging to the parties hereto), and on-or off-site cleanup costs (including expenses incurred in the investigation, removal, remediation, neutralization, or immobilization of contaminated soils, surface water, groundwater or any other contamination) growing out of or incidental to any discharge, spillage, disposal, release, or escape of any Hazardous Material or petroleum product arising therefrom. For purposes of this Agreement, the term "Hazardous Material" shall include, without limit, any flammable explosives, radioactive materials, hazardous materials, hazardous wastes, hazardous or toxic substances, or related materials defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (42 U.S.C. §§ 9601, et seq.), the Hazardous Material Transportation Act, as amended (49 U.S.C. §§ 1801, et seq.), the Resource Conservation and Recovery Act, as amended (42 U.S.C. §§ 6901 et seq.), the Toxic Substances Control Act, as amended (15 U.S.C. §§ 2601, et seq.), similar laws or ordinances enacted by any state, county or municipality in which the Property is located, or in the regulations adopted and publications promulgated pursuant to any of the above, as such laws or regulations now exist or may exist in the future.

Applicant is required to advise Railroad Company by thirty (30) day advance written notice when any work to be performed under this License may require Pollution Liability Insurance pursuant to the previous paragraph.

- F. All policies described above must include description of operations, Railroad Company milepost, highway or street name, city and state of location, project number, and Railroad Company contact person on the certificate.
2. Before commencing work, outside party shall deliver to Railroad Company a certificate of insurance evidencing the foregoing coverages and, if requested by Railroad Company, true and complete copies of the policies described above. If the policy is being issued in conjunction with, or as a result of, a city, county or state contract, the policy should be initially submitted to the respective city, county or state agency that will review it first and then forward it to Railroad Company.
3. Common Policy Provisions. Each policy described in paragraph 1, parts A through E above, must include the following provisions:
- A. Each policy shall include a waiver by the insurer of any right of subrogation against any recovery by or on behalf of any insured.
- B. Each policy shall provide for not less than thirty (30) days prior written notice to Railroad Company at the address listed above of cancellation of or any material change in that policy.

4. It is understood and agreed that the foregoing insurance coverage requirements, and outside party's compliance with those requirements, is not intended to, and shall not, relieve outside party from, or serve to limit, outside party's liability and indemnity obligations under the provisions herein.
5. Railroad Company shall have the right, from time to time, to revise the amount or form of insurance coverage required as circumstances or changing economic conditions may require. Railroad Company shall give outside party written notice of any such requested change at least thirty (30) days before the date of expiration of the then-existing policy or policies, outside party agrees to, and shall, thereupon provide Railroad Company with such revised policy or policies.
6. Insurance required of SUBCONTRACTOR:
 - A. If a SUBCONTRACTOR is to be employed by outside party to perform work on Railroad Company under or by the permission for occupancy granted to outside party by Railroad Company, before commencing work, the SUBCONTRACTOR shall provide and thereafter maintain all of the insurance described in paragraph 1, parts A through E, above, in the same forms and amounts as provided for above and subject to the other terms and conditions provided for in paragraphs 2 through 4 above.
 - B. In the alternative, before the SUBCONTRACTOR commences work for outside party on Railroad Company, outside party may provide and thereafter maintain all of the insurance described in paragraph 1, parts A through E, above, in the same forms and amounts as provided for above and subject to the other terms and conditions provided for in paragraphs 2 through 5 above, provided that all such insurance names SUBCONTRACTOR as an additional insured and all such insurance provides coverage to all additional insureds, including Railroad Company, for any liability arising out of work performed by all other additional insureds, including SUBCONTRACTOR.

Is safety training required?

Prior to any entry onto Railroad Company's property, the employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee shall determine by the guidelines hereinafter provided and by the work to be performed the level of safety training to be required.

All employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee not hired by Railroad Company that will work on CN property are required to have minimum www.contractororientation.com.

- a. EXCEPTION: Railroad Company has exempted those it classifies as "Delivery Persons" from this training. This will include contractors such as UPS, FedEx, trucking companies, etc. who merely access the property to supply materials or equipment.

All employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee hired by Railroad Company which will work on Railroad Company property are required to have minimum CN Safety and Security Awareness training, in addition to undergoing a background check. This training and background check must be obtained through the eRailSafe.com website. If not done before, the contractor must contact e-RailSafe at 855-383-7434 to be issued either a vendor number or issued instructions on obtaining a non –railroad contractor vendor number prior to accessing the noted website. Minimum information required of a Contractor, Grantee, Licensee, or Permittee and/or their subcontractor when contacting e-RailSafe is Name, Address, Telephone, Contact Person for State Projects, DOT Contract Number, and the AAR/DOT Number. This training is good for a period of two years.

- a. EXCEPTION: Railroad Company has exempted those employees of contractors providing paving services at a road crossing under construction or repair from this requirement.
- b. EXCEPTION: Railroad Company has exempted those it classifies as "Delivery Persons" from this training. This will include contractors such as UPS, FedEx, trucking companies, etc. who merely access the property to supply materials or equipment.

All employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee hired by Railroad Company, whose duties include and who are engaged in the inspection, construction, maintenance, or repair of railroad track, bridges, roadway, signal and communication systems, roadway facilities, or roadway machinery that will work foul of or have the potential to foul a live track are considered Roadway Workers under FRA regulations and CN Policy. They must complete the On-Track Safety Training course approved by Railroad Company and provided by R.R. Safety – AMR, P.O. Box 75, Lomira, WI 53048, telephone (920) 517-1677, email rrsafetytraining@yahoo.com. This training must be repeated at least once each calendar year.

- a. EXCEPTION: Railroad Company has exempted those employees of contractors providing paving services at a road crossing under construction or repair from this requirement.
- b. EXCEPTION: Railroad Company has exempted those it classifies as "Delivery Persons" from this training. This will include contractors such as UPS, FedEx, trucking companies, etc. who merely access the property to supply materials or equipment.
- c. All the employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee who will operate on-track machinery or those who will provide protection for other employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee must also be trained on CN US Operating Rules pertaining to their duties. They must take and pass the required examination. This training is good for a period of two years.
- d. "Potential to foul a live track" is considered, at a minimum, to be working within twenty-five (25) feet of the track; or as otherwise to be determined by CN Design & Construction Department.

The employees, subcontractors, and/or agents of the Licensee and/or its contractor shall qualify for, and make available for inspection to Railroad Company's employees or other authorized personnel at all times while on Railroad Company property, a photo identification issued by www.e-railsafe.com, along with at least one other government-issued form of identification. Licensee and/or their contractor shall bear all costs of compliance with the requirements of this Section. Railroad Company reserves the right to bar any of employees or agents of a Contractor, Grantee, Licensee, or Permittee and/or their contractor from Railroad Company's property at any time for any reason.

What are the costs and address to mail documents and ROE application fee check?

Application Fee Information:

Cost is \$1000.00* for application

*Fee may be increased for special handling, expedited handling, or multiple reviews.

Check Payable To: Wisconsin Central Ltd.

Mail To: Wisconsin Central Ltd.
Attn: Thomas L. Brasseur
700 Pershing Road
Pontiac, MI 48340

Mailing Address Information:

Mail To: Wisconsin Central Ltd.
Attn: Thomas L. Brasseur
700 Pershing Road
Pontiac, MI 48340

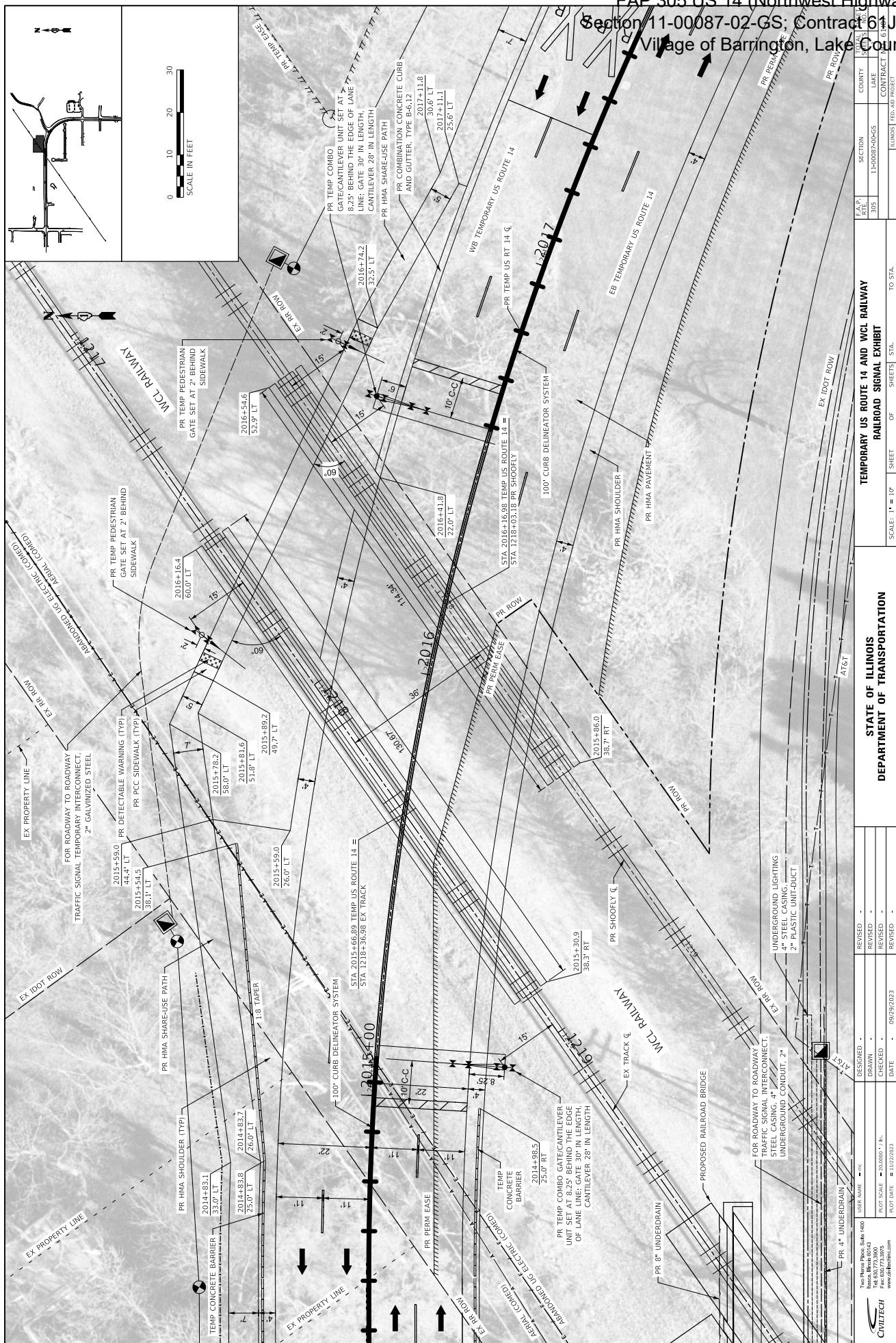
Flagging Protection Rates:

Basic daily rate – = \$1,300.00 per day
Monday thru Friday regular business hours
Includes 8 standard rate hours and 2 OT hours to set flags

Overtime rate – = \$150.00 per hour
hours in excess of 8 hours or outside of regular business hours

Weekend or holiday rate - = \$1,500.00 per day
\$150.00 per hour with a 10 hour minimum

Email the completed first page above to: Thomas.brasseur@cn.ca

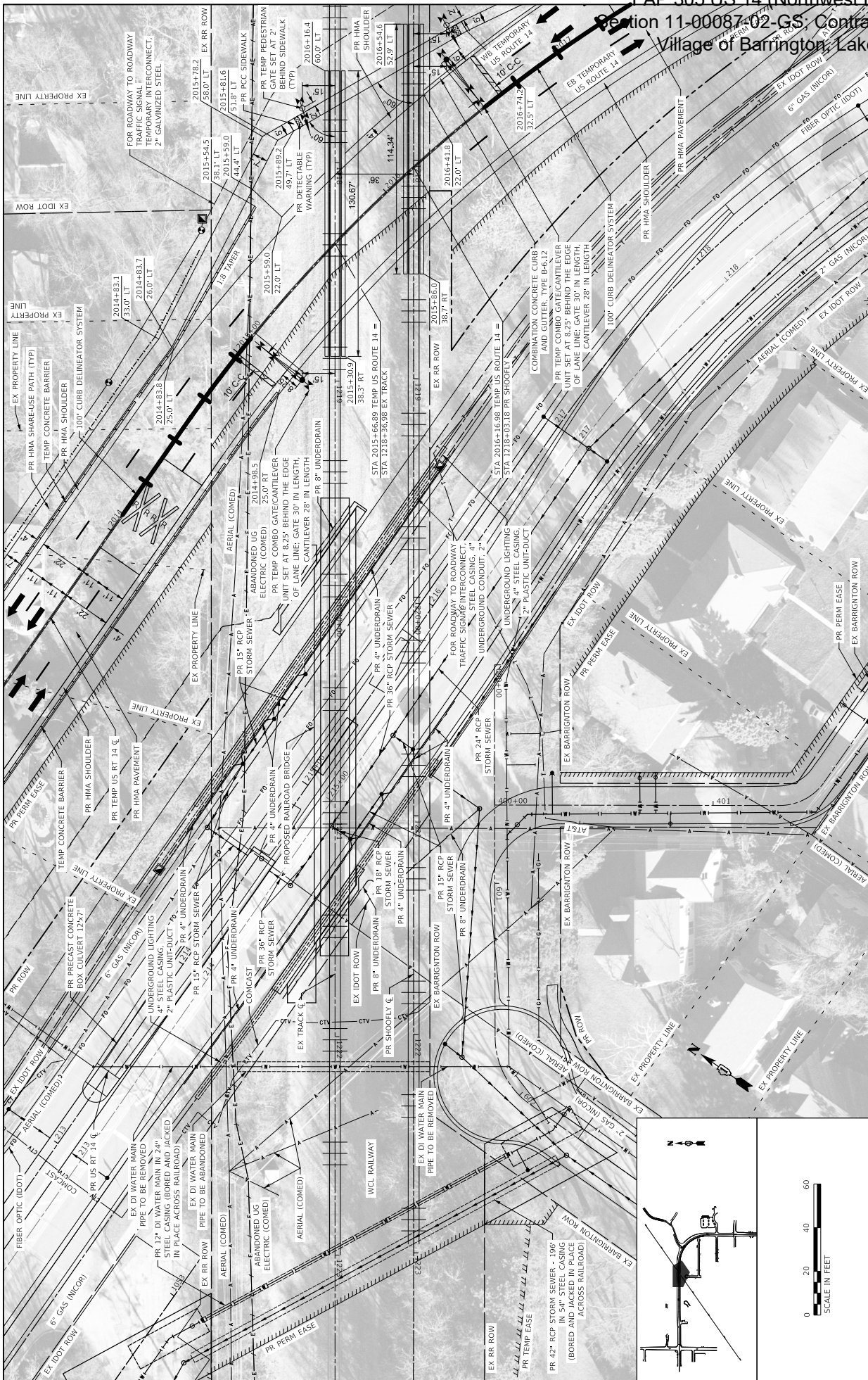


 CIVITECH Two Pierce Plaza, Suite 1400 Irvine, Illinois 60143 Tel: 630.773.3000 Fax: 630.773.3075 www.civitech.com	USER NAME	DESIGNED	REVISED
		DRAWN	REVISED
	PLOT SCALE	CHECKED	REVISED
	PLOT DATE	DATE	REVISED

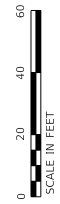
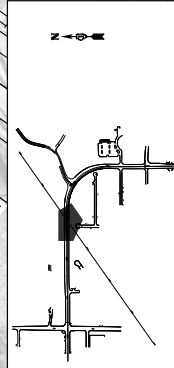
**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

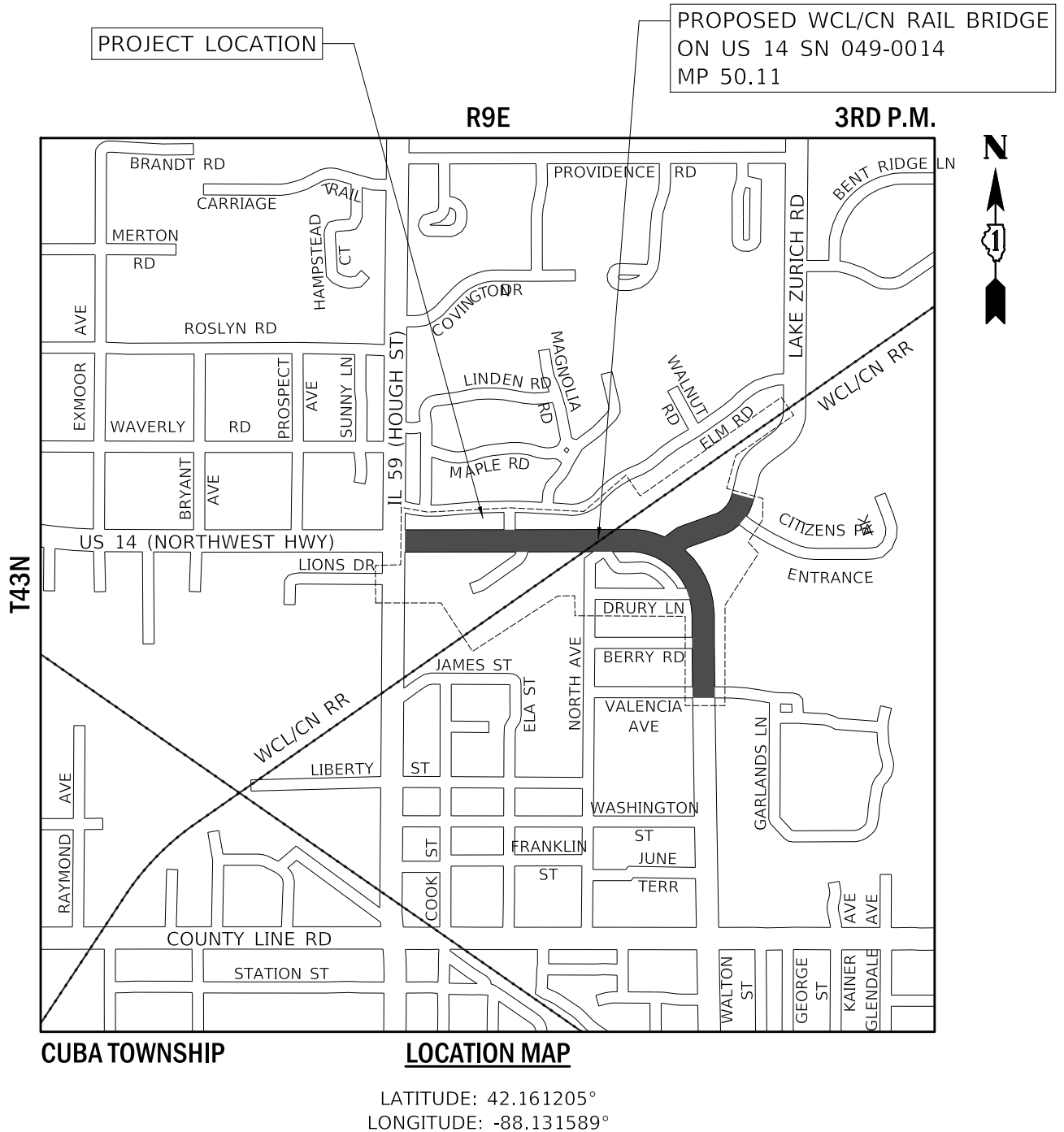
TEMPORARY US ROUTE 14 AND WCL RAILWAY RAILROAD SIGNAL EXHIBIT

F.A.P. RTE:	SECTION	COUNTY	TOTAL SEEDS
305	11-00087-00-65	LAKE	61
		CONTRACT NO. 61	
		ILLINOIS FED. AID PROJECT	



USER NAME: JMC PLOT SCALE: 1"=100.00' 1"=100.00' PLOT DATE: 09/29/2023		DESIGNED: - DRAWN: - CHECKED: - DATE: 09/29/2023		REVISIONS: REVISION - REVISION - REVISION - REVISION -		STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		TEMPERARY US ROUTE 14 AND WCL RAILWAY RAILROAD SIGNAL EXHIBIT		SHEET 20 OF 20 SCALE: 1"=20'	TO STA. FROM STA.	COUNTY 11-00087-02-GS	SECTION 305	CONTRACT 61J87	EILEWIST TPO-ADP PROJECT
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US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:
...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
12" WATER MAIN CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Village of Barrington

Street: 200 South Hough Street

City: Barrington State: IL Zip: 60010

Contact Name and Title: Marie Hansen, PE, CFM - Director of Development Services

Phone Number: 847.304.3464 Owner/Sponsor's Project #: _____

Email Address: mhansen@barrington-il.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #: _____

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus 207 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)

Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.161205 °, Longitude: -88.131589 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
Name of Submitter

Derek H. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood _____
☐ New: ☐ Steel or ☐ Wood _____

B. Number of Guys/Anchors on Property _____

C. Cross arm Overhang _____ ft.

D. Maximum Voltage _____

E. Number of Wires/Cables/Pairs/Strands (please specify # and type) _____

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

G. Clearance Over Railroad Company's Wires _____ ft.

H. Clearance Over Railroad Company's Tracks _____ ft.

I. Casing Length (Property Line to Property Line) _____ ft.

J. Size & Kind of Pipe or Duct _____

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify) _____

L. Size and Type of Wire/Cable _____

M. Insulated _____

N. Bare/Open Wire _____

O. Stranded _____

P. Solid _____

Q. Angle of Crossing _____ °

R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) _____ ft.

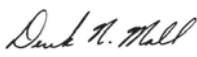
B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. _____ ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☐ Sewer (specify type): _____
- ☐ Steam
- ☐ Air
- ☒ Water (specify type): Pressure
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

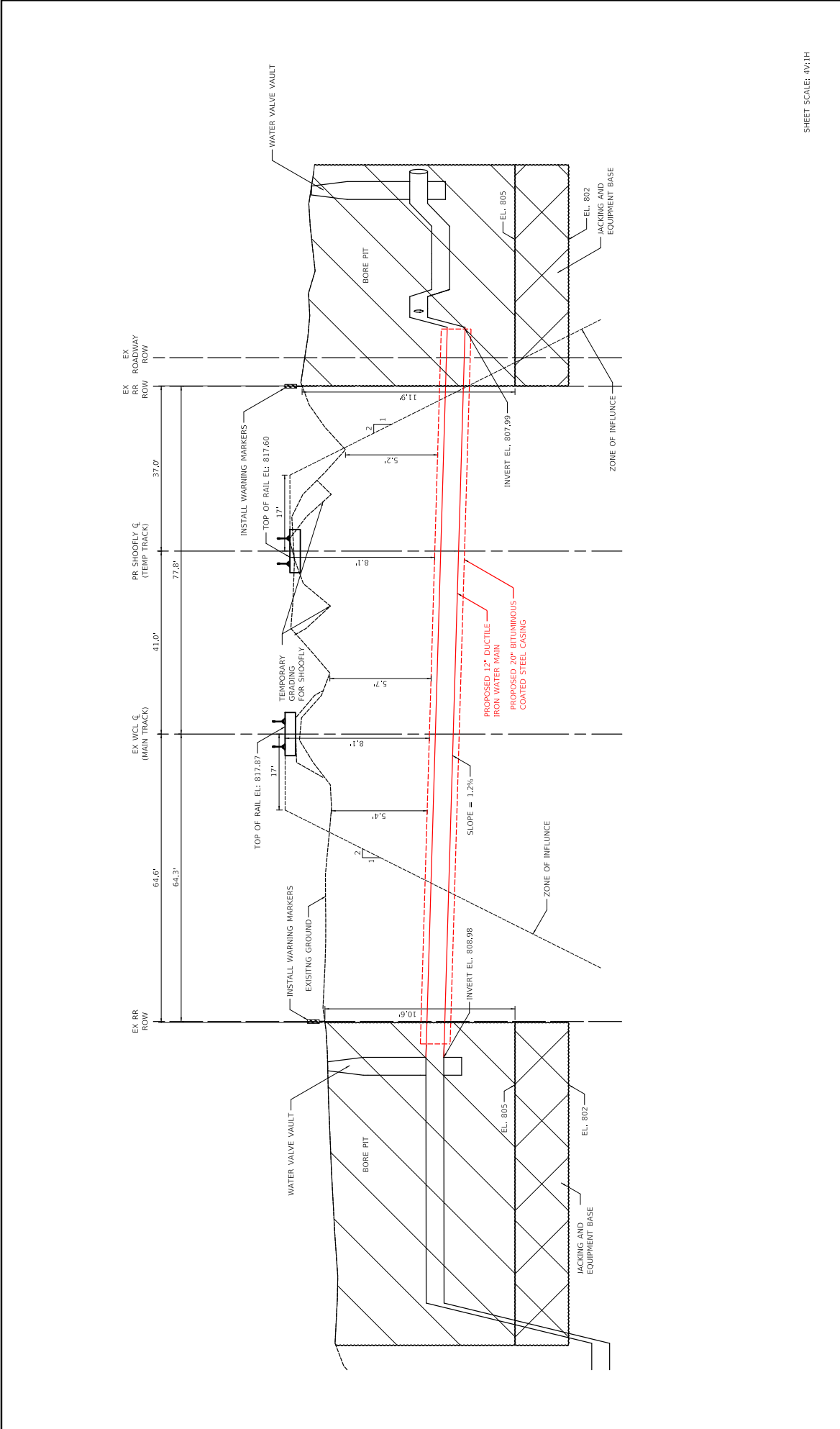
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>12.46in</u>	<u>19.31in</u>
B. Outside Diameter:	<u>13.2in</u>	<u>20in</u>
C. Wall Thickness:	<u>0.37in</u>	<u>0.34375in</u>
D. Pipe Material:	<u>Ductile Iron</u>	<u>Steel</u>
E. Specification/Grade or class:	<u>Class 52</u>	<u>36KSI</u>
F. Min. Yield Point of Material	<u>N/A</u>	<u>36KSI</u>
G. Process of Manufacture	<u>Spin Cast</u>	<u>Rolled</u>
H. Name of Manufacturer	<u>TBD</u>	<u>TBD</u>
I. Type of Joint	<u>Restrained</u>	<u>Welded</u>
J. Working Pressure	<u>55psi</u>	<u>N/A</u>
K. Maximum operating pressure (by gauge)	<u>90</u>	<u>psi</u>
L. Length of Casing pipe:	<u>160</u>	<u>ft.</u>
M. Casing pipe/uncased carrier pipe cathodically protected?	<u>Y / N</u>	
N. Hydrostatic pressure carrier pipe test pressure	<u>150</u>	<u>psi</u>
O. Will casing pipe be vented?	<u>Y / N</u>	
P. Pipe Vent Size:	<u>in.</u>	
Q. Will casing pipe/uncased carrier pipe have a protective coating?	<u>Y / N</u>	
R. Protective Coating Type	<u>Bituminous</u>	
S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>8.1</u> ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)	<u>Dry Bore & Jack</u>	
U. Depth of pipe below the ground. (not beneath tracks)	<u>5.7</u>	<u>ft.</u>
V. Depth of pipe below ditches.	<u>Ditch (1) 5.4 ft. (2) 5.7 ft (3) 5.2</u>	<u>ft.</u>
W. Distance from centerline of track to face of jacking/receiving pits.	<u>Jack-64.3ft, Recieve-97.7</u>	<u>ft.</u>
X. Depth from base of rail to bottom of jacking /receiving pits.	<u>12.6</u>	<u>ft.</u>

Derek Mall
Name of Submitter



Derek H. Mall
Signature

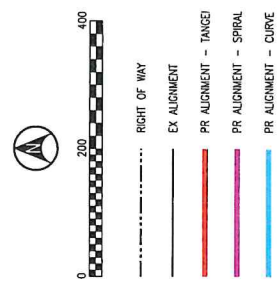
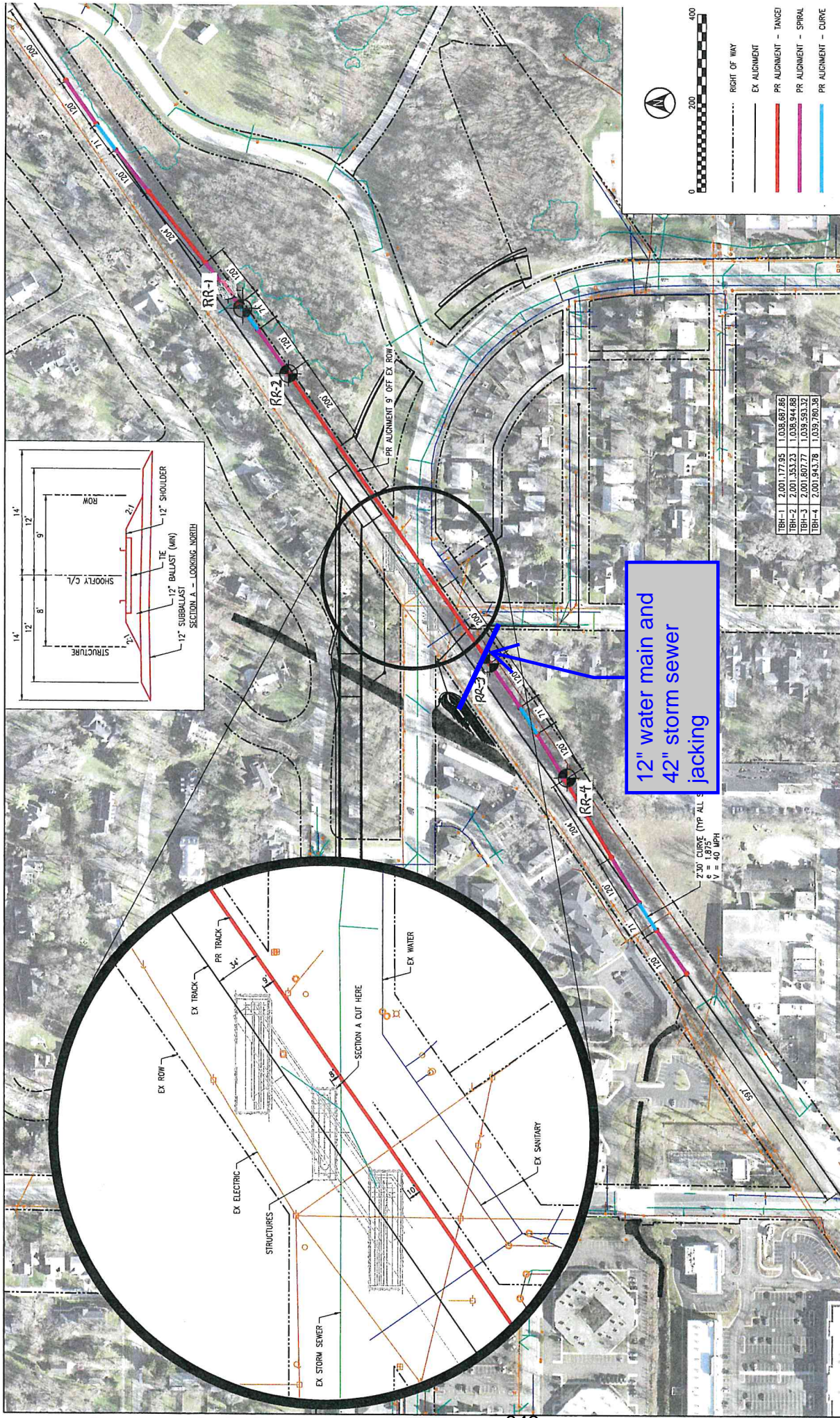
630.735.3361
Telephone #

11/13/2023
Date



SHEET SCALE: 4V:1H

7. 6. 5. 4. 3. 2. 1.	ISSUE FOR:	DATE	US ROUTE 14 GRADE SEPARATION LAKE ZURICH ROAD TO IL-59 BARRINGTON, ILLINOIS OPERATING COMPANY: WCL			CHICAGO DIVISION LEIGHTON SUB			 Two Plaza Place, Suite 1400 Barrington, Illinois 60015 Tel: 830.773.3800 Fax: 830.773.3875 www.civiltech.com			 Southern Region			US ROUTE 14 F.A.U. RTE: 0305 SECTION: 11-00087-00-GS COUNTY: LAKE CONTRACT:			DESIGN DRAWN CHECKED APPROVED DRAWING No.		
															CADD FILE NAME: ...3509-4H1-CN RR WM Profile.dgn					
															SHEET TITLE: 12" WATER MAIN CROSSING AT MAIN WCL CENTERLINE STA. 1222+97					
															A-02					
															DATE: 08/20/2022					
															SHEET: 2 OF 2					



DESIGN		DRAWN		CHECKED		APPROVED	
TEG	TEG	TEG	TEG	TEG	TEG	TEG	TEG
CAD FILE NAME: ShooFly Concept SHEET TITLE:							
US ROUTE 14 TO STA.				F.A.U. RTE: 0005 SECTION: 11-00087-00-GS COUNTY: LAKE CONTRACT:			
 1475 E. WOODFIELD RD., SUITE 600 SCHUMBERG, IL 60173 (847) 865-8600				CHICAGO DIVISION MATTESON SUB			
US ROUTE 14 GRADE SEPARATION BARRINGTON, ILLINOIS OPERATING COMPANY: WCL				EX-001 SHOOFLY CONCEPT 40 MPH DATE: 01/21/2021 SHEET: 1 OF 1			

TBR-1	2,001.177.95	1,035.687.86
TBR-2	2,001.353.23	1,035.944.88
TBR-3	2,001.607.77	1,035.593.32
TBR-4	2,001.943.78	1,035.760.38

230' CURVE (TYP. ALL)
 $e = 1.875'$
 $V = 40$ MPH



WWW.MSETINC.COM

MIDLAND STANDARD ENGINEERING & TESTING, INC.

410 Nolen Drive South Elgin, Illinois 60177

(847) 844-1895 f(847) 844-3875

July 2, 2021

Mr. Derek Mall, P.E.
Civiltech Engineering, Inc.
Two Pierce Place, Suite 1400
Itasca, Illinois 60143

Re: Geotechnical Exploration and Analysis
US Route 14 Grade Separation at WCL
Railroad Shoofly Alignment
IDOT Section 11-00087-00-GS
Barrington, Illinois
MSET Project No. 20618

Dear Mr. Mall:

MSET has completed the field exploration work and analysis of the subgrade conditions for the referenced project. This report was prepared for use in the preparation of the project design plans.

Purpose

The purpose of this exploration was to determine the subgrade conditions a proposed temporary railroad realignment. Using this information along with the project data provided, design criteria and recommendations have been prepared for use by the Design Engineers in preparing the plans and specifications.

Scope

The scope of this exploration and analysis included review of the available information from previous work conducted in the area; field and laboratory testing; analysis of the data obtained; formulation of our recommendations and preparation of this report. The field exploration included making four (4) soil borings to a depth of twenty-five (25) feet below the current ground surface.

PROJECT LOCATION AND DESCRIPTION

Project Location and Description

This portion of the main project is located on the east side of the existing railroad tracks, from roughly 1350 feet NE of Route 14 to 1100 feet SW of Route 14 within the RR Right- of-Way. The main line rail alignment will be temporarily offset 34 feet to the east to allow for the construction of a bridge crossing of the Route 14 underpass.

FIELD EXPLORATION

General

The procedures for this exploration were conducted in accordance with the appropriate Illinois Department of Transportation Standards. The borings were supervised by a field engineer from Midland Standard Engineering & Testing, Inc. The soil specimens were transported to our laboratory for testing and analysis. Our project engineer has directed all phases of this investigation.

Drilling Equipment

The soil boring was drilled using an ATV mounted drill rig equipped with a rotary head. Hollow stem augers were used to advance the boreholes.

Sampling and Standard Penetration Test Procedures

Representative samples were obtained by the use of split-spoon sampling procedures in accordance with ASTM Procedure D-1586.

During the split-spoon sampling procedures, a standard penetration test was performed in accordance with current ASTM D-1586 Procedures. At sampling intervals, advancement of the boring was stopped and all loose material removed from the borehole. The sampler was then lowered into the borehole and seated in undisturbed soil by pushing or tapping, taking suitable precautions that the rods were reasonably tight. The sampling spoon was then driven using an automatic drop hammer. During the sampling procedure, the standard penetration value (N) of the soil was determined. The standard penetration value (N) is defined as the number of blows of a one hundred-forty pound (140 lb) hammer required to advance the spoon sampler one foot (12") into the soil.

The results of the standard penetration tests indicated the relative density and comparative consistency of the soils and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components. The results of standard penetration tests can be found on the attached boring logs.

Strength Tests

A calibrated hand penetrometer was used to aid in determining the strength and consistency of cohesive soil samples (Q_p) in the field. Split spoon samples were subjected to unconfined compressive strength testing (Q_u) by the RIMAC Method as modified by IDOT. Consideration must be given to the manner in which the values of the unconfined compressive strength were obtained. Split-spoon sampling techniques provide a representative, but somewhat disturbed soil sample.

Water Level Measurements

Water level observations were made during and immediately after the boring operations and are noted on the attached boring logs. In relatively pervious, sandy soils, the water level elevations would be considered reliable. In relatively impervious, clayey soils, the accurate determination of the groundwater elevation may not be possible, even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table, and volumes of water will depend on the permeability of the soils.

LABORATORY TESTING

Scope

A supplemental laboratory-testing program was conducted to ascertain additional pertinent engineering characteristics of the foundation materials necessary in analyzing the behavior of the proposed construction. The soils laboratory work was performed in accordance with applicable ASTM standards.

The laboratory-testing program included supplementary visual classification, unconfined compressive strength on cohesive samples, and moisture contents on all samples. The results of laboratory testing are reported on the boring logs that are attached.

SUBSURFACE CONDITIONS

Subgrade Soil Conditions

The soil profile encountered in the borings made for the realignment are 10 to 18 inches of Black CLAY Topsoil. Underlying the Topsoil at RR-1 is an 18-inch layer of stiff, dark grey and grey CLAY, A-7-6 that extends to a depth of 3 feet. The moisture content, Mc of the CLAY, A-7-6 is 25 percent and the unconfined compressive strength, Qu is 1.55 tons per square foot. At RR-3 the surficial Topsoil is underlain by a thin layer of Silty LOAM A-2-4 FILL, and then natural Black CLAY Topsoil to 3 feet.

Below these shallow depth layers, and below the Topsoil at RR-2 and RR-4 is slightly to medium dense Sandy LOAM with Gravel, A-2-4 changing to SAND with Gravel, A-1 with an occasional layer of SAND, A-3. These granular materials become saturated and extend to depths of 10.5 feet (RR-1) to 21.5 feet (RR-2).

Below the granular layers, stiff to very stiff and occasionally hard Grey CLAY A-6 was present to a depth of 25 feet. The Mc measured in the CLAY ranges from 14 to 23 percent and the Qu ranges from 1.5 to 5.66 tsf, with one sample at Qu of 0.66 tsf at a depth of 18.5 feet in RR-1.

Details of the soil conditions at each boring location are presented on the attached boring logs.

Groundwater Conditions

Groundwater measurements were made during and immediately after drilling operations were completed. Groundwater was measured at a depth of 5.5 feet at boring RR-1 the north boring and at 7.5 to 10.5 feet at the other three borings. The Details of the groundwater measurements at each boring location are presented on the attached boring logs.

SHOOFLY TRACK

Planned Track Cross Section

The temporary run around track is about 2500 feet long and 34 feet from the existing track centerline on the east side of the ROW. The planned track cross section consists of a 17 foot wide, twelve inch thick ballast and railroad tie section supported by a 28 foot wide, twelve inch sub-ballast layer. The total thickness of the rail, ties, ballast, and sub-ballast is 38 inches, soil subgrade to top of rail. The ground surface along the proposed shoofly is lower in some areas than the exiting track and new embankment FILL will be placed to meet design rail grades.

SUBGRADE RECOMMENDATIONS

Topsoil Depth

The measured Topsoil depth at the four borehole locations is 10 to 18 inches for earthwork estimates. The Topsoil depth is not always easy to determine and in many cases dark colored transitional soil is present just below the rooted soil. The contractor should base his cost estimate on his own measurements.

General Subgrade Preparation

It is anticipated that the grade of the realigned tracks will match the existing track grade and that roughly five feet of embankment FILL, Sub-ballast, and Ballast will be required to support the tracks.

Topsoil and surface vegetation should be stripped to the suitable subgrade soil along the proposed full width of the rail embankment alignment. The alignment should then be inspected by proof-rolling with a loaded semi-dump truck, rubber tired end loader or similar equipment with a wheel load sufficient to locate any soft or unstable areas. Soft or unstable subgrade areas that cannot be repaired with discing, drying, and recompaction procedures should be undercut and replaced with a well-graded granular material. Initial project costs should allow for some subgrade undercutting and replacement with stone and geotechnical fabric in wet conditions.

Areas identified by the soil borings as requiring subgrade treatment prior to filling are outlined in 'Subgrade Treatment Areas' below.

Subgrade Treatment Areas

The table on the following page outlines the lower strength subgrade soil areas identified by the soil borings and the recommended subgrade treatment prior to embankment FILL placement.

Summary of Earthwork Remedial Treatment Areas

Boring	Subgrade Conditions	Treatment Depth	Treatment Material
RR-1	CLAY, A-7-6 Mc=25%, Qu=1.55 tsf Groundwater at 5.0 feet	18"	Note 2
RR-2	Sandy LOAM, w/Gravel A-2-4, N=8 bpf	NA	Note 1
RR-3	Sandy LOAM, w/Gravel A-2-4, N=9 bpf	NA	Note 1
RR-4	Sandy LOAM, w/Gravel A-2-4, N=10 bpf	NA	Note 1

Subgrade Treatment Notes

1. Remove surface vegetation, roots, topsoil to the depth encountered, then disk, dry, and compact exposed soil. Then place and compact embankment fill where required or sub-ballast/ballast in lifts to design grade. Each lift of new embankment FILL to widen the embankment should be notched two feet into the existing embankment so that a slip plane old to new is not created, reference attached detail.
2. Replacement Materials or Treatment: Remove low strength soil to depth shown in the table above and replace with Geotechnical Fabric placed on the undercut subgrade follow with an 18-inch lift of open graded aggregate. The open graded aggregate should be 3 to 6 inch top size crushed stone or crushed concrete, equivalent to IDOT PGES/Aggregate Subgrade Improvement. The Geotechnical Fabric should meet the requirements of Article 1080.02 Fabric for Ground Stabilization of the IDOT Standard Specification for Road and Bridge Construction. The undercut should be made with a backhoe, followed by placement of the fabric and aggregate backfill by pushing the material into place. No equipment should drive directly on the undercut soil subgrade. Then place and compact embankment fill where required or sub-ballast/ballast in lifts to design grade.

Embankment Fill

The fill is required to raise the embankment grade, material used as Structural FILL should be a medium to low plasticity cohesive (clay type) material, classified as 'CL' or a clean (low fines content) granular material such as 'SP', 'SW', 'GP' or 'GW', in accordance with ASTM D-2487, Classification of Soils for Engineering Purposes. The FILL should be placed in 9-inch maximum lifts loose measure and compacted to 95 percent of the maximum dry density as defined by ASTM D-1557. The FILL placed to widen the existing embankment should be stepped or benched into the existing material as shown on "Benching Detail for Embankment Widening" attached to this report.

Surface and Groundwater Control

Groundwater was not encountered near the surface at the time of drilling. Excavations to remove topsoil at this site are not expected to expose groundwater. The recommended undercut at the north end of the new temporary embankment will expose soil near the water table and the excavation should be made with a backhoe followed with fabric and stone backfill installed by pushing into place.

Closure

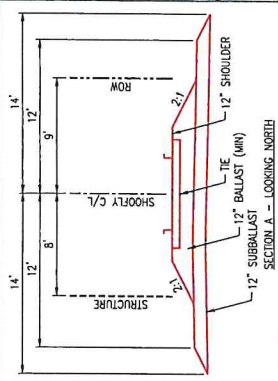
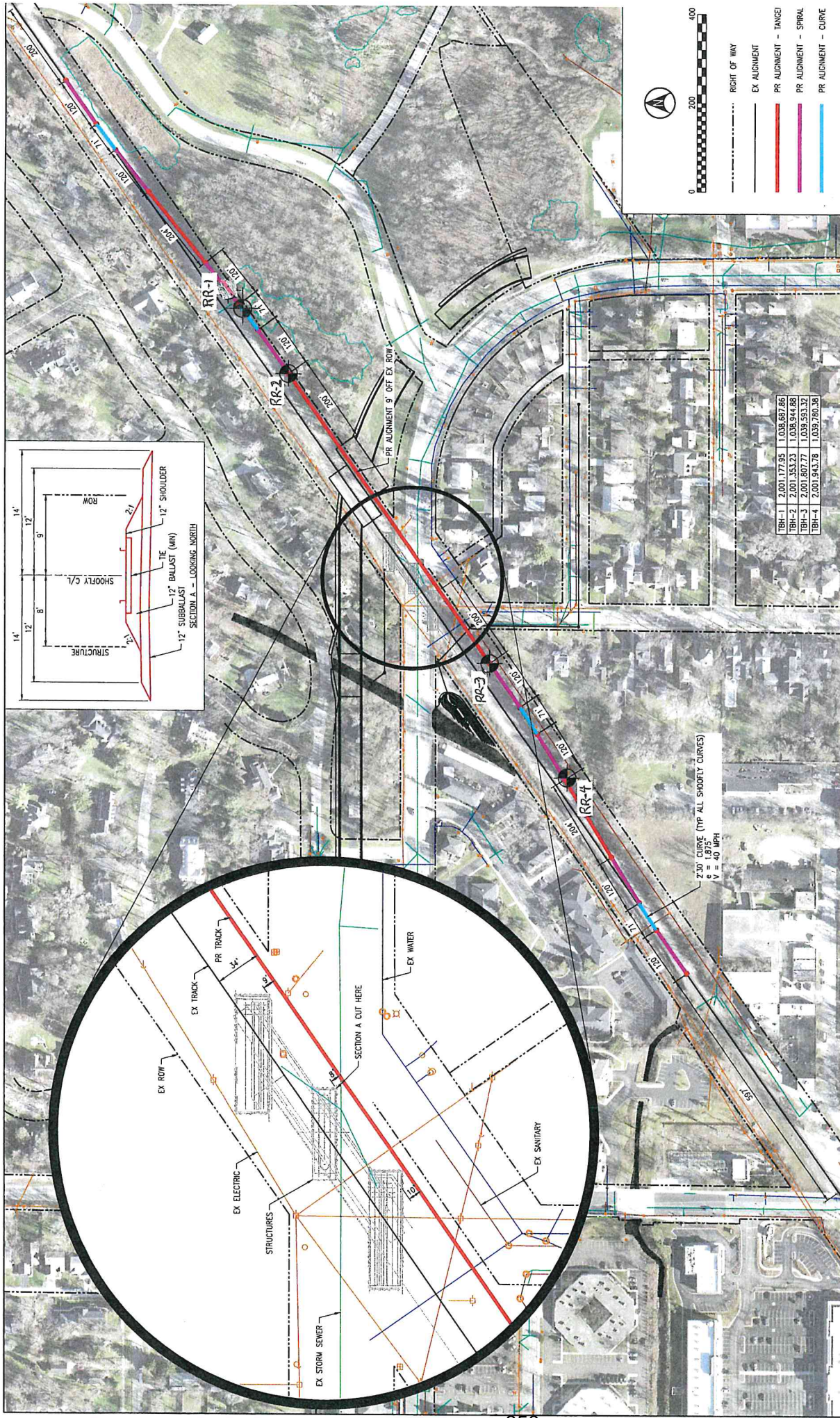
The report is based on the information available at this time and as the design progresses, we would be happy to review the soil conditions relevant to the proposed construction. Thank you for the opportunity to offer our services. If you should have any questions regarding this report, please feel free to call.

Very truly yours,
MIDLAND STANDARD ENGINEERING & TESTING, INC.



William J. Wyzgala, P.E.
Principal

Attachments: Boring Location Diagram
Boring Logs (RR-1 through RR-4)
Benching Detail for Embankment Widening
General Notes



RIGHT OF WAY

EX ALIGNMENT

PR ALIGNMENT - TANGENT

PR ALIGNMENT - SPIRAL

PR ALIGNMENT - CURVE

7. 8. 9. 10. 11. 12.	1. ADDED BORINGS: TURNED ON WETLANDS 2. ISSUE FOR:	DATE 2021-02-08	US ROUTE 14 TO STA.	 1475 E. WOODFIELD RD., SUITE 600 SCHUMBERG, IL 60173 (847) 865-8600	CHICAGO DIVISION MATTESON SUB	BARRINGTON, ILLINOIS OPERATING COMPANY: WCL	US ROUTE 14 TO STA.	F.A.U. RTE: 0005 SECTION: 11-00087-00-GS COUNTY: LAKE CONTRACT:		SHOOFLY CONCEPT 40 MPH	DRAWING No. EX-001	DESIGN	DRAWN	CHECKED	APPROVED
												TEG	TEG	TEG	TEG
CAD FILE NAME: Shoofly Concept															
SHEET TITLE:															
DATE: 01/21/2021															
SHEET: 1 OF 1															

PROJECT: **Route 14 Underpass Phase 2**SITE LOCATION: **Barrington, Illinois**BORING LOCATION: **Station 1213+40, 25' L**CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE			TESTS			REMARKS
				TYPE/ INTERVAL	NO.	N-VALUE Blows per ft.	Wc %	Dry Unit Weight, pcf	Unconfined Compressive Strength, tsf	
0		Topsoil - Black CLAY A-7-6 to A-8 (18"), stiff	812.8	SS	1A	4	26	91	2.06	
		Dark Grey and Light Grey CLAY, A-7-6, stiff	811.3	SS	1B	6	25	88	1.55	
4		Dark Brown and Black Sandy LOAM (f-c) with Gravel, A-2-4, slightly dense	809.8	SS	2	9	15			
		Brown SAND (f-c) with Gravel, A-1, wet, medium dense	807.3	SS	3	17	14			
8				SS	4	22				no recovery
		probable Boulder at 10.0'								
12		Grey CLAY with intermittent Sand and Gravel seams, A-6, wet, very stiff	802.3	SS	5	50	13		2.79	
				SS	6	20				no recovery
16		Grey CLAY, A-6, stiff to firm	797.3	SS	7	12	23		1.90	
20		with Gravel hard		SS	8	11	17		0.66	
				SS	9	24	18		5.63	
24				SS	10	17	16		4.5 + Qp	
		End of Boring at 25'	787.8							

WATER LEVEL OBSERVATIONS, ft.

DURING DRILLING:

IMMEDIATELY AFTER DRILLING:

DELAYED READING AFTER

 5.5'
 5.0'


MSET

BORING STARTED:

BORING COMPLETED:

LOGGED BY:

BORING METHOD:

6/17/21

6/17/21

GPF

HSA

MSET PROJECT NO.: 20618		LOG OF BORING NO. RR-2			Page 1 of 1		
PROJECT: Route 14 Underpass Phase 2				SITE LOCATION: Barrington, Illinois			
BORING LOCATION: Station 1215+40, 27' L				CLIENT: Civiltech Engineering, Inc.			

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE			TESTS			REMARKS
				TYPE/ INTERVAL	NO.	N-VALUE Blows per ft.	Wc%	Dry Unit Weight, pcf	Unconfined Compressive Strength, tsf	
0		Topsoil - Black CLAY (10")	816.0							
		Dark Brown to Brown Sandy LOAM (f-c) with Gravel, A-2-4, slightly to medium dense	815.2	SS	1	8	12			
4				SS	2	15	7			
				SS	3	23	10			
8		Brown SAND (f-c), A-3, wet, slightly dense	808.0	SS	4	8	17			
		Grey Sandy LOAM (fine), A-2-4, wet, loose	805.5	SS	5	4	23			
12		Grey SAND (f-c) with Gravel, A-1, wet, slightly to medium dense	803.0	SS	6	7	12			
16				SS	7	14	11			
				SS	8	22				
20				SS	9A	14	13			
				SS	9B	9	14			1.5 Qp
24		Grey CLAY, A-6, stiff to very stiff	794.5							
				SS	10	13	17			2.5 Qp
		End of Boring at 25'	791.0							

WATER LEVEL OBSERVATIONS, ft. DURING DRILLING: 8.0' IMMEDIATELY AFTER DRILLING: 7.5' DELAYED READING AFTER	 MSET	BORING STARTED: 6/17/21 BORING COMPLETED: 6/17/21 LOGGED BY: GPF BORING METHOD: HSA
--	-----------------	--

PROJECT: **Route 14 Underpass Phase 2**SITE LOCATION: **Barrington, Illinois**BORING LOCATION: **Station 1223+11, 35' L**CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE			TESTS			REMARKS
				TYPE/ INTERVAL	NO.	N-VALUE Blows per ft.	Wc%	Dry Unit Weight, pcf	Unconfined Compressive Strength, tsf	
0		Topsoil - Black CLAY (10")	817.5							
		FILL - Dark Brown and Black Sandy LOAM (f-c) with Gravel, A-2-4, slightly dense	816.7	SS	1A	9	13		--	
			815.5	SS	1B	8	20		4.5 + Qp	
		Black CLAY, A-7-6 to A-8, hard	814.5							
4		Brown Sandy LOAM (f-c) with Gravel, A-2-4, medium dense		SS	2	20	5			
				SS	3	15	11			
8		Brown and Grey SAND (f-c) with Gravel, A-1, medium dense	810.0	SS	4	17	8			
		Grey SAND (f-c) with Gravel, A-1, wet, medium dense to dense	807.0	SS	5	21	13			
12		probable Cobble at 13.5'		SS	6	34	8			
				SS	7	20	15			
16				SS	8	14	18		3.57	
20		Grey CLAY, A-6, very stiff	799.5	SS	9	14	21		2.10	
				SS	10	9	20		1.98	
24		End of Boring at 25'	792.5							

WATER LEVEL OBSERVATIONS, ft.

DURING DRILLING:

IMMEDIATELY AFTER DRILLING:

DELAYED READING AFTER


 10.5'
11.5'


MSET

BORING STARTED: 6/17/21

BORING COMPLETED: 6/17/21

LOGGED BY: GPF

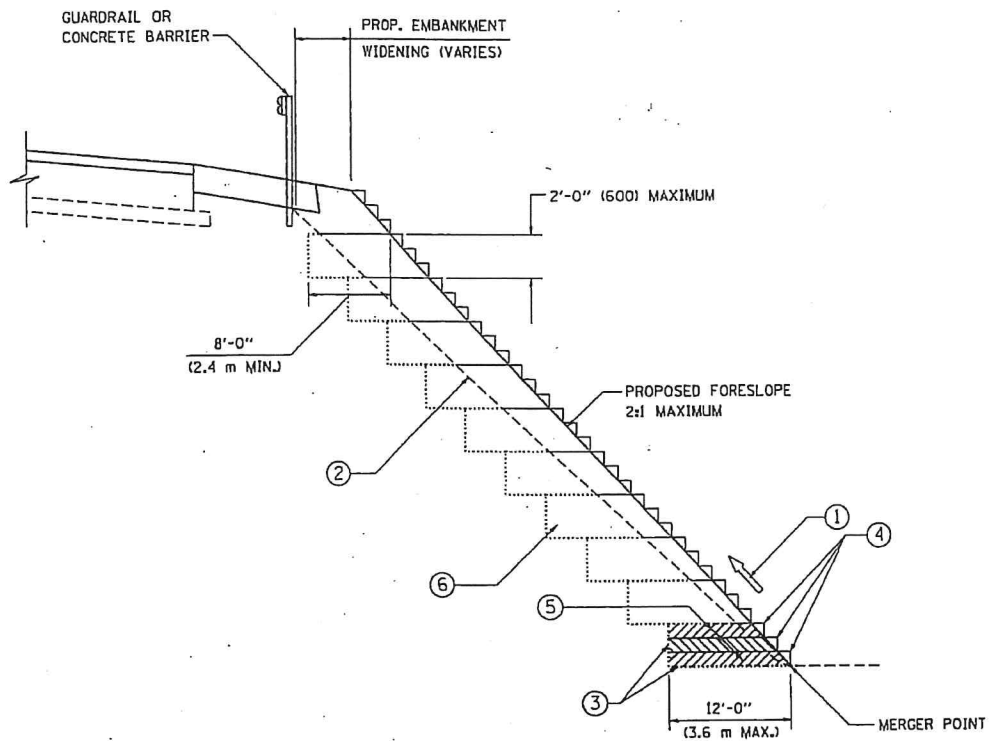
BORING METHOD: HSA

MSET PROJECT NO.: 20618		LOG OF BORING NO. RR-4				Page 1 of 1			
PROJECT: Route 14 Underpass Phase 2					SITE LOCATION: Barrington, Illinois				
BORING LOCATION: Station 1226+20, 28' L					CLIENT: Civiltech Engineering, Inc.				

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE			TESTS			REMARKS
				TYPE/ INTERVAL	NO.	N-VALUE Blows per ft.	Wc%	Dry Unit Weight, pcf	Unconfined Compressive Strength, tsf	
0		Topsoil - Black CLAY (14")	814.1							
		Brown and Grey Sandy LOAM (f-c) with Gravel, A-2-4, medium dense	812.9	SS	1	10	17			
4				SS	2	11	14			
		Brown and Grey SAND (f-c) with Gravel, A-1, medium dense probable Cobble at 7.0'	808.6	SS	3	24	9			
8		Grey SAND (f-c) with Gravel, A-1, wet, dense	806.1	SS	4	32	9			
12		Grey CLAY with intermittent Sand seams, A-6, wet, hard	803.6	SS	5	16	18	113	5.04	
		Grey SAND (f-c) with Gravel, A-1, wet, medium dense probable Boulder at 15.0'	801.1	SS	6	26	10			
16		Grey CLAY, A-6, stiff to very stiff	798.6	SS	7	11	22		1.5 Qp	
				SS	8	12	20		1.75	
20				SS	9	13				no recovery
24				SS	10	10	21	110	2.10	
		End of Boring at 25'	789.1							

WATER LEVEL OBSERVATIONS, ft. DURING DRILLING: 8.0' IMMEDIATELY AFTER DRILLING: 9.0' DELAYED READING AFTER	 MSET	BORING STARTED: <u>6/17/21</u> BORING COMPLETED: <u>6/17/21</u> LOGGED BY: <u>GPF</u> BORING METHOD: <u>HSA</u>
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Midland Standard Engineering & Testing, Inc. 410 Nolen Drive, South Elgin, Illinois 60177 (847) 844-1895 f(847) 844-3875



TYPICAL BENCHING DETAIL
FOR EMBANKMENT

NOTES:

- ① CONSTRUCT SUCCEEDING BENCH CUTS AND EMBANKMENT PLACEMENT AND COMPACTION FROM BOTTOM TO TOP IN STAIRSTEP FASHION.
- ② EXISTING FORESLOPE PREPARED IN ACCORDANCE WITH ARTICLE 205.03 OF THE STANDARD SPECIFICATIONS.
- ③ BENCH CUT EXISTING SLOPE TYPICAL FOR EACH STEP.
- ④ TRIM TO FINAL SLOPE.
- ⑤ EQUAL 8-INCH (200) LIFTS OF EMBANKMENT COMPACTED IN ACCORDANCE WITH ARTICLE 205.05 OF THE STANDARD SPECIFICATIONS.
- ⑥ EXCAVATION OF BENCH CUTS WITHIN EXISTING EMBANKMENT WILL BE PAID FOR AT THE CONTRACT UNIT PRICE PER CUBIC METER OR CUBIC YARD FOR "EARTH EXCAVATION". THIS PRICE WILL INCLUDE ALL LABOR AND MATERIAL, NO ADDITIONAL COMPENSATION WILL BE ALLOWED.
- ⑦ SLOPES SHALL BE BENCHED ACCORDING TO THIS DETAIL WHEN THE SLOPE IS STEEPER THAN 4:1 AND THE HEIGHT IS GREATER THAN 5' (1.5 m).

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)
UNLESS OTHERWISE SHOWN.

REVISIONS		ILLINOIS DEPARTMENT OF TRANSPORTATION
NAME	DATE	
		<p style="text-align: center;">BENCHING DETAIL FOR EMBANKMENT WIDENING</p> <p>SCALE: VERT. NONE HORIZ. </p> <p>DRAWN BY: CHECKED BY: BD-51</p>

GENERAL NOTES

PARTICLE SIZE DESCRIPTION & TERMINOLOGY

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and the fine grained soils on the basis of their strength or consistency and their plasticity.

Major Component of Sample	Size Range	Descriptive Term of Components Also Present in Sample	Approximate Quantity (Percent)
Boulders	Over 8 in. (200 mm)		
Cobbles	8 inches to 3 inches (200 mm to 75mm)	Trace	1 - 9
Gravel	3 inches to #4 sieve (75mm to 4.75mm)	Little	10 - 19
Sand	#4 to #200 sieve (4.75mm to 0.075mm)	Some	20 - 34
Silt	Passing #200 sieve (0.075mm to 0.002mm)	And	35 - 50
Clay	Smaller than 0.002mm		

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

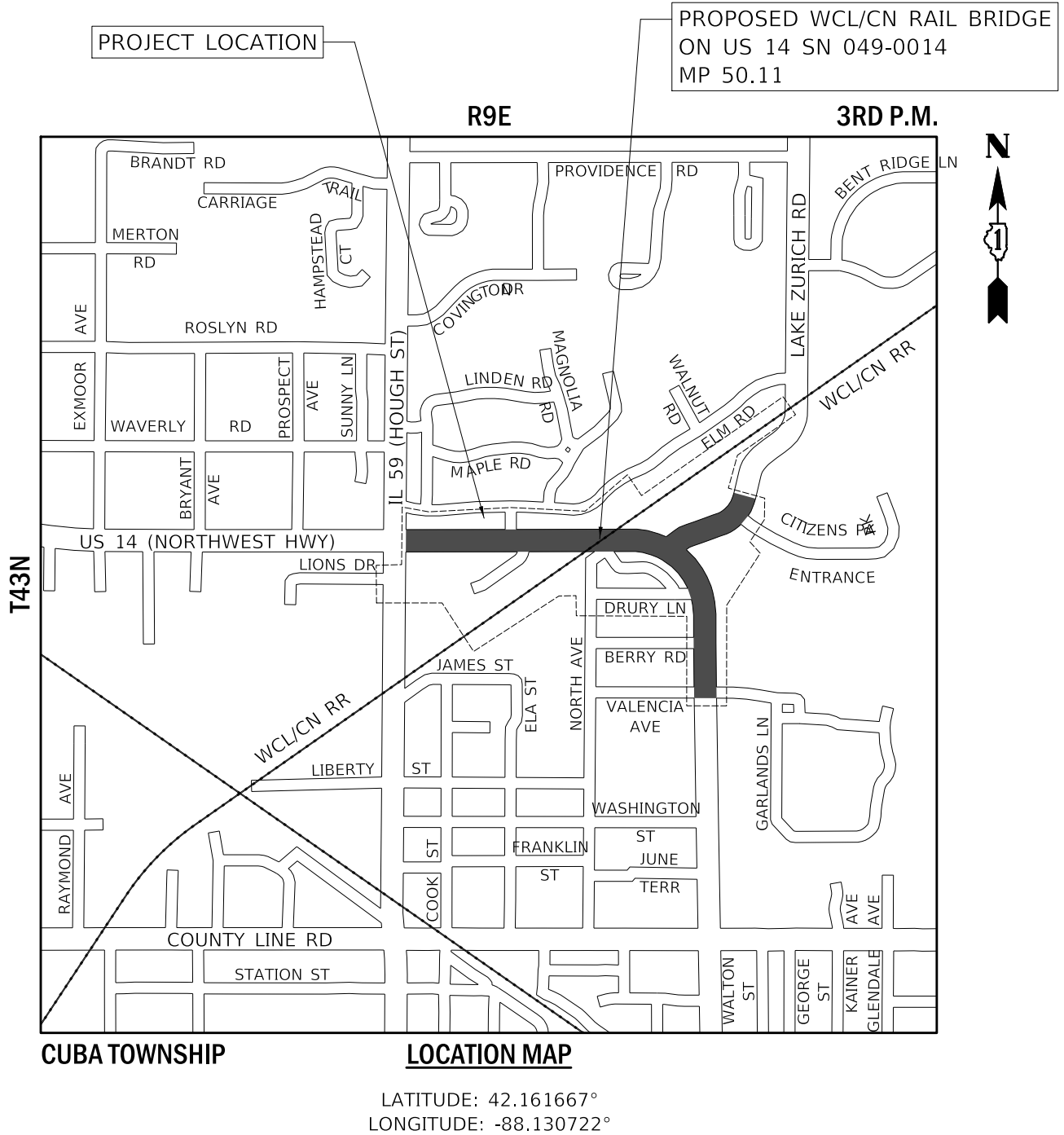
GRANULAR SOILS

DENSITY CLASSIFICATION	APPROXIMATE RANGE OF N *
Very Loose	0 - 3
Slightly Dense	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	50 - 80
Extremely Dense	80 +

COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH, Qu - TSF	APPROXIMATE RANGE OF N *
Very Soft	0.25	0 - 2
Soft	0.25 - 0.49	3 - 4
Firm	0.50 - 0.99	5 - 8
Stiff	1.00 - 1.99	9 - 15
Very Stiff	2.00 - 3.99	16 - 30
Hard	4.00 - 8.00	31 - 50
Very Hard	8.00 +	Over 50

*STANDARD PENETRATION TEST (ASTM D1586) - A 2.0" outside-diameter, split barrel sampler is driven into undisturbed soil by means of a 140 pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven 3 successive 6 inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:
...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
LIGHTING CONDUIT CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Village of Barrington

Street: 200 South Hough Street

City: Barrington State: IL Zip: 60010

Contact Name and Title: Marie Hansen, PE, CFM - Director of Development Services

Phone Number: 847.304.3464 Owner/Sponsor's Project #: _____

Email Address: mhanzen@barrington-il.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #: _____

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus 81.4 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)

Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.161667 °, Longitude: -88.130722 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
Name of Submitter

Derek N. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone
<input type="checkbox"/> Cable TV
<input type="checkbox"/> Coaxial
<input checked="" type="checkbox"/> Underground
<input type="checkbox"/> Overhead
<input checked="" type="checkbox"/> Other (please specify): <u>Lighting Conduit</u> | <input type="checkbox"/> Fiber Optic (# of Strands _____)
<input type="checkbox"/> Copper Pair (# of Wires _____)
<input type="checkbox"/> Electric
<input type="checkbox"/> Crossing
<input type="checkbox"/> Longitudinal |
|--|---|

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
☐ New: ☐ Steel or ☐ Wood

B. Number of Guys/Anchors on Property

C. Cross arm Overhang

D. Maximum Voltage

E. Number of Wires/Cables/Pairs/Strands (please specify # and type)

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground (Rail)-26.33/(Ground)-2.5 ft.

G. Clearance Over Railroad Company's Wires

H. Clearance Over Railroad Company's Tracks

I. Casing Length (Property Line to Property Line)

J. Size & Kind of Pipe or Duct

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify)

L. Size and Type of Wire/Cable

M. Insulated

N. Bare/Open Wire

O. Stranded

P. Solid

Q. Angle of Crossing

R. Length of Span Crossing Tracks (unsupported length if above tracks)

2in. UNIT-DUCT POLYETHYLENE SCH 40

61.529 °

_____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) 65.167 ft.


B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. 16.42 ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☐ Sewer (specify type): _____
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☐ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	_____	_____
B. Outside Diameter:	_____	_____
C. Wall Thickness:	_____	_____
D. Pipe Material:	_____	_____
E. Specification/Grade or class:	_____	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below base of rail or top of ground. _____ft. (Closest point of utility to any base of rail or ground)	_____	
T. Method of installing casing pipe /uncased carrier pipe _____ (Dry bore & jack, directional, tunnel, other – specify)	_____	
U. Depth of pipe below the ground. (not beneath tracks)	_____	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

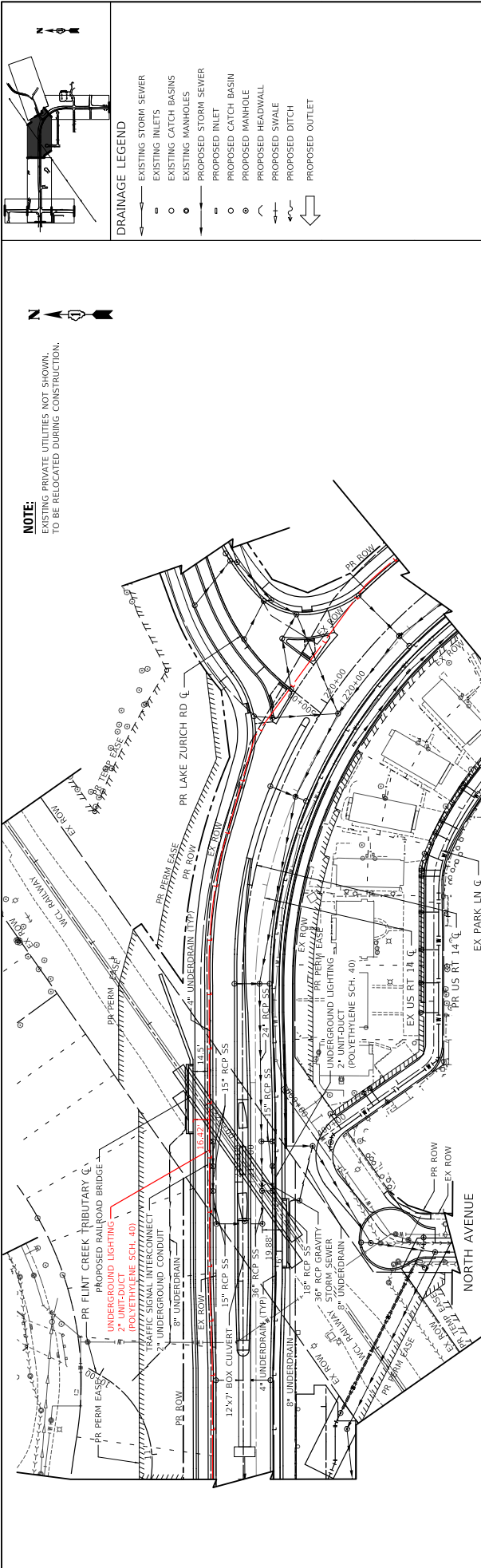
Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

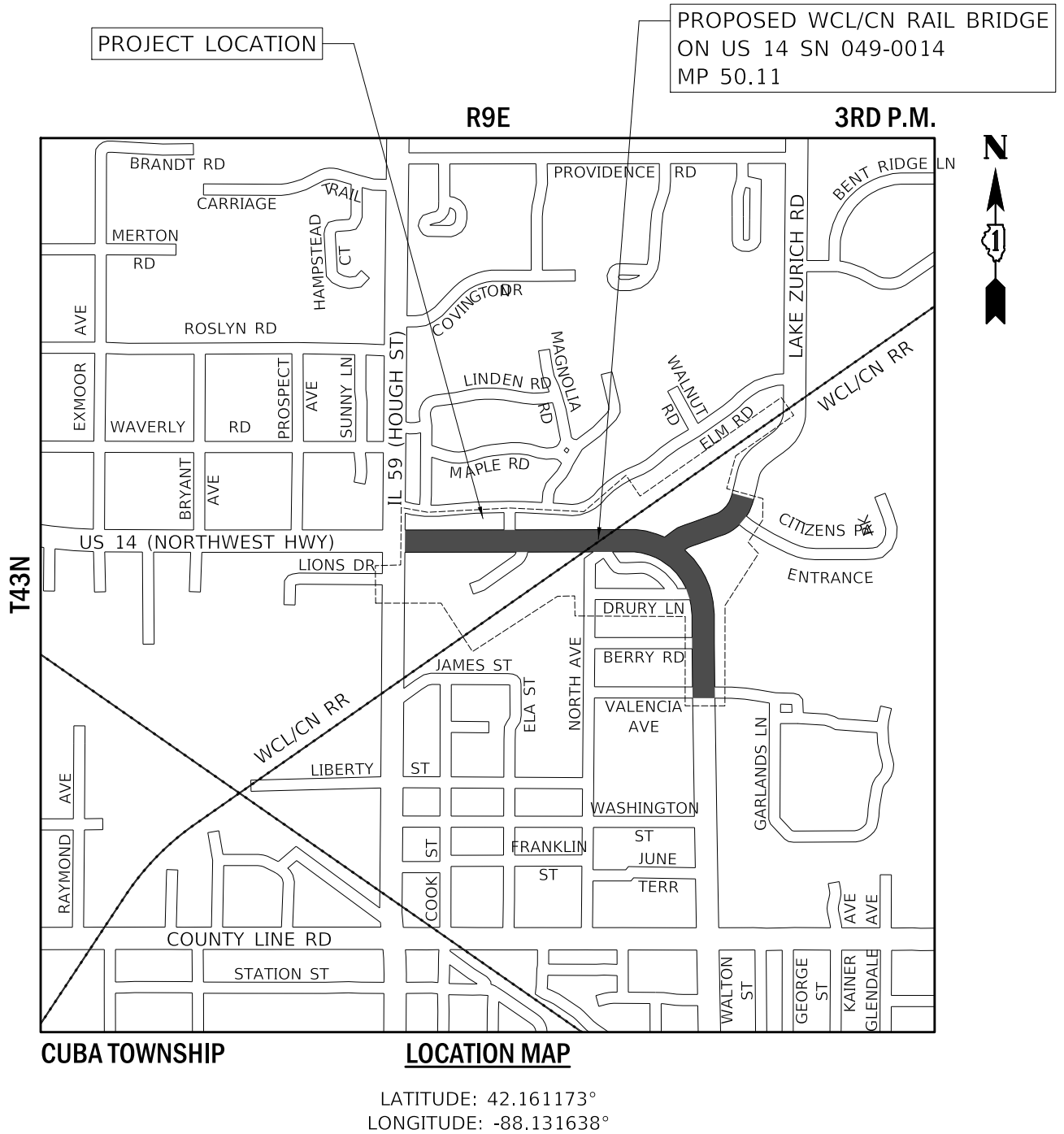
NOTE:
EXISTING PRIVATE UTILITIES NOT SHOWN.
TO BE RELOCATED DURING CONSTRUCTION.



Plan view of proposed railroad bridge and roadway interchange. The drawing shows a proposed railroad bridge crossing a roadway. Key features include:

- Proposed Railroad Bridge:** Indicated by a dashed line and labeled "PROPOSED RAILROAD BRIDGE".
- Existing Railroad Right-of-Way (EX RR ROW):** Shown as a solid line.
- Proposed Roadway:** A red line representing the proposed roadway alignment.
- Interchange:** A 30' roundabout interchange with a 1.75' radius, featuring a 4" underdrain and a 15" RCP (15' box culvert).
- Underground Conduit:** A 2" underground conduit for traffic signal interconnect, shown in red.
- Underground Lighting:** A 2" underground conduit for lighting, also shown in red.
- PR FEL:** Proposed Right-of-Way Line.
- 4" Underdrain:** Located along the roadway.
- 15" RCP (15' Box Culvert):** A box culvert structure.
- Stationing:** The drawing includes stationing markers along the top and bottom edges, ranging from 815.64 to 820.00.

[illegible]



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

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US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:
...\\3509 CN Location Map.dgn

SHEET TITLE:

**LOCATION MAP
LIGHTING CONDUIT CROSSING**

DRAWING No.

DATE:

SHEET: OF

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Street: 200 South Hough Street

City: Barrington State: IL Zip: 60010

Contact Name and Title: Marie Hansen, PE, CFM - Director of Development Services

Phone Number: 847.304.3464 Owner/Sponsor's Project #: _____

Email Address: mhanzen@barrington-il.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #: _____

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence: _____

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Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

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(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)

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(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).

If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.161173 °, Longitude: -88.131638 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
Name of Submitter

Derek N. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone
<input type="checkbox"/> Cable TV
<input type="checkbox"/> Coaxial
<input checked="" type="checkbox"/> Underground
<input type="checkbox"/> Overhead
<input checked="" type="checkbox"/> Other (please specify): <u>Lighting Conduit</u> | <input type="checkbox"/> Fiber Optic (# of Strands _____)
<input type="checkbox"/> Copper Pair (# of Wires _____)
<input type="checkbox"/> Electric
<input type="checkbox"/> Crossing
<input type="checkbox"/> Longitudinal |
|--|---|

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
☐ New: ☐ Steel or ☐ Wood

B. Number of Guys/Anchors on Property

C. Cross arm Overhang

D. Maximum Voltage

E. Number of Wires/Cables/Pairs/Strands (please specify # and type)

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground (Rail)-26.17/(Ground)-2.5 ft.

G. Clearance Over Railroad Company's Wires

H. Clearance Over Railroad Company's Tracks

I. Casing Length (Property Line to Property Line)

J. Size & Kind of Pipe or Duct

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify)

L. Size and Type of Wire/Cable

M. Insulated

N. Bare/Open Wire

O. Stranded

P. Solid

Q. Angle of Crossing

R. Length of Span Crossing Tracks (unsupported length if above tracks)

2in. UNIT-DUCT POLYETHYLENE SCH 40

61.529 °

_____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) 65.167 ft.

B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. 6 ft.

Derek Mall
Name of Submitter

Derek H. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☐ Sewer (specify type): _____
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☐ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

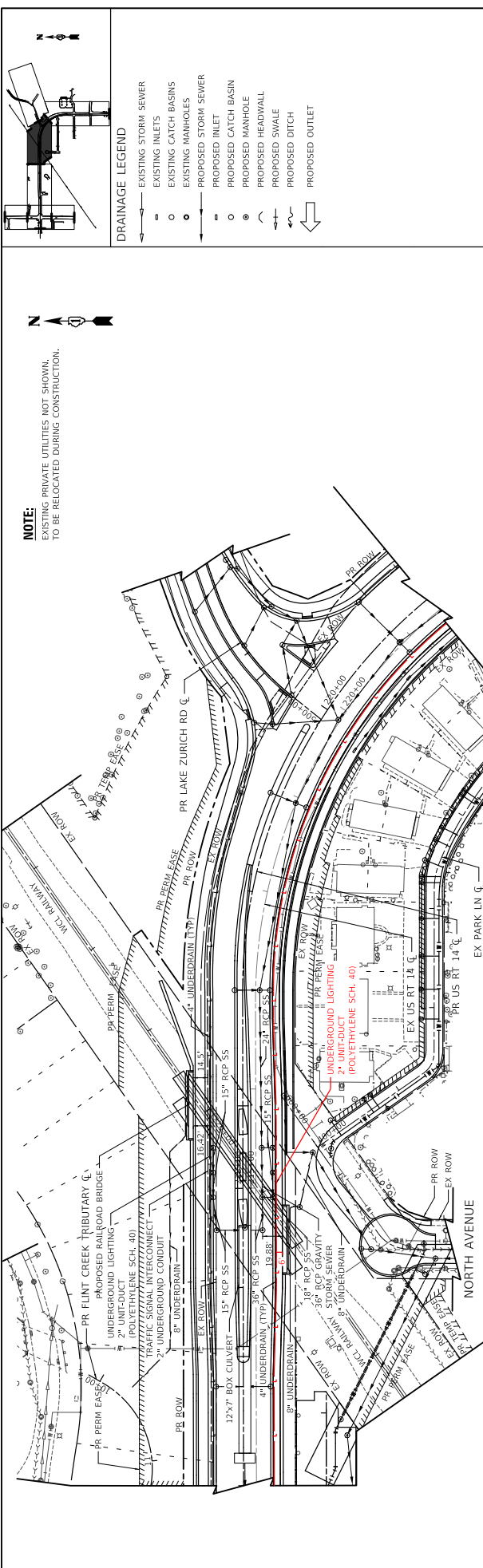
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	_____	_____
B. Outside Diameter:	_____	_____
C. Wall Thickness:	_____	_____
D. Pipe Material:	_____	_____
E. Specification/Grade or class:	_____	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below base of rail or top of ground. _____ft. (Closest point of utility to any base of rail or ground)	_____	
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)	_____	
U. Depth of pipe below the ground. (not beneath tracks)	_____ft.	
V. Depth of pipe below ditches.	_____ft.	
W. Distance from centerline of track to face of jacking/receiving pits.	_____ft.	
X. Depth from base of rail to bottom of jacking /receiving pits.	_____ft.	

Derek Mall
Name of Submitter


Derek N. Mall
Signature

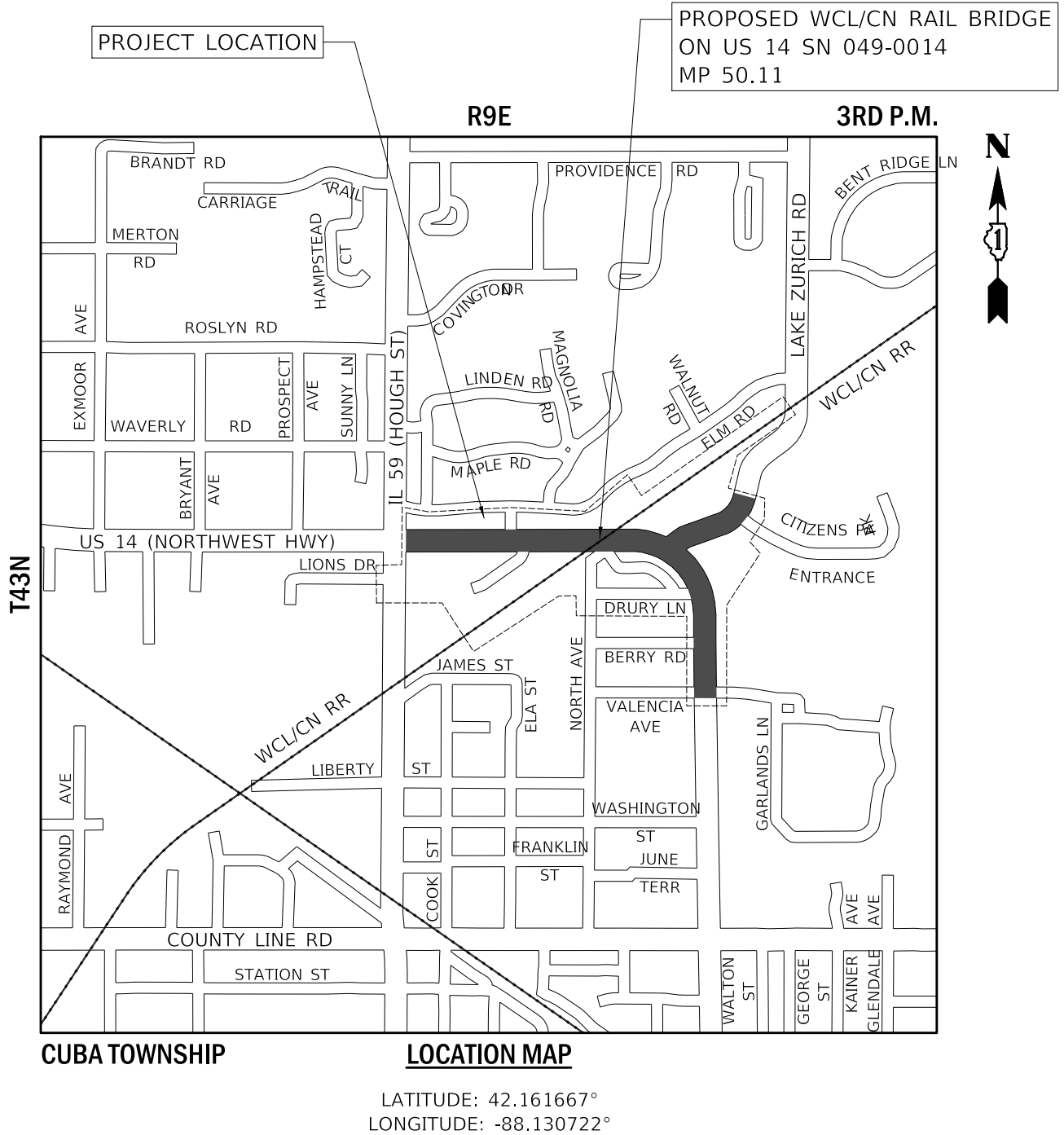
630.735.3361
Telephone #

11/13/2023
Date



Station	820	815	810	805	800	795	790	785	780
Proposed Railroad Bridge	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
Ex RR ROW	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
PR SHOULDER EL. 818.15	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
Underground Lighting	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
2' UNFOOT (PER TYPICAL SCH. 40)	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
PR RGL	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
4" UNDERDRAIN	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
24" RCP SS	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
15" RCP SS	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
36" RCP SS	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
12'x7' BOX CULVERT	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
18" RCP SS	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
4" UNDERDRAIN	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
1.75'	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
30' MINIMUM	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
PROPOSED RAILROAD BRIDGE	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61
EX RR ROW	819.57	819.51	819.36	819.25	819.16	819.01	818.89	818.79	818.61

 CMI TECH Two River Plaza, Suite 1400 1400 N. 14th St. Milwaukee, WI 53212 Tel: 480.773.8800 Fax: 480.773.8875 www.cmithech.com		213+00	214+00	215+00	216+00	217+00	218+00	219+00	220+00	221+00	US ROUTE 14 LIGHTING CONDUIT CROSSING				F.A.P. NO. 305		SECTION 1+000B+00-05		COUNTY LAKE		TOTAL SHEETS 61	
		USER NAME ■ cmitdtd DRAWN ■ CHECKED ■ DATE ■ 06/02/2024 PLOT SCALE ■ 10.0000" / 1' 0" PLOT DATE ■ 06/02/2024 www.cmithech.com		DESIGNED ■		REVISED ■		DRAWN ■		REVISED ■		DATE ■ 06/02/2024		SHEET ■		OF ■ 50*		SHEETS ■		STA. ■		SCALE: 1" = 50'
STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION																						



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
TRAFFIC SIGNAL FIBER CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation
 Street: 201 West Center Court
 City: Schaumburg State: IL Zip: 60196-1096
 Contact Name and Title: Andy Rabadi, PE - Railroad Engineer
 Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____
 Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.
 Street: 2 Pierce Place, Suite 1400
 City: Itasca State: IL Zip: 60143
 Contact Name and Title: Derek Mall, PE - Senior Project Manager
 Phone Number: 630.735.3361 Consultant's Project #: _____
 Email Address: dmall@civiltechinc.com
 Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

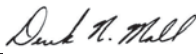
Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)
 Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)
 Village of Barrington County: Lake State: IL
 Utility Location – Railroad Mile Post: 50.11 plus .84 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)
 Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
 If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.161667 °, Longitude: -88.130722 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
 Name of Submitter


 Signature

630.735.3361
 Telephone #

11/13/2023
 Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone
<input type="checkbox"/> Cable TV
<input type="checkbox"/> Coaxial
<input checked="" type="checkbox"/> Underground
<input type="checkbox"/> Overhead
<input checked="" type="checkbox"/> Other (please specify): <u>Signal Fiber</u> | <input type="checkbox"/> Fiber Optic (# of Strands _____)
<input type="checkbox"/> Copper Pair (# of Wires _____)
<input type="checkbox"/> Electric
<input type="checkbox"/> Crossing
<input type="checkbox"/> Longitudinal |
|--|---|

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
☐ New: ☐ Steel or ☐ Wood

B. Number of Guys/Anchors on Property

C. Cross arm Overhang

D. Maximum Voltage

E. Number of Wires/Cables/Pairs/Strands (please specify # and type)

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground (Rail)-26.28/(Ground)-2.5 ft.

G. Clearance Over Railroad Company's Wires

H. Clearance Over Railroad Company's Tracks

I. Casing Length (Property Line to Property Line)

J. Size & Kind of Pipe or Duct

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify)

L. Size and Type of Wire/Cable

M. Insulated

N. Bare/Open Wire

O. Stranded

P. Solid

Q. Angle of Crossing

R. Length of Span Crossing Tracks (unsupported length if above tracks)

(Rail)-26.28/(Ground)-2.5 ft.

2 in Galvanized Steel
Trenched
Fiber Optic, 1-1/C #14

61.529 °
_____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track)

B. Distance From Each Facility (Encroachment) to Center Line of Main Track

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track


D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc.

65.167 ft.

14.5 ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☐ Sewer (specify type): _____
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☐ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

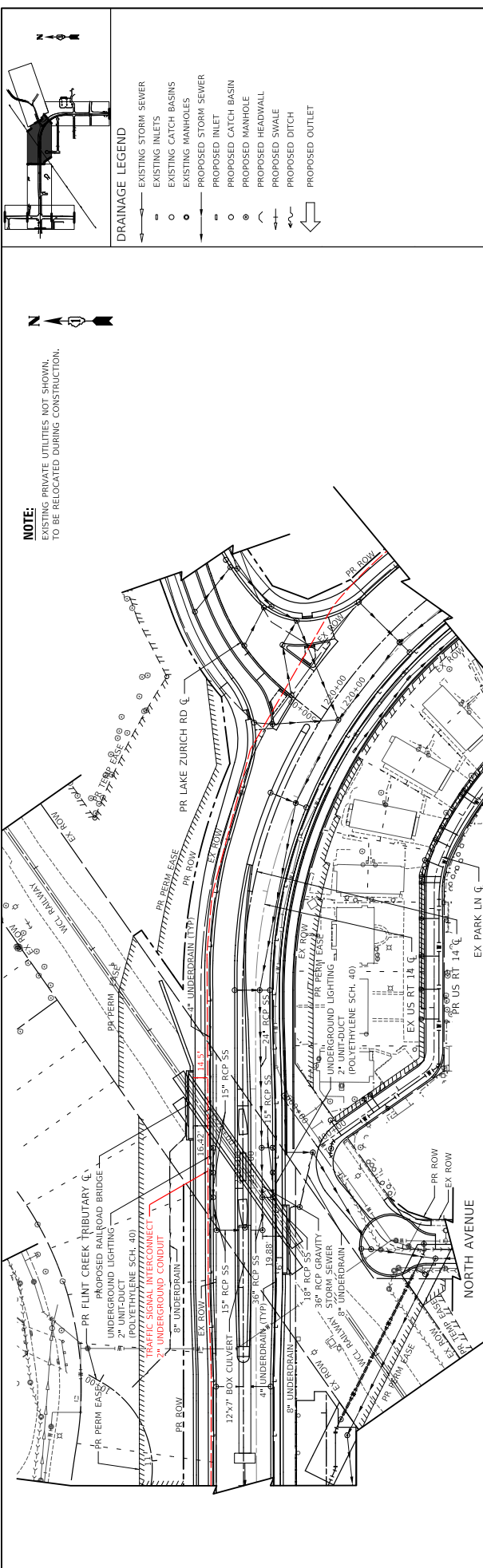
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	_____	_____
B. Outside Diameter:	_____	_____
C. Wall Thickness:	_____	_____
D. Pipe Material:	_____	_____
E. Specification/Grade or class:	_____	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below base of rail or top of ground. _____ft. (Closest point of utility to any base of rail or ground)	_____	
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)	_____	
U. Depth of pipe below the ground. (not beneath tracks)	_____ft.	
V. Depth of pipe below ditches.	_____ft.	
W. Distance from centerline of track to face of jacking/receiving pits.	_____ft.	
X. Depth from base of rail to bottom of jacking /receiving pits.	_____ft.	

Derek Mall
Name of Submitter

Derek N. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date




FAP 305 U.S. 14 (Northwest)
Section 15-00087-02 GS-80
Village of Barrington, Lake

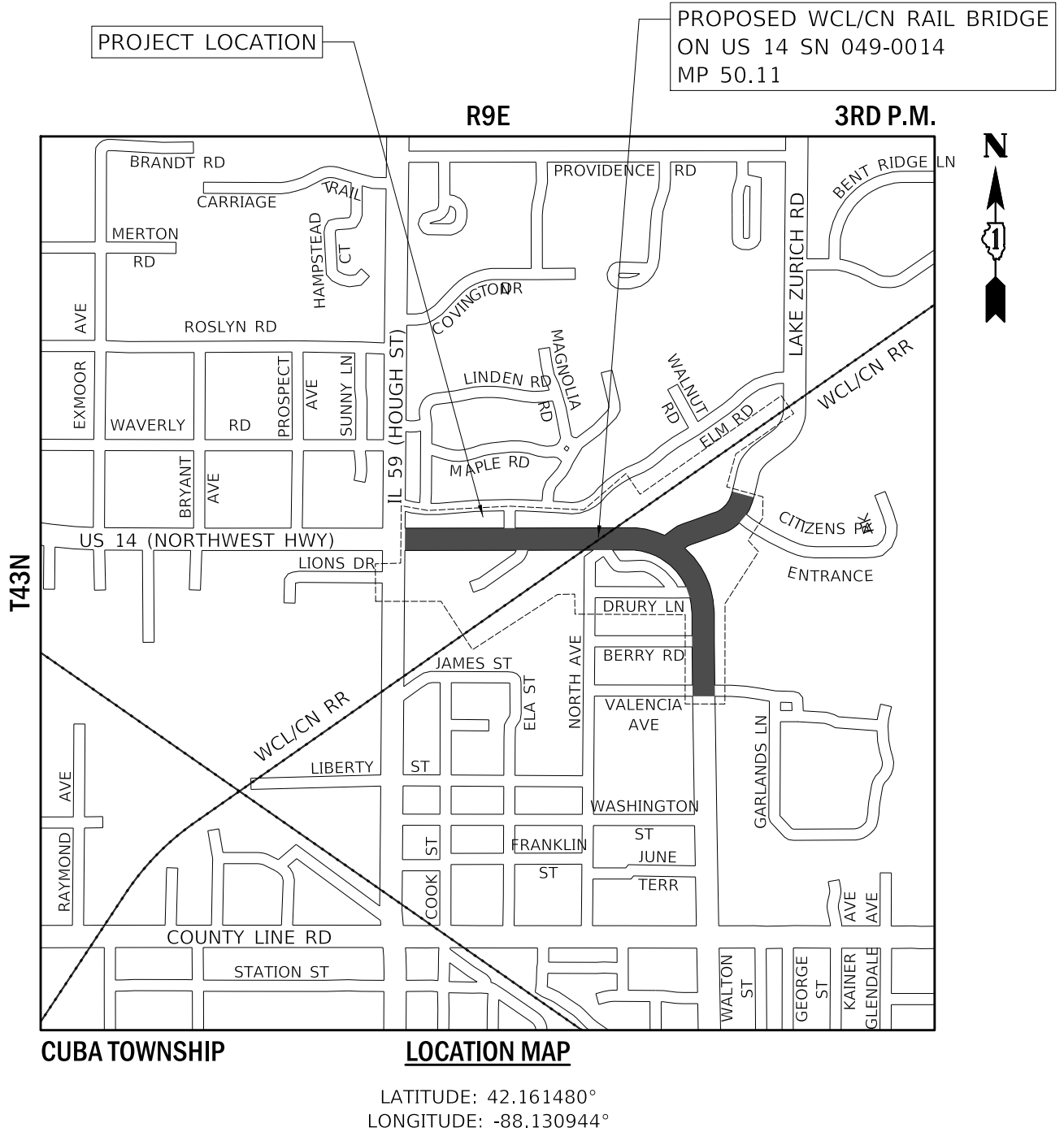
820
815
810
805
800
795
790
785
780

PROPOSED RAILROAD BRIDGE
EX RR ROW
PR SHOULDER EL. 818.15
EX PART AT PR PGL
EX RR ROW

UNDERGROUND LIGHTING
2" UNDERGROUND CONDUIT
TRAFFIC SIGNAL INTERCONNECT
2" UNDERGROUND CONDUIT
PR PGL
4" UNDERDRAIN
30' MIN. ROW
15' RCP 55
15' RCP 55
12"x7' BOX CULVERT
4" UNDERDRAIN
1.75'
4" UNDERDRAIN

819.57
819.51
812.50
819.36
810.50
808.50
819.25
806.50
819.16
804.50
819.01
818.99
802.50
800.50
818.79
798.58
818.61
797.00
818.39
795.80
818.15
794.97
817.90
794.53
817.73
794.46
817.59
794.77
817.28
795.45
816.88
796.52
816.50
797.96
816.18
799.78
815.92
801.78
815.64

 CMITech www.cmit-tech.com		Two River Plaza, Suite 1400 1400 N. 14th St. Milwaukee, WI 53233 Tel: 480.773.8800 Fax: 630.773.8979 Email: info@cmit-tech.com	DESIGNED - DRAWN - CHECKED - DATE -	214+00 215+00 216+00 217+00	218+00 219+00 220+00 221+00	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION				US ROUTE 14 TRAFFIC SIGNAL FIBER CROSSING				F.A.P. NO. SECTION COUNTY LAKE CONTRACT	SHEET OF SHEETS STA.	TOTAL SHEETS 61
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US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
36" GRAVITY STORM SEWER CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation
 Street: 201 West Center Court
 City: Schaumburg State: IL Zip: 60196-1096
 Contact Name and Title: Andy Rabadi, PE - Railroad Engineer
 Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____
 Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.
 Street: 2 Pierce Place, Suite 1400
 City: Itasca State: IL Zip: 60143
 Contact Name and Title: Derek Mall, PE - Senior Project Manager
 Phone Number: 630.735.3361 Consultant's Project #: _____
 Email Address: dmall@civiltechinc.com
 Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

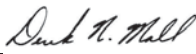
Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)
 Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)
 Village of Barrington County: Lake State: IL
 Utility Location – Railroad Mile Post: 50.11 plus 11.22 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)
 Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
 If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.161480 °, Longitude: -88.130944 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
 Name of Submitter


 Signature

630.735.3361
 Telephone #

11/13/2023
 Date

APPLICATION FOR UTILITY OCCUPANCY

WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

- ### A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
- ☐ New: ☐ Steel or ☐ Wood

- ### B. Number of Guys/Anchors on Property

- ### C. Cross arm Overhang

- #### D. Maximum Voltage

- E. Number of Wires/Cables/Pairs/Strands (please specify # and type)

- F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground

- ### G. Clearance Over Railroad Company's Wires

- #### H. Clearance Over Railroad Company's Tracks

- I. Casing Length (Property Line to Property Line)

- J. Size & Kind of Pipe or Duct

- K. Method: How is Pipe or Duct to be installed under the track (dry bore & jack, directional, tunnel, other – specify)

- #### L. Size and Type of Wire/Cable

- M. Insulated

- N. Bare/Open Wire

- O. Stranded

- P. Solid

- ### Q. Angle of Crossing

- R. Length of Span Crossing Tracks (unsupported length if above tracks)

6. Location References and Clearances of Facility (Encroachment)

- | | | |
|--|--------|-----|
| A. Width of Public Road (crossing track) | 65.167 | ft. |
| B. Distance From Each Facility (Encroachment) to Center Line of Main Track | | ft. |
| C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track | | ft. |
| D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower | | ft. |
| E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. | 19.88 | ft. |

Derek Mall
Name of Submitter

David H. Hall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☒ Sewer (specify type): Gravity storm
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

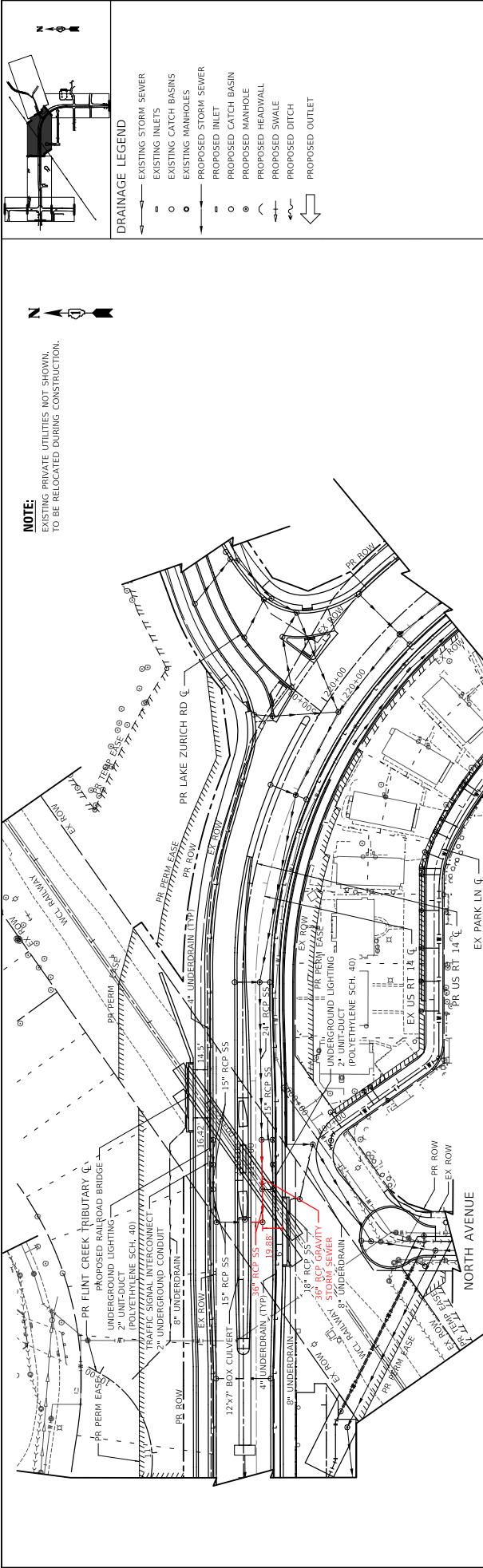
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>36in</u>	_____
B. Outside Diameter:	<u>40in</u>	_____
C. Wall Thickness:	<u>4in</u>	_____
D. Pipe Material:	<u>Concrete</u>	_____
E. Specification/Grade or class:	<u>Class A Type 2</u>	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>26.72</u> ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)	_____	
U. Depth of pipe below the ground. (not beneath tracks)	<u>2.67</u>	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

Derek Mall
Name of Submitter

Derek N. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date



Section 13-000007-02 GS, Contra

Village of Barrington, Lak

820
815
810
805
800
795
790
785
780

PROPOSED RAILROAD BRIDGE
EX RR ROW

EX RR ROW

PR SHOOFLY (EL. 818.15)

EX PANT AT PR PEL

UNDERGROUND LIGHTING
2" UNIDRIFT POLYETHYLENE SCH. 40

PR PEL

4" UNDERDRAIN

18" RCP SS

4" UNDERDRAIN


12"x7" BOX CULVERT

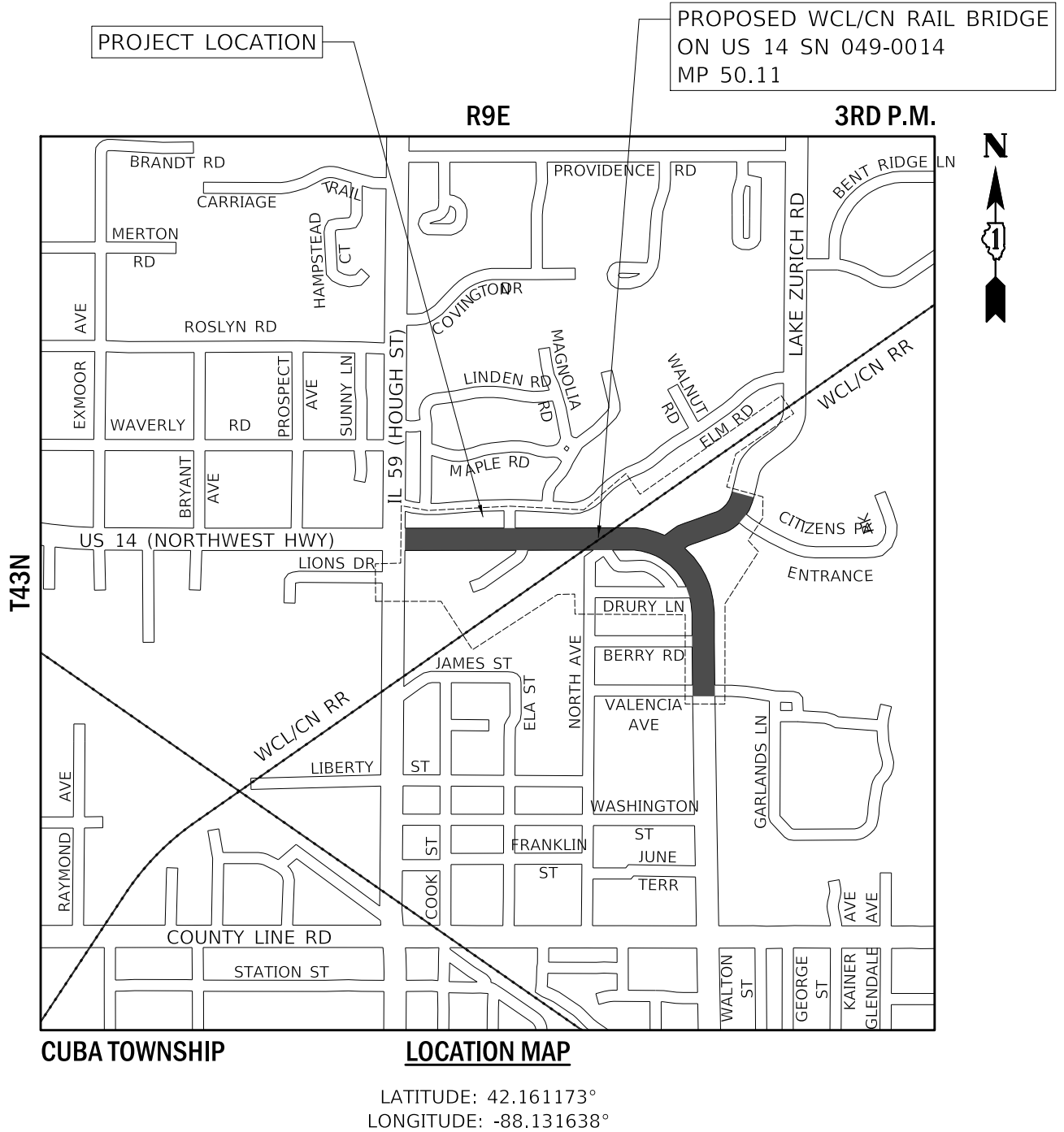
15" RCP SS

30" MINIMUM

30" RCP SS

814.50
819.57
812.50
819.51
810.50
819.36
808.50
819.25
806.50
819.16
819.01
802.50
818.89
800.50
818.79
798.58
818.61
797.00
818.39
795.80
818.15
794.97
817.90
794.53
817.73
794.46
817.59
794.77
817.28
795.45
816.88
796.52
816.50
799.36
816.18
799.78
815.92
801.78
815.64

 CH2M HILL Two Plaza Plaza, Suite 1400 Chicago, IL 60601-1000 Tel: 800.773.3000 Tel: 312.271.4000 Fax: 800.773.3095 www.ch2mhill.com	212+00	213+00	214+00	215+00	217+00	218+00	219+00	220+00	221+00	US ROUTE 14 36" STORM SEWER CROSSING STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	<table><tr><td colspan="2">F.A.P. RATE.</td><td colspan="2">SECTION</td><td colspan="2">TOTAL STATION</td></tr><tr><td colspan="2">305</td><td colspan="2">11-0087-00-55</td><td colspan="2">LAKE</td></tr><tr><td colspan="2"></td><td colspan="2"></td><td colspan="2">CONTRACT</td></tr><tr><td colspan="2"></td><td colspan="2"></td><td colspan="2">FED. AID PROJECT</td></tr></table>				F.A.P. RATE.		SECTION		TOTAL STATION		305		11-0087-00-55		LAKE						CONTRACT						FED. AID PROJECT	
	F.A.P. RATE.		SECTION		TOTAL STATION																																	
	305		11-0087-00-55		LAKE																																	
					CONTRACT																																	
					FED. AID PROJECT																																	
	DESIGNED -		REVISED -																																			
DRAWN -		REVISED -																																				
CHECKED -		REVISED -																																				
DATE -		DATE -		SAME																																		
PILOT SCALE = 1/8"= 50'		PILOT SCALE = 1/8"= 50'		PILOT SCALE = 1/8"= 50'																																		
PILOT DATE = 6/10/2004		PILOT DATE = 6/10/2004		PILOT DATE = 6/10/2004																																		



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
42" GRAVITY STORM SEWER CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation

Street: 201 West Center Court

City: Schaumburg State: IL Zip: 60196-1096

Contact Name and Title: Andy Rabadi, PE - Railroad Engineer

Phone Number: 847-705-4248 Owner/Sponsor's Project #:

Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #:

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence:

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus 220 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)


Utility Location – Railroad Mile Post: plus ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.161173 °, Longitude: -88.131638 °

Latitude: °, Longitude: °

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

- ### A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
- ☐ New: ☐ Steel or ☐ Wood

- ### B. Number of Guys/Anchors on Property

- C. Cross arm Overhang _____ ft.

- #### D. Maximum Voltage

- E. Number of Wires/Cables/Pairs/Strands (please specify # and type)

- F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

- G. Clearance Over Railroad Company's Wires _____ ft.

- H. Clearance Over Railroad Company's Tracks _____ ft.

- I. Casing Length (Property Line to Property Line) _____ ft.

- J. Size & Kind of Pipe or Duct

- K. Method: How is Pipe or Duct to be installed under the track (dry bore & jack, directional, tunnel, other – specify)

- #### L. Size and Type of Wire/Cable

- M. Insulated

- N. Bare/Open Wire

- O. Stranded

- P. Solid

- Q. Angle of Crossing _____ °

- R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

- A. Width of Public Road (crossing track) _____ ft.

- B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

- C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

- D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

- E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. _____ ft.

Derek Mall
Name of Submitter

David H. Hall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☒ Sewer (specify type): Gravity Storm
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

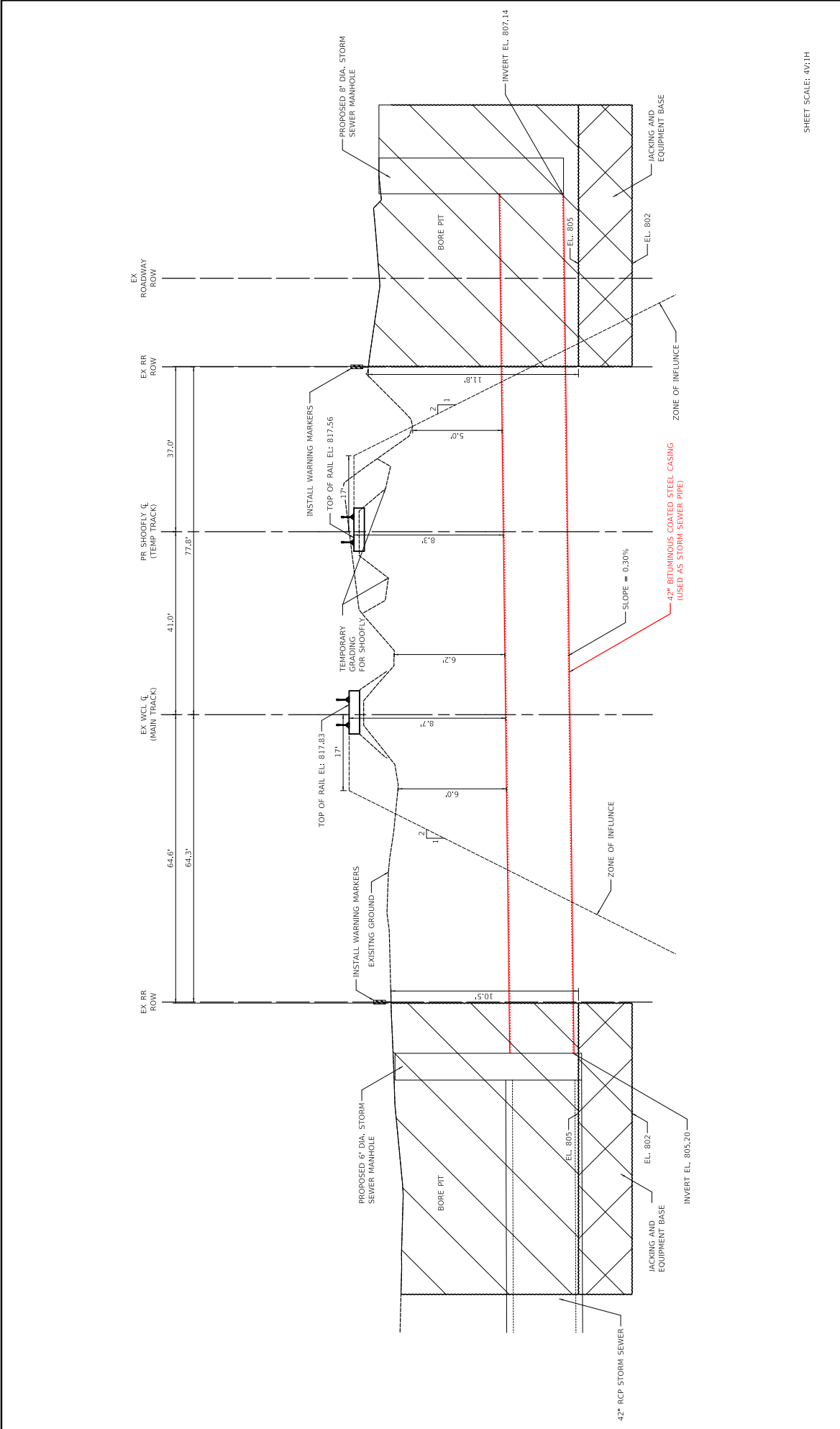
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>42in</u>	_____
B. Outside Diameter:	<u>42.63in</u>	_____
C. Wall Thickness:	<u>0.63in</u>	_____
D. Pipe Material:	<u>DIP</u>	_____
E. Specification/Grade or class:	<u>ASTM A 252, Grade 2</u>	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	<u>Electric seam, butt, or spiral welding</u>	_____
H. Name of Manufacturer	<u>To be provided by Contractor</u>	_____
I. Type of Joint	_____	_____
J. Working Pressure	<u>N/A</u>	_____
K. Maximum operating pressure (by gauge)	_____	_____ psi
L. Length of Casing pipe:	_____	_____ ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	<u>Y / N</u>	_____
N. Hydrostatic pressure carrier pipe test pressure	_____	_____ psi
O. Will casing pipe be vented?	<u>Y / N</u>	_____
P. Pipe Vent Size:	_____	_____ in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	<u>Y / N</u>	_____
R. Protective Coating Type	<u>Bituminous Coated</u>	_____
S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>8.3</u> ft. (Closest point of utility to any base of rail or ground)	_____	_____ ft.
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)	<u>Dry bore & jack</u>	_____
U. Depth of pipe below the ground. (not beneath tracks)	<u>5.01</u>	_____ ft.
V. Depth of pipe below ditches.	<u>Ditch (1) 6.06 ft (2) 6.20 ft (3) 5.01</u>	_____ ft.
W. Distance from centerline of track to face of jacking/receiving pits.	<u>Jack-64.3 ft, Receive-97.7</u>	_____ ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	<u>12.6</u>	_____ ft.



Derek Mall
Name of Submitter

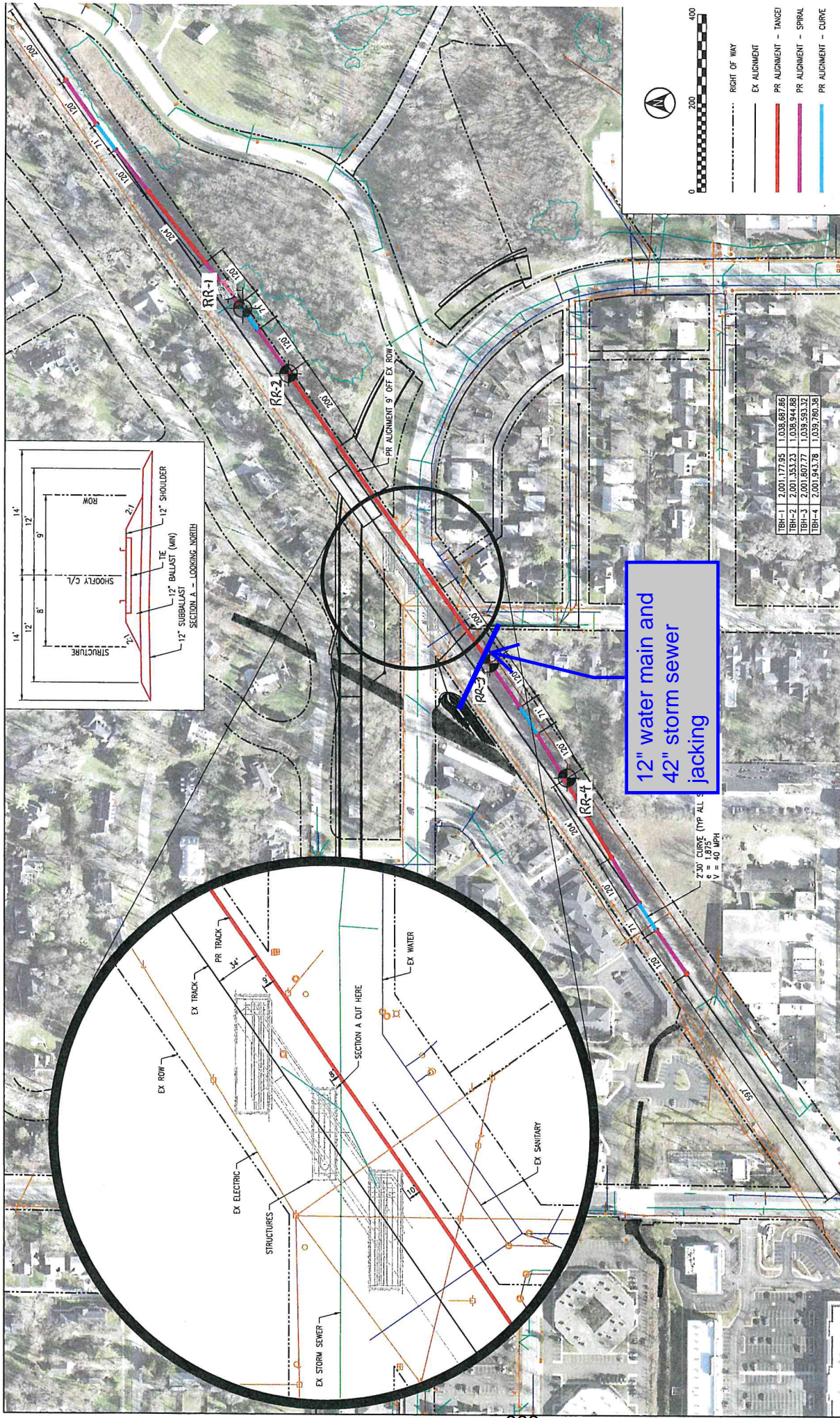
Derek N. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date



7. 6. 5. 4. 3. 2. 1.	US ROUTE 14 GRADE SEPARATION			CHICAGO DIVISION LEIGHTON SUB	 Two Plaza Place, Suite 1400 Barrington, Illinois 60015 Tel: 830.773.3800 Fax: 830.773.3875 www.civiltech.com	US ROUTE 14 F.A.U. RTE: 0305 SECTION: 11-0087-00-GS COUNTY: LAKE CONTRACT:	 Southern Region	DESIGN	DRAWN	CHECKED	APPROVED	DRAWING No.
	CADD FILE NAME: 11-3509-4H1-CN RR SS Profile.dgn							SHEET TITLE: 42" STORM SEWER CROSSING MAIN WCL CENTERLINE STA. 1223+12	B-02			
	ISSUE FOR:									DATE:	09/20/2022	
	DATE:									2	OF 2	





WWW.MSETINC.COM

MIDLAND STANDARD ENGINEERING & TESTING, INC.

410 Nolen Drive South Elgin, Illinois 60177

(847) 844-1895 f(847) 844-3875

July 2, 2021

Mr. Derek Mall, P.E.
Civiltech Engineering, Inc.
Two Pierce Place, Suite 1400
Itasca, Illinois 60143

Re: Geotechnical Exploration and Analysis
US Route 14 Grade Separation at WCL
Railroad Shoofly Alignment
IDOT Section 11-00087-00-GS
Barrington, Illinois
MSET Project No. 20618

Dear Mr. Mall:

MSET has completed the field exploration work and analysis of the subgrade conditions for the referenced project. This report was prepared for use in the preparation of the project design plans.

Purpose

The purpose of this exploration was to determine the subgrade conditions a proposed temporary railroad realignment. Using this information along with the project data provided, design criteria and recommendations have been prepared for use by the Design Engineers in preparing the plans and specifications.

Scope

The scope of this exploration and analysis included review of the available information from previous work conducted in the area; field and laboratory testing; analysis of the data obtained; formulation of our recommendations and preparation of this report. The field exploration included making four (4) soil borings to a depth of twenty-five (25) feet below the current ground surface.

PROJECT LOCATION AND DESCRIPTION

Project Location and Description

This portion of the main project is located on the east side of the existing railroad tracks, from roughly 1350 feet NE of Route 14 to 1100 feet SW of Route 14 within the RR Right- of-Way. The main line rail alignment will be temporarily offset 34 feet to the east to allow for the construction of a bridge crossing of the Route 14 underpass.

FIELD EXPLORATION

General

The procedures for this exploration were conducted in accordance with the appropriate Illinois Department of Transportation Standards. The borings were supervised by a field engineer from Midland Standard Engineering & Testing, Inc. The soil specimens were transported to our laboratory for testing and analysis. Our project engineer has directed all phases of this investigation.

Drilling Equipment

The soil boring was drilled using an ATV mounted drill rig equipped with a rotary head. Hollow stem augers were used to advance the boreholes.

Sampling and Standard Penetration Test Procedures

Representative samples were obtained by the use of split-spoon sampling procedures in accordance with ASTM Procedure D-1586.

During the split-spoon sampling procedures, a standard penetration test was performed in accordance with current ASTM D-1586 Procedures. At sampling intervals, advancement of the boring was stopped and all loose material removed from the borehole. The sampler was then lowered into the borehole and seated in undisturbed soil by pushing or tapping, taking suitable precautions that the rods were reasonably tight. The sampling spoon was then driven using an automatic drop hammer. During the sampling procedure, the standard penetration value (N) of the soil was determined. The standard penetration value (N) is defined as the number of blows of a one hundred-forty pound (140 lb) hammer required to advance the spoon sampler one foot (12") into the soil.

The results of the standard penetration tests indicated the relative density and comparative consistency of the soils and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components. The results of standard penetration tests can be found on the attached boring logs.

Strength Tests

A calibrated hand penetrometer was used to aid in determining the strength and consistency of cohesive soil samples (Q_p) in the field. Split spoon samples were subjected to unconfined compressive strength testing (Q_u) by the RIMAC Method as modified by IDOT. Consideration must be given to the manner in which the values of the unconfined compressive strength were obtained. Split-spoon sampling techniques provide a representative, but somewhat disturbed soil sample.

Water Level Measurements

Water level observations were made during and immediately after the boring operations and are noted on the attached boring logs. In relatively pervious, sandy soils, the water level elevations would be considered reliable. In relatively impervious, clayey soils, the accurate determination of the groundwater elevation may not be possible, even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table, and volumes of water will depend on the permeability of the soils.

LABORATORY TESTING

Scope

A supplemental laboratory-testing program was conducted to ascertain additional pertinent engineering characteristics of the foundation materials necessary in analyzing the behavior of the proposed construction. The soils laboratory work was performed in accordance with applicable ASTM standards.

The laboratory-testing program included supplementary visual classification, unconfined compressive strength on cohesive samples, and moisture contents on all samples. The results of laboratory testing are reported on the boring logs that are attached.

SUBSURFACE CONDITIONS

Subgrade Soil Conditions

The soil profile encountered in the borings made for the realignment are 10 to 18 inches of Black CLAY Topsoil. Underlying the Topsoil at RR-1 is an 18-inch layer of stiff, dark grey and grey CLAY, A-7-6 that extends to a depth of 3 feet. The moisture content, Mc of the CLAY, A-7-6 is 25 percent and the unconfined compressive strength, Qu is 1.55 tons per square foot. At RR-3 the surficial Topsoil is underlain by a thin layer of Silty LOAM A-2-4 FILL, and then natural Black CLAY Topsoil to 3 feet.

Below these shallow depth layers, and below the Topsoil at RR-2 and RR-4 is slightly to medium dense Sandy LOAM with Gravel, A-2-4 changing to SAND with Gravel, A-1 with an occasional layer of SAND, A-3. These granular materials become saturated and extend to depths of 10.5 feet (RR-1) to 21.5 feet (RR-2).

Below the granular layers, stiff to very stiff and occasionally hard Grey CLAY A-6 was present to a depth of 25 feet. The Mc measured in the CLAY ranges from 14 to 23 percent and the Qu ranges from 1.5 to 5.66 tsf, with one sample at Qu of 0.66 tsf at a depth of 18.5 feet in RR-1.

Details of the soil conditions at each boring location are presented on the attached boring logs.

Groundwater Conditions

Groundwater measurements were made during and immediately after drilling operations were completed. Groundwater was measured at a depth of 5.5 feet at boring RR-1 the north boring and at 7.5 to 10.5 feet at the other three borings. The Details of the groundwater measurements at each boring location are presented on the attached boring logs.

SHOOFLY TRACK

Planned Track Cross Section

The temporary run around track is about 2500 feet long and 34 feet from the existing track centerline on the east side of the ROW. The planned track cross section consists of a 17 foot wide, twelve inch thick ballast and railroad tie section supported by a 28 foot wide, twelve inch sub-ballast layer. The total thickness of the rail, ties, ballast, and sub-ballast is 38 inches, soil subgrade to top of rail. The ground surface along the proposed shoofly is lower in some areas than the exiting track and new embankment FILL will be placed to meet design rail grades.

SUBGRADE RECOMMENDATIONS

Topsoil Depth

The measured Topsoil depth at the four borehole locations is 10 to 18 inches for earthwork estimates. The Topsoil depth is not always easy to determine and in many cases dark colored transitional soil is present just below the rooted soil. The contractor should base his cost estimate on his own measurements.

General Subgrade Preparation

It is anticipated that the grade of the realigned tracks will match the existing track grade and that roughly five feet of embankment FILL, Sub-ballast, and Ballast will be required to support the tracks.

Topsoil and surface vegetation should be stripped to the suitable subgrade soil along the proposed full width of the rail embankment alignment. The alignment should then be inspected by proof-rolling with a loaded semi-dump truck, rubber tired end loader or similar equipment with a wheel load sufficient to locate any soft or unstable areas. Soft or unstable subgrade areas that cannot be repaired with discing, drying, and recompaction procedures should be undercut and replaced with a well-graded granular material. Initial project costs should allow for some subgrade undercutting and replacement with stone and geotechnical fabric in wet conditions.

Areas identified by the soil borings as requiring subgrade treatment prior to filling are outlined in 'Subgrade Treatment Areas' below.

Subgrade Treatment Areas

The table on the following page outlines the lower strength subgrade soil areas identified by the soil borings and the recommended subgrade treatment prior to embankment FILL placement.

Summary of Earthwork Remedial Treatment Areas

Boring	Subgrade Conditions	Treatment Depth	Treatment Material
RR-1	CLAY, A-7-6 Mc=25%, Qu=1.55 tsf Groundwater at 5.0 feet	18"	Note 2
RR-2	Sandy LOAM, w/Gravel A-2-4, N=8 bpf	NA	Note 1
RR-3	Sandy LOAM, w/Gravel A-2-4, N=9 bpf	NA	Note 1
RR-4	Sandy LOAM, w/Gravel A-2-4, N=10 bpf	NA	Note 1

Subgrade Treatment Notes

1. Remove surface vegetation, roots, topsoil to the depth encountered, then disk, dry, and compact exposed soil. Then place and compact embankment fill where required or sub-ballast/ballast in lifts to design grade. Each lift of new embankment FILL to widen the embankment should be notched two feet into the existing embankment so that a slip plane old to new is not created, reference attached detail.
2. Replacement Materials or Treatment: Remove low strength soil to depth shown in the table above and replace with Geotechnical Fabric placed on the undercut subgrade follow with an 18-inch lift of open graded aggregate. The open graded aggregate should be 3 to 6 inch top size crushed stone or crushed concrete, equivalent to IDOT PGES/Aggregate Subgrade Improvement. The Geotechnical Fabric should meet the requirements of Article 1080.02 Fabric for Ground Stabilization of the IDOT Standard Specification for Road and Bridge Construction. The undercut should be made with a backhoe, followed by placement of the fabric and aggregate backfill by pushing the material into place. No equipment should drive directly on the undercut soil subgrade. Then place and compact embankment fill where required or sub-ballast/ballast in lifts to design grade.

Embankment Fill

The fill is required to raise the embankment grade, material used as Structural FILL should be a medium to low plasticity cohesive (clay type) material, classified as 'CL' or a clean (low fines content) granular material such as 'SP', 'SW', 'GP' or 'GW', in accordance with ASTM D-2487, Classification of Soils for Engineering Purposes. The FILL should be placed in 9-inch maximum lifts loose measure and compacted to 95 percent of the maximum dry density as defined by ASTM D-1557. The FILL placed to widen the existing embankment should be stepped or benched into the existing material as shown on "Benching Detail for Embankment Widening" attached to this report.

Surface and Groundwater Control

Groundwater was not encountered near the surface at the time of drilling. Excavations to remove topsoil at this site are not expected to expose groundwater. The recommended undercut at the north end of the new temporary embankment will expose soil near the water table and the excavation should be made with a backhoe followed with fabric and stone backfill installed by pushing into place.

Closure

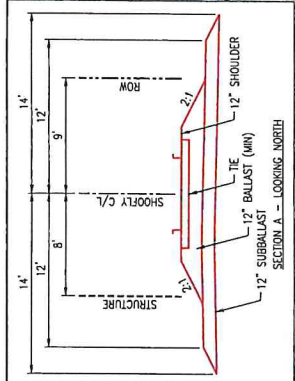
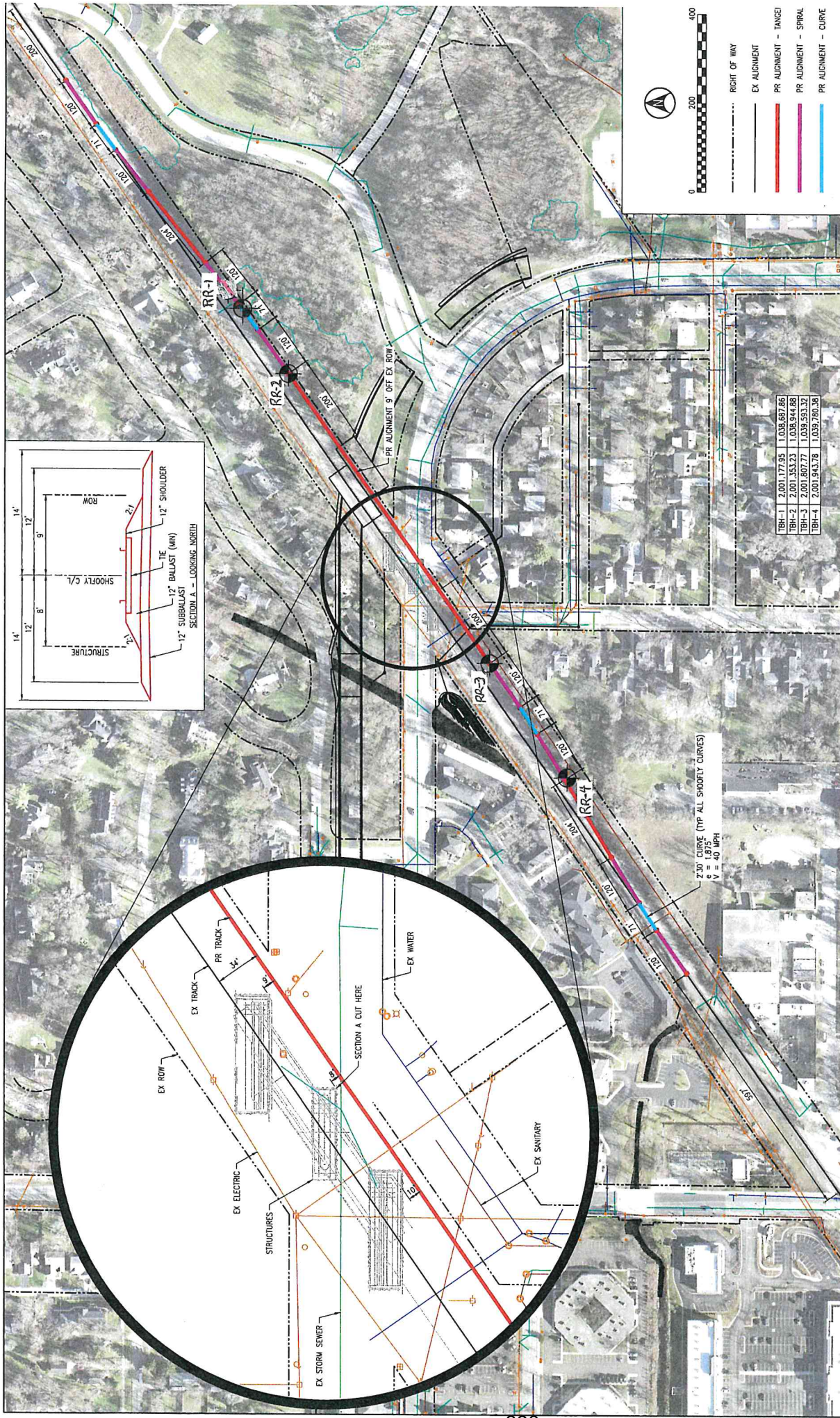
The report is based on the information available at this time and as the design progresses, we would be happy to review the soil conditions relevant to the proposed construction. Thank you for the opportunity to offer our services. If you should have any questions regarding this report, please feel free to call.

Very truly yours,
MIDLAND STANDARD ENGINEERING & TESTING, INC.



William J. Wyzgala, P.E.
Principal

Attachments: Boring Location Diagram
Boring Logs (RR-1 through RR-4)
Benching Detail for Embankment Widening
General Notes



RIGHT OF WAY

EX ALIGNMENT

PR ALIGNMENT - TANGENT

PR ALIGNMENT - SPIRAL

PR ALIGNMENT - CURVE

7.	DESIGN	DRAWN	CHECKED	APPROVED	DRAWING NO.
6.	TEG	TEG	TEG	TEG	EX-001
5.	CADD FILE NAME: ShooFly Concept				
4.	SHEET TITLE:				
3.	SHOOFLY CONCEPT				
2.	40 MPH				
1.	DATE: 01/21/2021				
No.	SHEET: 1 OF 1				

1475 E. WOODFIELD RD., SUITE 600
SCHUMBERG, IL 60173
(847) 865-8600

US ROUTE 14
TO STA.

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:

CHICAGO DIVISION

MATTESON SUB

US ROUTE 14 GRADE SEPARATION

BARRINGTON, ILLINOIS

OPERATING COMPANY: WCL

2021-02-08



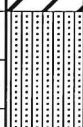
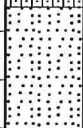
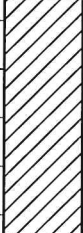
1. ADDED BORINGS: TURNED ON WETLANDS

2. ISSUE FOR:

TBN-1	2,001.177.95	1,035.687.86
TBN-2	2,001.353.23	1,035.944.88
TBN-3	2,001.607.77	1,035.593.32
TBN-4	2,001.943.78	1,035.760.38

230' CURVE (TYP ALL SHOOFLY CURVES)
E = 1.875'
V = 40 MPH

PROJECT: **Route 14 Underpass Phase 2**SITE LOCATION: **Barrington, Illinois**BORING LOCATION: **Station 1213+40, 25' L**CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE			TESTS			REMARKS
				TYPE/ INTERVAL	NO.	N-VALUE Blows per ft.	Wc %	Dry Unit Weight, pcf	Unconfined Compressive Strength, tsf	
0		Topsoil - Black CLAY A-7-6 to A-8 (18"), stiff	812.8	SS	1A	4	26	91	2.06	no recovery
		Dark Grey and Light Grey CLAY, A-7-6, stiff	811.3	SS	1B	6	25	88	1.55	
4		Dark Brown and Black Sandy LOAM (f-c) with Gravel, A-2-4, slightly dense	809.8	SS	2	9	15			
		Brown SAND (f-c) with Gravel, A-1, wet, medium dense	807.3	SS	3	17	14			
8				SS	4	22				
		probable Boulder at 10.0'								
12		Grey CLAY with intermittent Sand and Gravel seams, A-6, wet, very stiff	802.3	SS	5	50	13		2.79	
				SS	6	20				
16		Grey CLAY, A-6, stiff to firm	797.3	SS	7	12	23		1.90	
20		with Gravel hard		SS	8	11	17		0.66	
				SS	9	24	18		5.63	4.5 + Qp
24				SS	10	17	16			
		End of Boring at 25'	787.8							

WATER LEVEL OBSERVATIONS, ft.

DURING DRILLING:

IMMEDIATELY AFTER DRILLING:

DELAYED READING AFTER

 5.5'
 5.0'



MSET

BORING STARTED:

BORING COMPLETED:

LOGGED BY:

BORING METHOD:

6/17/21

6/17/21

GPF

HSA

MSET PROJECT NO.: 20618		LOG OF BORING NO. RR-2			Page 1 of 1		
PROJECT: Route 14 Underpass Phase 2				SITE LOCATION: Barrington, Illinois			
BORING LOCATION: Station 1215+40, 27' L				CLIENT: Civiltech Engineering, Inc.			

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE			TESTS			REMARKS
				TYPE/ INTERVAL	NO.	N-VALUE Blows per ft.	Wc%	Dry Unit Weight, pcf	Unconfined Compressive Strength, tsf	
0	[Symbol: wavy lines]	Topsoil - Black CLAY (10")	816.0							
		Dark Brown to Brown Sandy LOAM (f-c) with Gravel, A-2-4, slightly to medium dense	815.2	SS	1	8	12			
4				SS	2	15	7			
				SS	3	23	10			
8	[Symbol: dots]	Brown SAND (f-c), A-3, wet, slightly dense	808.0	SS	4	8	17			
12	[Symbol: dots]	Grey Sandy LOAM (fine), A-2-4, wet, loose	805.5	SS	5	4	23			
	[Symbol: dots]	Grey SAND (f-c) with Gravel, A-1, wet, slightly to medium dense	803.0	SS	6	7	12			
16				SS	7	14	11			
				SS	8	22				
20				SS	9A	14	13			
	[Symbol: diagonal lines]	Grey CLAY, A-6, stiff to very stiff	794.5	SS	9B	9	14			-- 1.5 Qp
24				SS	10	13	17			2.5 Qp
		End of Boring at 25'	791.0							

WATER LEVEL OBSERVATIONS, ft. DURING DRILLING: 8.0' IMMEDIATELY AFTER DRILLING: 7.5' DELAYED READING AFTER: [Symbol: wavy lines]	 MSET	BORING STARTED: 6/17/21 BORING COMPLETED: 6/17/21 LOGGED BY: GPF BORING METHOD: HSA
---	-----------------	--

PROJECT: **Route 14 Underpass Phase 2**SITE LOCATION: **Barrington, Illinois**BORING LOCATION: **Station 1223+11, 35' L**CLIENT: **Civiltech Engineering, Inc.**

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE			TESTS			REMARKS
				TYPE/ INTERVAL	NO.	N-VALUE Blows per ft.	Wc%	Dry Unit Weight, pcf	Unconfined Compressive Strength, tsf	
0		Topsoil - Black CLAY (10")	817.5							
		FILL - Dark Brown and Black Sandy LOAM (f-c) with Gravel, A-2-4, slightly dense	816.7	SS	1A	9	13		--	
			815.5	SS	1B	8	20		4.5 + Qp	
		Black CLAY, A-7-6 to A-8, hard	814.5							
4		Brown Sandy LOAM (f-c) with Gravel, A-2-4, medium dense		SS	2	20	5			
				SS	3	15	11			
8		Brown and Grey SAND (f-c) with Gravel, A-1, medium dense	810.0	SS	4	17	8			
		Grey SAND (f-c) with Gravel, A-1, wet, medium dense to dense	807.0	SS	5	21	13			
12		probable Cobble at 13.5'		SS	6	34	8			
				SS	7	20	15			
16				SS	8	14	18		3.57	
20		Grey CLAY, A-6, very stiff	799.5	SS	9	14	21		2.10	
				SS	10	9	20		1.98	
24		End of Boring at 25'	792.5							

WATER LEVEL OBSERVATIONS, ft.

DURING DRILLING:

IMMEDIATELY AFTER DRILLING:

DELAYED READING AFTER


 10.5'
11.5'


MSET

BORING STARTED: 6/17/21

BORING COMPLETED: 6/17/21

LOGGED BY: GPF

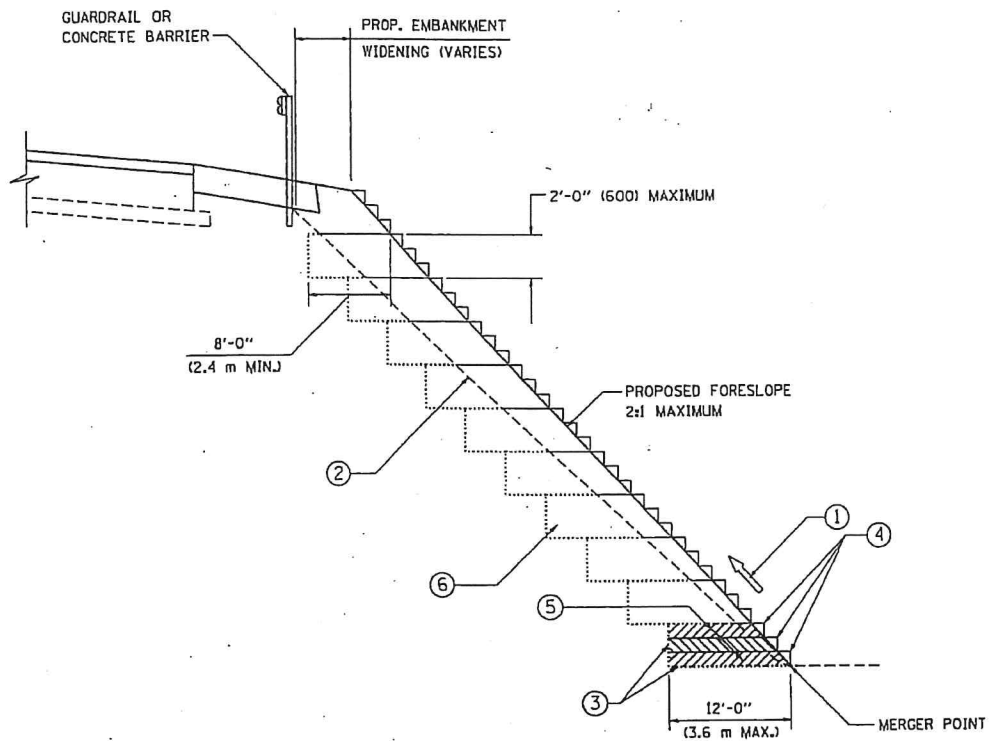
BORING METHOD: HSA

MSET PROJECT NO.: 20618		LOG OF BORING NO. RR-4				Page 1 of 1			
PROJECT: Route 14 Underpass Phase 2					SITE LOCATION: Barrington, Illinois				
BORING LOCATION: Station 1226+20, 28' L					CLIENT: Civiltech Engineering, Inc.				

DEPTH (feet)	SOIL TYPE	Material Description	Elevation	SAMPLE			TESTS			REMARKS
				TYPE/ INTERVAL	NO.	N-VALUE Blows per ft.	Wc%	Dry Unit Weight, pcf	Unconfined Compressive Strength, tsf	
0		Topsoil - Black CLAY (14")	814.1							
		Brown and Grey Sandy LOAM (f-c) with Gravel, A-2-4, medium dense	812.9	SS	1	10	17			
4				SS	2	11	14			
		Brown and Grey SAND (f-c) with Gravel, A-1, medium dense probable Cobble at 7.0'	808.6	SS	3	24	9			
8		Grey SAND (f-c) with Gravel, A-1, wet, dense	806.1	SS	4	32	9			
12		Grey CLAY with intermittent Sand seams, A-6, wet, hard	803.6	SS	5	16	18	113	5.04	
		Grey SAND (f-c) with Gravel, A-1, wet, medium dense probable Boulder at 15.0'	801.1	SS	6	26	10			
16		Grey CLAY, A-6, stiff to very stiff	798.6	SS	7	11	22		1.5 Qp	
				SS	8	12	20		1.75	
20				SS	9	13				no recovery
24				SS	10	10	21	110	2.10	
		End of Boring at 25'	789.1							

WATER LEVEL OBSERVATIONS, ft. DURING DRILLING: 8.0' IMMEDIATELY AFTER DRILLING: 9.0' DELAYED READING AFTER	 MSET	BORING STARTED: <u>6/17/21</u> BORING COMPLETED: <u>6/17/21</u> LOGGED BY: <u>GPF</u> BORING METHOD: <u>HSA</u>
--	-----------------	--

Midland Standard Engineering & Testing, Inc. 410 Nolen Drive, South Elgin, Illinois 60177 (847) 844-1895 f(847) 844-3875
 894



**TYPICAL BENCHING DETAIL
FOR EMBANKMENT**

NOTES:

- ① CONSTRUCT SUCCEEDING BENCH CUTS AND EMBANKMENT PLACEMENT AND COMPACTION FROM BOTTOM TO TOP IN STAIRSTEP FASHION.
- ② EXISTING FORESLOPE PREPARED IN ACCORDANCE WITH ARTICLE 205.03 OF THE STANDARD SPECIFICATIONS.
- ③ BENCH CUT EXISTING SLOPE TYPICAL FOR EACH STEP.
- ④ TRIM TO FINAL SLOPE.
- ⑤ EQUAL 8-INCH (200) LIFTS OF EMBANKMENT COMPACTED IN ACCORDANCE WITH ARTICLE 205.05 OF THE STANDARD SPECIFICATIONS.
- ⑥ EXCAVATION OF BENCH CUTS WITHIN EXISTING EMBANKMENT WILL BE PAID FOR AT THE CONTRACT UNIT PRICE PER CUBIC METER OR CUBIC YARD FOR "EARTH EXCAVATION". THIS PRICE WILL INCLUDE ALL LABOR AND MATERIAL, NO ADDITIONAL COMPENSATION WILL BE ALLOWED.
- ⑦ SLOPES SHALL BE BENCHED ACCORDING TO THIS DETAIL WHEN THE SLOPE IS STEEPER THAN 4:1 AND THE HEIGHT IS GREATER THAN 5' (1.5 m).

ALL DIMENSIONS ARE IN INCHES (MILLIMETERS)
UNLESS OTHERWISE SHOWN.

REVISIONS		ILLINOIS DEPARTMENT OF TRANSPORTATION	
NAME	DATE		
		BENCHING DETAIL FOR EMBANKMENT WIDENING	
SCALE: VERT. NONE HORIZ. NONE		DRAWN BY: CHECKED BY: BD-51	

GENERAL NOTES

PARTICLE SIZE DESCRIPTION & TERMINOLOGY

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and the fine grained soils on the basis of their strength or consistency and their plasticity.

Major Component of Sample	Size Range	Descriptive Term of Components Also Present in Sample	Approximate Quantity (Percent)
Boulders	Over 8 in. (200 mm)		
Cobbles	8 inches to 3 inches (200 mm to 75mm)	Trace	1 - 9
Gravel	3 inches to #4 sieve (75mm to 4.75mm)	Little	10 - 19
Sand	#4 to #200 sieve (4.75mm to 0.075mm)	Some	20 - 34
Silt	Passing #200 sieve (0.075mm to 0.002mm)	And	35 - 50
Clay	Smaller than 0.002mm		

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

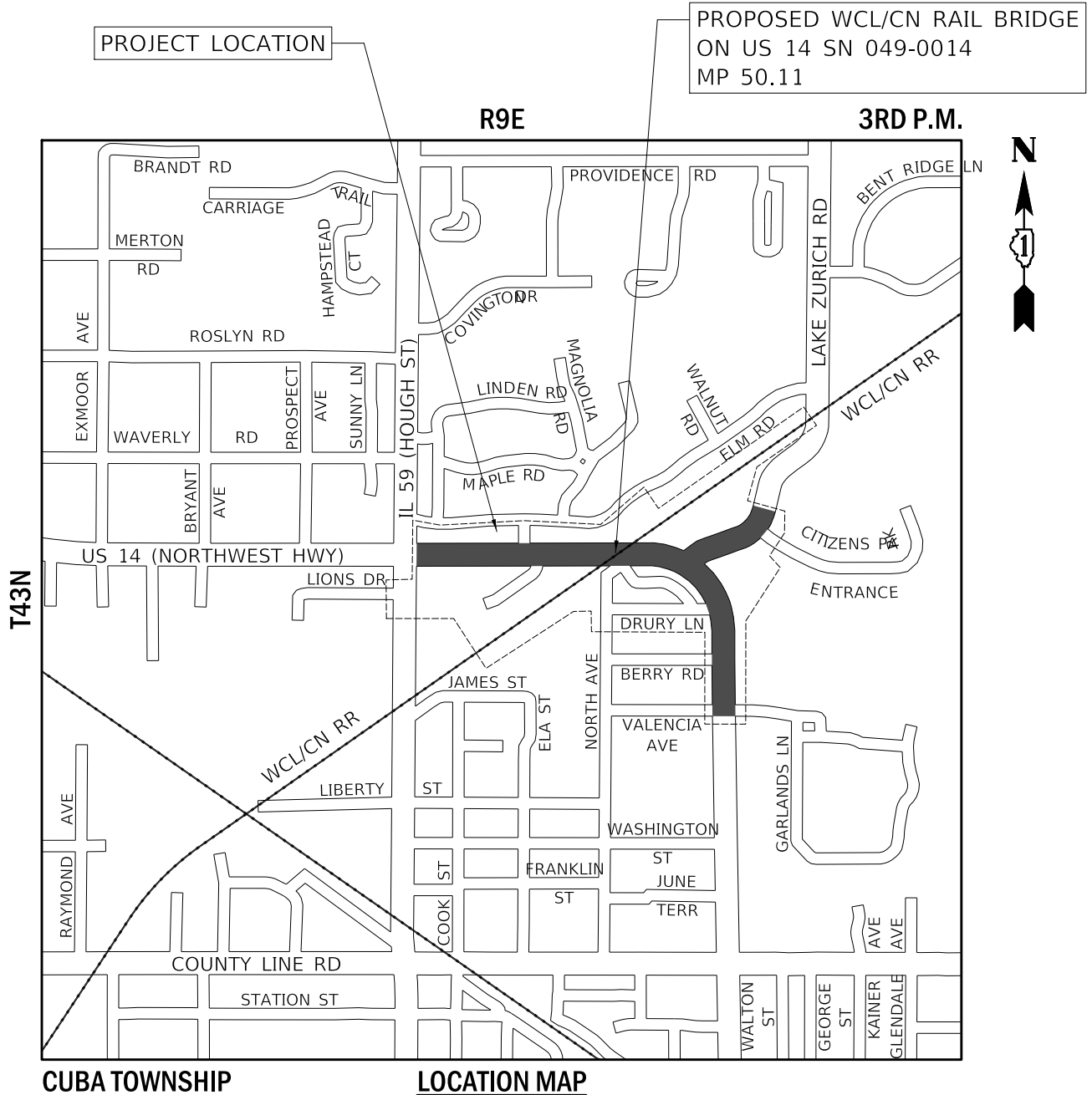
GRANULAR SOILS

DENSITY CLASSIFICATION	APPROXIMATE RANGE OF N *
Very Loose	0 - 3
Slightly Dense	4 - 9
Medium Dense	10 - 29
Dense	30 - 49
Very Dense	50 - 80
Extremely Dense	80 +

COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH, Qu - TSF	APPROXIMATE RANGE OF N *
Very Soft	0.25	0 - 2
Soft	0.25 - 0.49	3 - 4
Firm	0.50 - 0.99	5 - 8
Stiff	1.00 - 1.99	9 - 15
Very Stiff	2.00 - 3.99	16 - 30
Hard	4.00 - 8.00	31 - 50
Very Hard	8.00 +	Over 50

*STANDARD PENETRATION TEST (ASTM D1586) - A 2.0" outside-diameter, split barrel sampler is driven into undisturbed soil by means of a 140 pound weight falling freely through a vertical distance of 30 inches. The sampler is normally driven 3 successive 6 inch increments. The total number of blows required for the final 12 inches of penetration is the Standard Penetration Resistance (N).



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:
...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
12' x 7' BOX CULVERT CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation

Street: 201 West Center Court

City: Schaumburg State: IL Zip: 60196-1096

Contact Name and Title: Andy Rabadi, PE - Railroad Engineer

Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____

Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #: _____

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus -19.32 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)


Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1615521 °, Longitude: -88.1309078 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood _____
☐ New: ☐ Steel or ☐ Wood _____

B. Number of Guys/Anchors on Property _____

C. Cross arm Overhang _____ ft.

D. Maximum Voltage _____

E. Number of Wires/Cables/Pairs/Strands (please specify # and type) _____

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

G. Clearance Over Railroad Company's Wires _____ ft.

H. Clearance Over Railroad Company's Tracks _____ ft.

I. Casing Length (Property Line to Property Line) _____ ft.

J. Size & Kind of Pipe or Duct _____

K. Method: How is Pipe or Duct to be installed under the track _____
(dry bore & jack, directional, tunnel, other – specify)

L. Size and Type of Wire/Cable _____

M. Insulated _____

N. Bare/Open Wire _____

O. Stranded _____

P. Solid _____

Q. Angle of Crossing _____ °

R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) 65.167 ft.


B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. 31.75 ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☒ Sewer (specify type): Gravity storm
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☒ Other (please specify): 12x7 Box Culvert
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

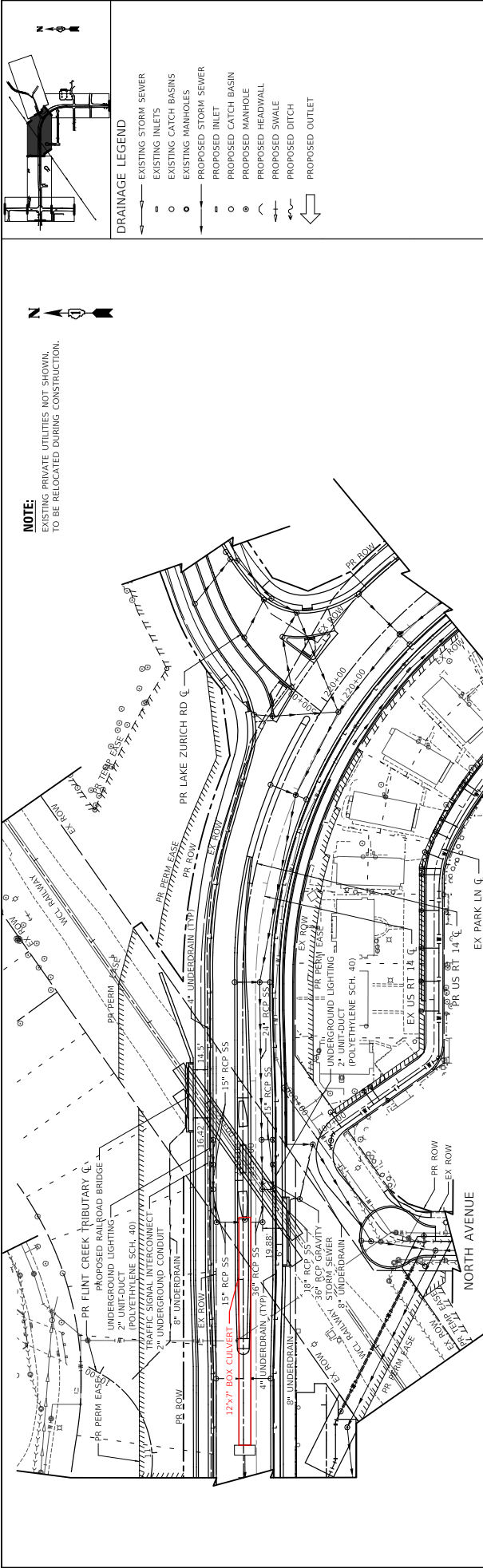
	CARRIER PIPE	CASING PIPE
A. Inside Diameter: Box Culvert Size:	<u>12ft x 7ft</u>	_____
B. Outside Diameter:	_____	_____
C. Wall Thickness:	_____	_____
D. Pipe Material:	<u>Concrete</u>	_____
E. Specification/Grade or class:	_____	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below base of rail or top of ground. _____ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe _____ (Dry bore & jack, directional, tunnel, other – specify)		
U. Depth of pipe below the ground. (not beneath tracks)	<u>3.18</u>	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

Derek Mall
Name of Submitter

Derek H. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date



Section 13-00087-02 GS, Contra

Village of Barrington, Lak

820

815

810

805

800

795

790

785

780

PROPOSED RAILROAD BRIDGE

EX RR ROW

PR SHOOFLY (EL. 818.15)

EX PANT AT PR PEL

UNDERGROUND LIGHTING
2" UNID-DOET (POLYETHYLENE SCH. 40)

PR PEL

4" UNDERDRAIN

18" RCP SS

30" MINIMUM

15" RCP SS

36" RCP SS

12'x7' BOX CULVERT

814.50

819.57

812.50

819.51

810.50

819.36

808.50

819.25

806.50

819.16

819.01

802.50

818.89

800.50

818.79

818.61

797.00

818.39

795.80

818.15

794.97

817.90

794.53

817.73

794.46

817.59

794.77

817.28

795.45

816.88

796.52

816.50

797.96


816.18

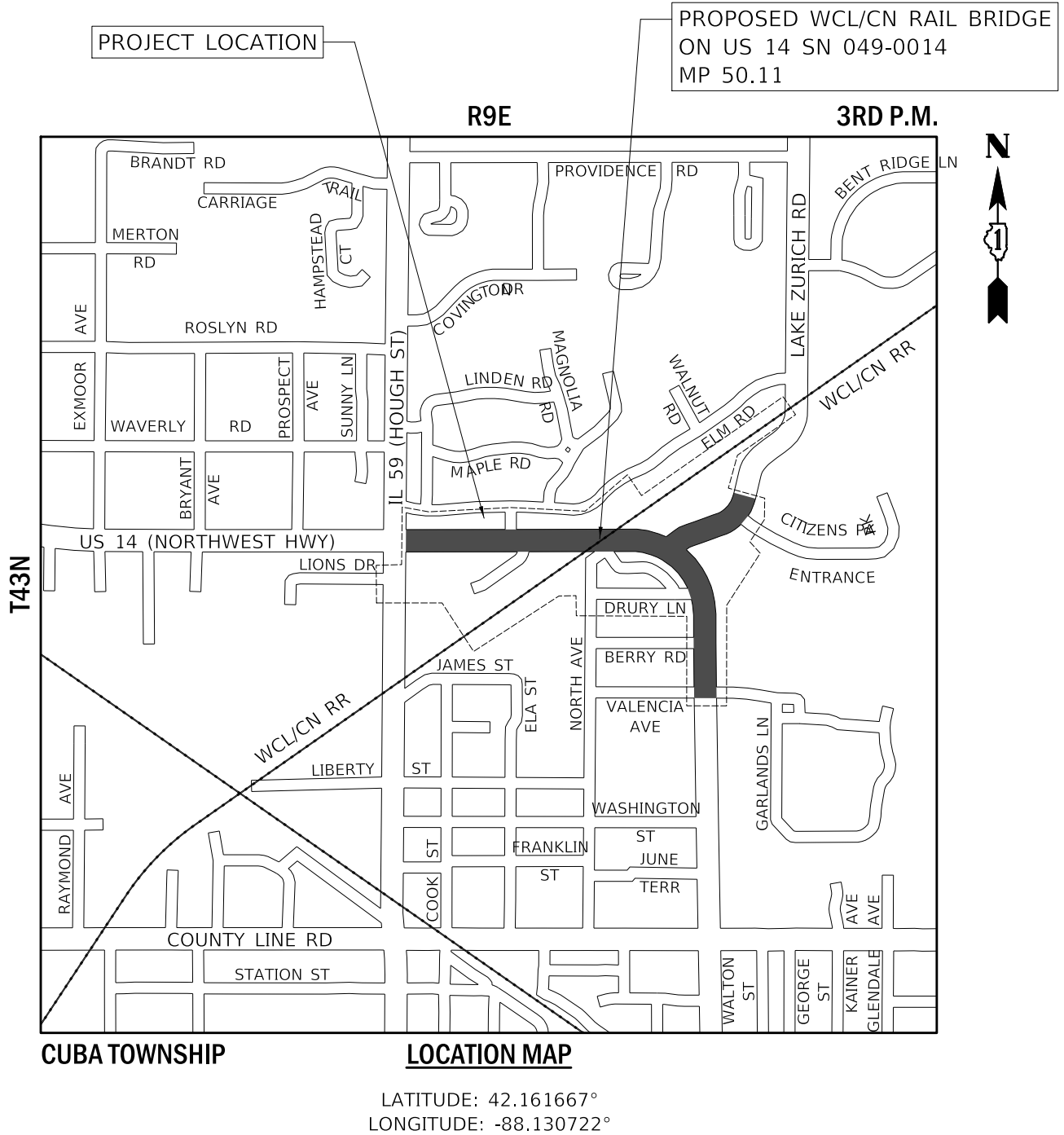
799.78

815.92

801.78

815.64

 CH2M HILL TRANSPORTATION 14000 E. Harvard Ave. Suite 1400 Denver, CO 80231 Tel: 800.773.3800 Fax: 800.773.3895 www.ch2mhill.com	212+00	213+00	214+00	215+00	217+00	218+00	219+00	220+00	221+00	US ROUTE 14 12' x 7' BOX CULVERT CROSSING STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	<table><tr><td colspan="2">F.A.P. RATE.</td><td>SECTION</td><td>TOTAL SHEETS</td></tr><tr><td>305</td><td>11-0087-00-55</td><td>LAKE</td><td>COUNTY</td></tr><tr><td colspan="2">CONTRACT</td><td>NO.</td><td>DATE</td></tr><tr><td colspan="2">FED. AID PROJECT</td><td>ILLINOIS</td><td>FED. AID PROJECT</td></tr></table>				F.A.P. RATE.		SECTION	TOTAL SHEETS	305	11-0087-00-55	LAKE	COUNTY	CONTRACT		NO.	DATE	FED. AID PROJECT		ILLINOIS	FED. AID PROJECT
	F.A.P. RATE.		SECTION	TOTAL SHEETS																										
	305	11-0087-00-55	LAKE	COUNTY																										
	CONTRACT		NO.	DATE																										
	FED. AID PROJECT		ILLINOIS	FED. AID PROJECT																										
	DESIGNED -		REVISED -																											
DRAWN -		REVISED -																												
CHECKED -		REVISED -																												
DATE = 6/6/2004		PILOT DATE = 10/08/09 / J.L.																												
PILOT DATE = 6/6/2004		PILOT DATE = SAME																												
PILOT DATE = 6/6/2004		PILOT DATE = 6/6/2004																												



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS

OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
24" STORM SEWER CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation

Street: 201 West Center Court

City: Schaumburg State: IL Zip: 60196-1096

Contact Name and Title: Andy Rabadi, PE - Railroad Engineer

Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____

Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #: _____

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus 10.35 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)


Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1615055 °, Longitude: -88.1309976 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
☐ New: ☐ Steel or ☐ Wood

B. Number of Guys/Anchors on Property

C. Cross arm Overhang

D. Maximum Voltage

E. Number of Wires/Cables/Pairs/Strands (please specify # and type)

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground

G. Clearance Over Railroad Company's Wires

H. Clearance Over Railroad Company's Tracks

I. Casing Length (Property Line to Property Line)

J. Size & Kind of Pipe or Duct

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify)

L. Size and Type of Wire/Cable

M. Insulated

N. Bare/Open Wire

O. Stranded

P. Solid


Q. Angle of Crossing

R. Length of Span Crossing Tracks (unsupported length if above tracks)

6. Location References and Clearances of Facility (Encroachment)

- | | |
|--|-------------------|
| A. Width of Public Road (crossing track) | <u>65.167</u> ft. |
| B. Distance From Each Facility (Encroachment) to Center Line of Main Track | _____ ft. |
| C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track | _____ ft. |
| D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower | _____ ft. |
| E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. | <u>20.66</u> ft. |

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☒ Sewer (specify type): Gravity storm
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

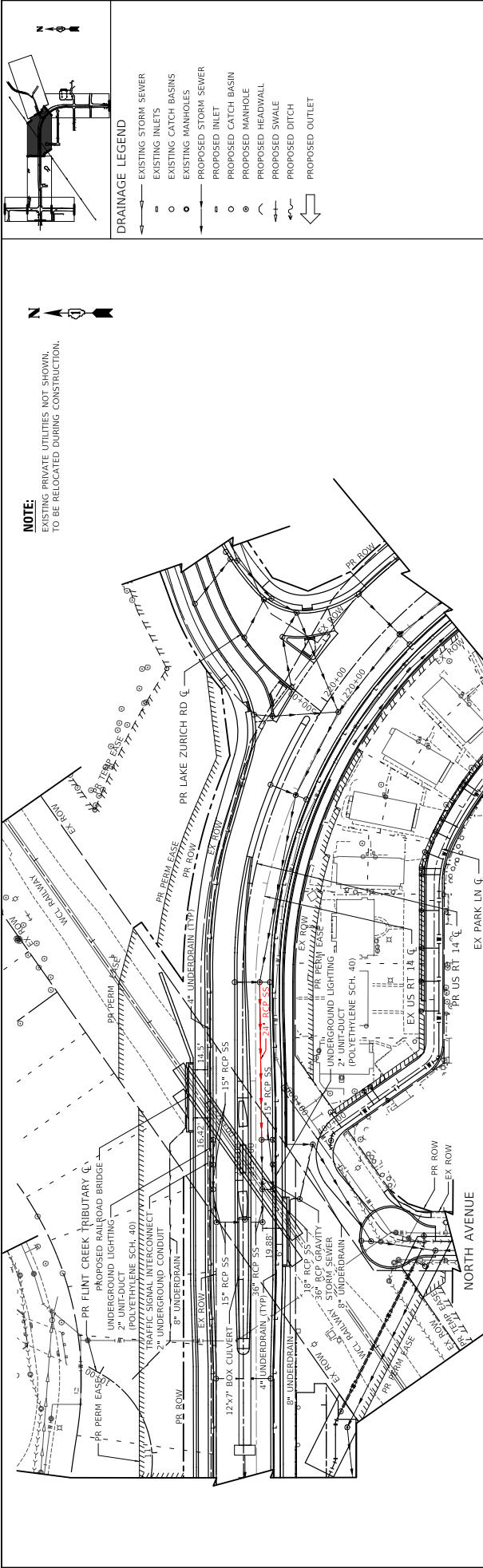
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>24in</u>	_____
B. Outside Diameter:	<u>27in</u>	_____
C. Wall Thickness:	<u>3in</u>	_____
D. Pipe Material:	<u>Concrete</u>	_____
E. Specification/Grade or class:	<u>Class A Type 1</u>	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below base of rail or top of ground. _____ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe _____ (Dry bore & jack, directional, tunnel, other – specify)		
U. Depth of pipe below the ground. (not beneath tracks)	<u>3.38</u>	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date



Section 13-00000-02 GS, Contra

Village of Barrington, Lak

820 815 810 805 800 795 790 785 780

814.50 819.57 812.50 819.51 810.50 819.36 808.50 819.25 806.50 819.16 819.01 802.50 818.89 800.50 818.79 798.58 818.61 797.00 818.39 795.80 818.15 794.97 817.90 794.53 817.73 794.46 817.59 794.77 817.28 795.45 816.88 796.52 816.50 816.18 799.78 815.92 801.78 815.64

PROPOSED RAILROAD BRIDGE

EX RR ROW

PR SHOOFLY (EL. 818.15)

EX PANT AT PR PEL

UNDERGROUND LIGHTING
2" UNID-DOET (POLYETHYLENE SCH. 40)

PR PEL

4" UNDERDRAIN

18" RCP SS

30" MINIMUM


15" RCP SS

38" RCP SS

32'x7' BOX CULVERT

4" UNDERDRAIN

72" RCP SS


CHILTECH
 Trans-Plex Paper, Sales 1400
 Tel: 800-773-3800
 Fax: 800-773-3895
www.chiltech.com

212+00

213+00

214+00

215+00

217+00

218+00

219+00

220+00

221+00

USER NAME: **mc**

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DRAWN -

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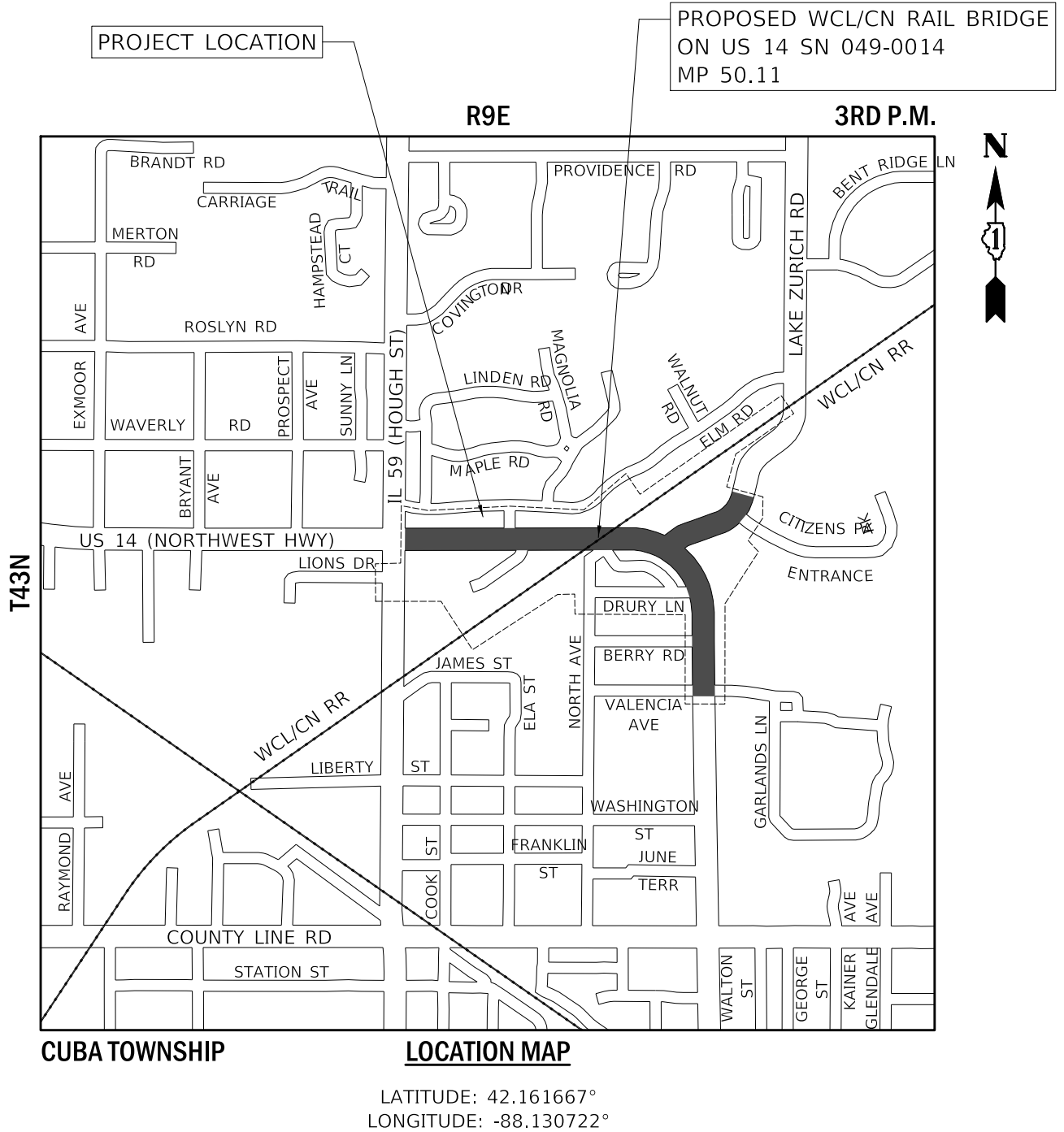
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US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:
...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
18" STORM SEWER CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation

Street: 201 West Center Court

City: Schaumburg State: IL Zip: 60196-1096

Contact Name and Title: Andy Rabadi, PE - Railroad Engineer

Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____

Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #: _____

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus 11.22 ft.

(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)

Utility Location – Railroad Mile Post: 50.11 plus 29.70 ft.

(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)


Please provide the coordinates for the point at which the utility will cross over or under the track(s).

If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1615041 °, Longitude: -88.1310002 °

Latitude: 42.1614751 °, Longitude: -88.1310561 °

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

- ### A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
- ☐ New: ☐ Steel or ☐ Wood

- ### B. Number of Guys/Anchors on Property

- ### C. Cross arm Overhang

- #### D. Maximum Voltage

- E. Number of Wires/Cables/Pairs/Strands (please specify # and type)

- F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground

- ### G. Clearance Over Railroad Company's Wires

- #### H. Clearance Over Railroad Company's Tracks

- I. Casing Length (Property Line to Property Line)

- J. Size & Kind of Pipe or Duct

- K. Method: How is Pipe or Duct to be installed under the track (dry bore & jack, directional, tunnel, other – specify)

- #### L. Size and Type of Wire/Cable

- M. Insulated

- N. Bare/Open Wire

- O. Stranded

- P. Solid

- ### Q. Angle of Crossing

- R. Length of Span Crossing Tracks (unsupported length if above tracks)

6. Location References and Clearances of Facility (Encroachment)

- | | | |
|--|--------|-----|
| A. Width of Public Road (crossing track) | 65.167 | ft. |
| B. Distance From Each Facility (Encroachment) to Center Line of Main Track | | ft. |
| C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track | | ft. |
| D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower | | ft. |
| E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. | 9.58 | ft. |

Derek Mall
Name of Submitter

David H. Hall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☒ Sewer (specify type): Gravity Storm
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

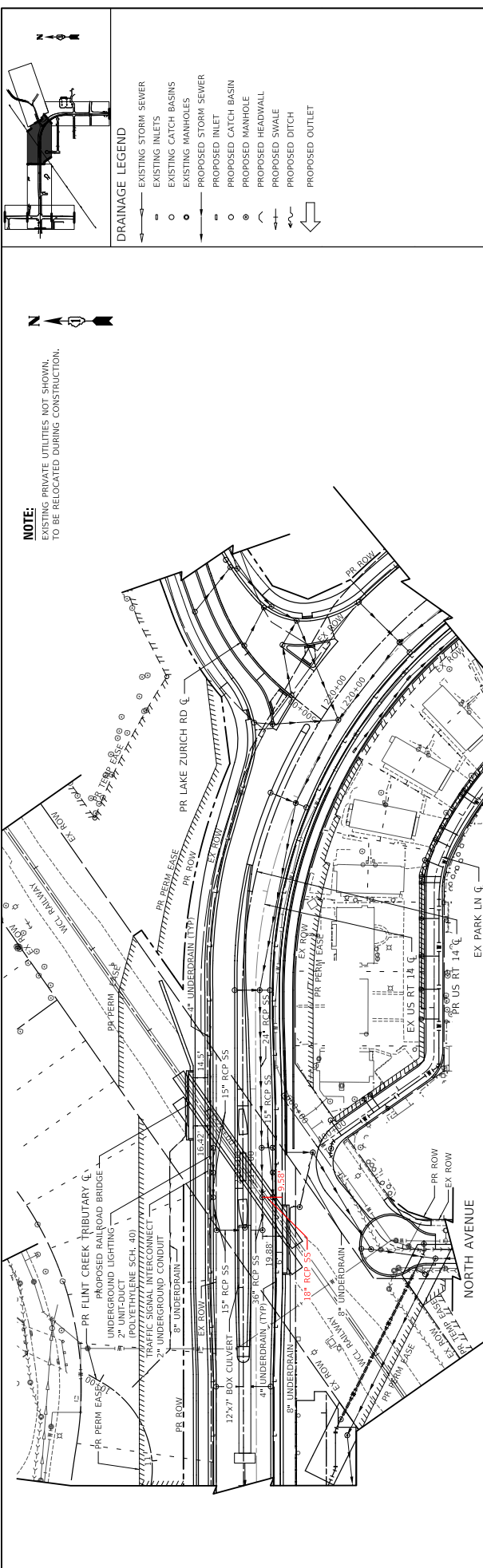
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>18in</u>	_____
B. Outside Diameter:	<u>20.5in</u>	_____
C. Wall Thickness:	<u>2.5in</u>	_____
D. Pipe Material:	<u>Concrete</u>	_____
E. Specification/Grade or class:	<u>Class A Type 2</u>	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>29.57</u> ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)	_____	
U. Depth of pipe below the ground. (not beneath tracks)	<u>3.71</u>	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

Derek Mall
Name of Submitter


Derek N. Mall
Signature

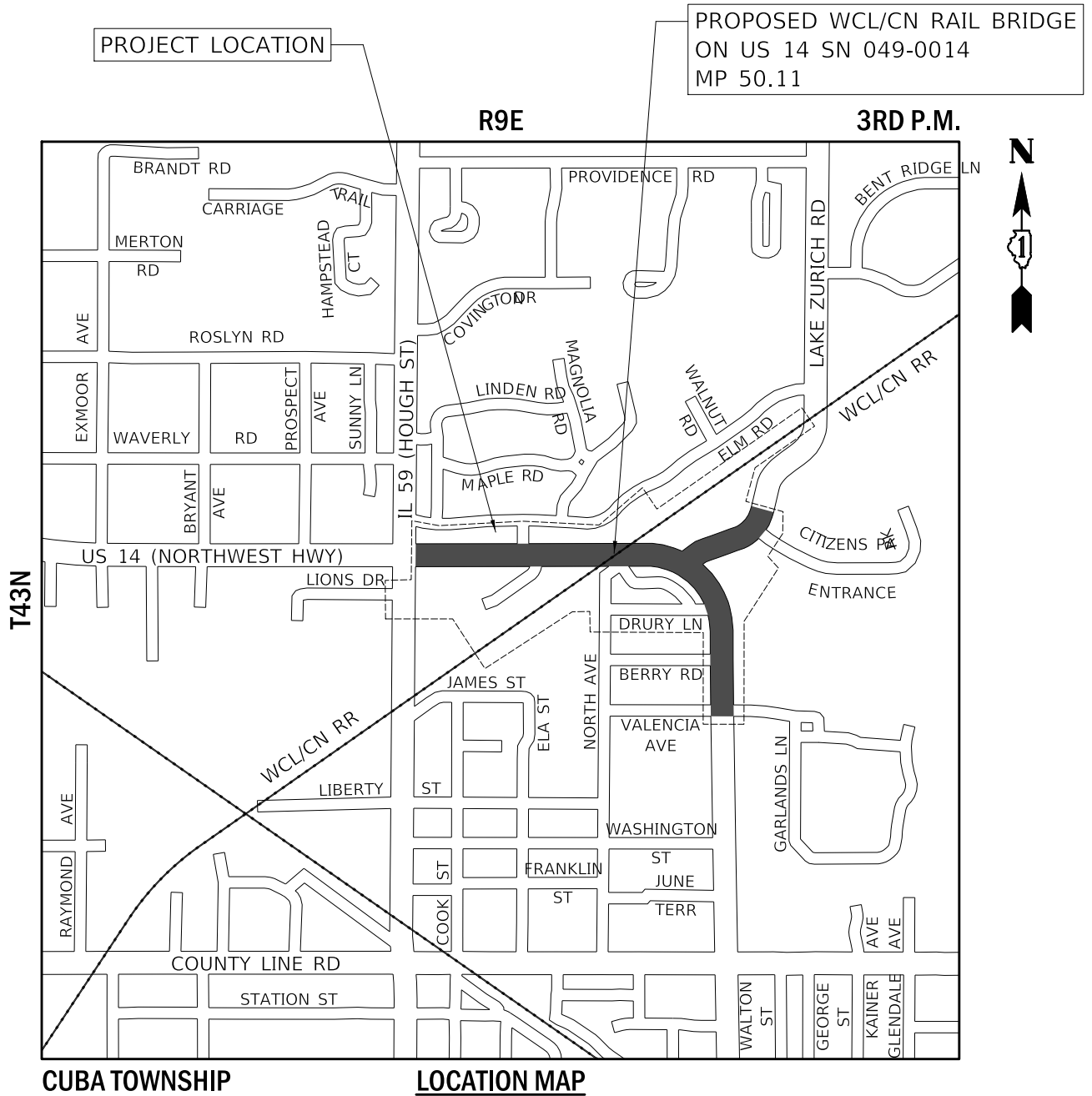
630.735.3361
Telephone #

11/13/2023
Date



Station	815	810	805	800	795	790	785	780
820	815	810	805	800	795	790	785	780

 CMI TECH Two River Plaza, Suite 1400 1400 N. 1st St. Milwaukee, WI 53212 Tel: 480.773.8800 Fax: 480.773.8875 www.cmithech.com		USER NAME ■ ■ ■ ■ ■ DESIGNED ■ DRAWN ■ PLOT SCALE ■ 10.0000' / 1" ■ CHECKED ■ DATE ■ 06/20/24 PLOT DATE ■ 06/20/24	213+00 214+00 215+00 216+00 217+00 218+00 219+00 220+00 221+00	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION				US ROUTE 14 18" STORM SEWER CROSSING				F.A.P. NO. RTE. 305	SECTION 13+000B+00-65	COUNTY LAKE	TOTAL SHEETS 6	SHEET NO. 61			
SCALE: 1" = 50'												SHEET	OF	SHEETS	STA.	TO STA.	ILLINOIS FED. AID PROJECT		



CUBA TOWNSHIP

LOCATION MAP

LATITUDE: 42.161667°
LONGITUDE: -88.130722°

US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
15" STORM SEWER CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation

Street: 201 West Center Court

City: Schaumburg State: IL Zip: 60196-1096

Contact Name and Title: Andy Rabadi, PE - Railroad Engineer

Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____

Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #: _____

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus 10.35 ft.

(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)

Utility Location – Railroad Mile Post: 50.11 plus 29.70 ft.

(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)


Please provide the coordinates for the point at which the utility will cross over or under the track(s).

If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1615055 °, Longitude: -88.1309976 °

Latitude: 42.1614751 °, Longitude: -88.1310561 °

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood _____
☐ New: ☐ Steel or ☐ Wood _____

B. Number of Guys/Anchors on Property _____

C. Cross arm Overhang _____ ft.

D. Maximum Voltage _____

E. Number of Wires/Cables/Pairs/Strands (please specify # and type) _____

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

G. Clearance Over Railroad Company's Wires _____ ft.

H. Clearance Over Railroad Company's Tracks _____ ft.

I. Casing Length (Property Line to Property Line) _____ ft.

J. Size & Kind of Pipe or Duct _____

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify) _____

L. Size and Type of Wire/Cable _____

M. Insulated _____

N. Bare/Open Wire _____

O. Stranded _____

P. Solid _____

Q. Angle of Crossing _____ °

R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) 65.167 ft.


B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. 9.58 ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☒ Sewer (specify type): Gravity Storm
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

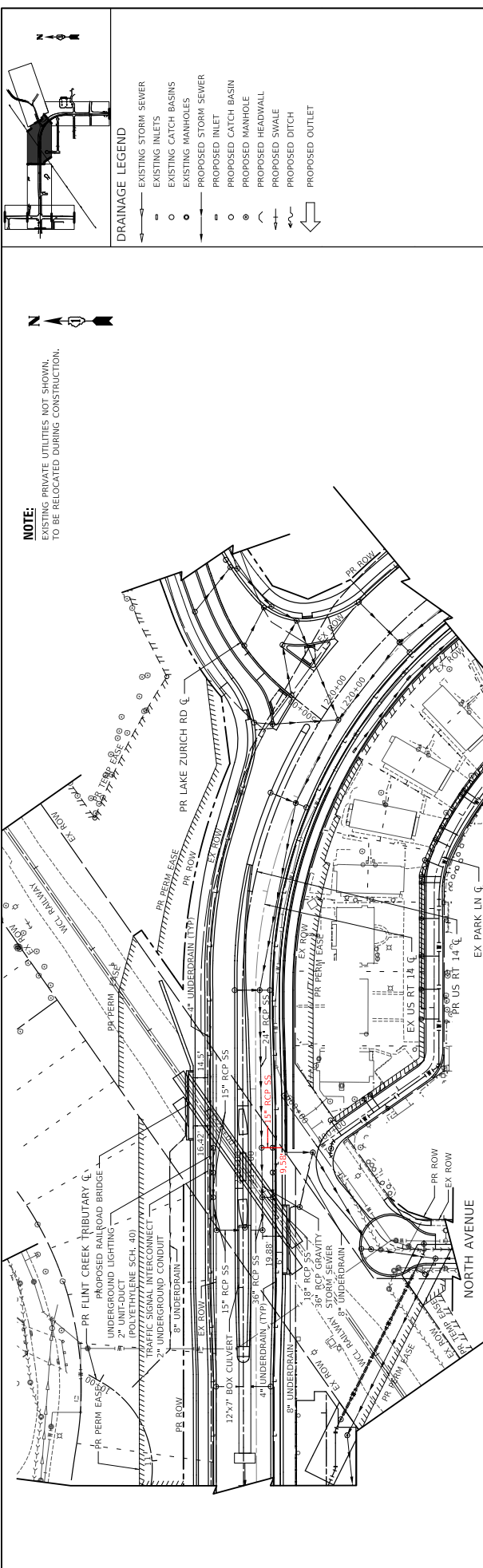
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>15in</u>	_____
B. Outside Diameter:	<u>17.25in</u>	_____
C. Wall Thickness:	<u>2.25in</u>	_____
D. Pipe Material:	<u>Concrete</u>	_____
E. Specification/Grade or class:	<u>Class A Type 2</u>	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below base of rail or top of ground. _____ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe _____ (Dry bore & jack, directional, tunnel, other – specify)		
U. Depth of pipe below the ground. (not beneath tracks)	<u>3.31</u>	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

Derek Mall
Name of Submitter


Signature


630.735.3361
Telephone #

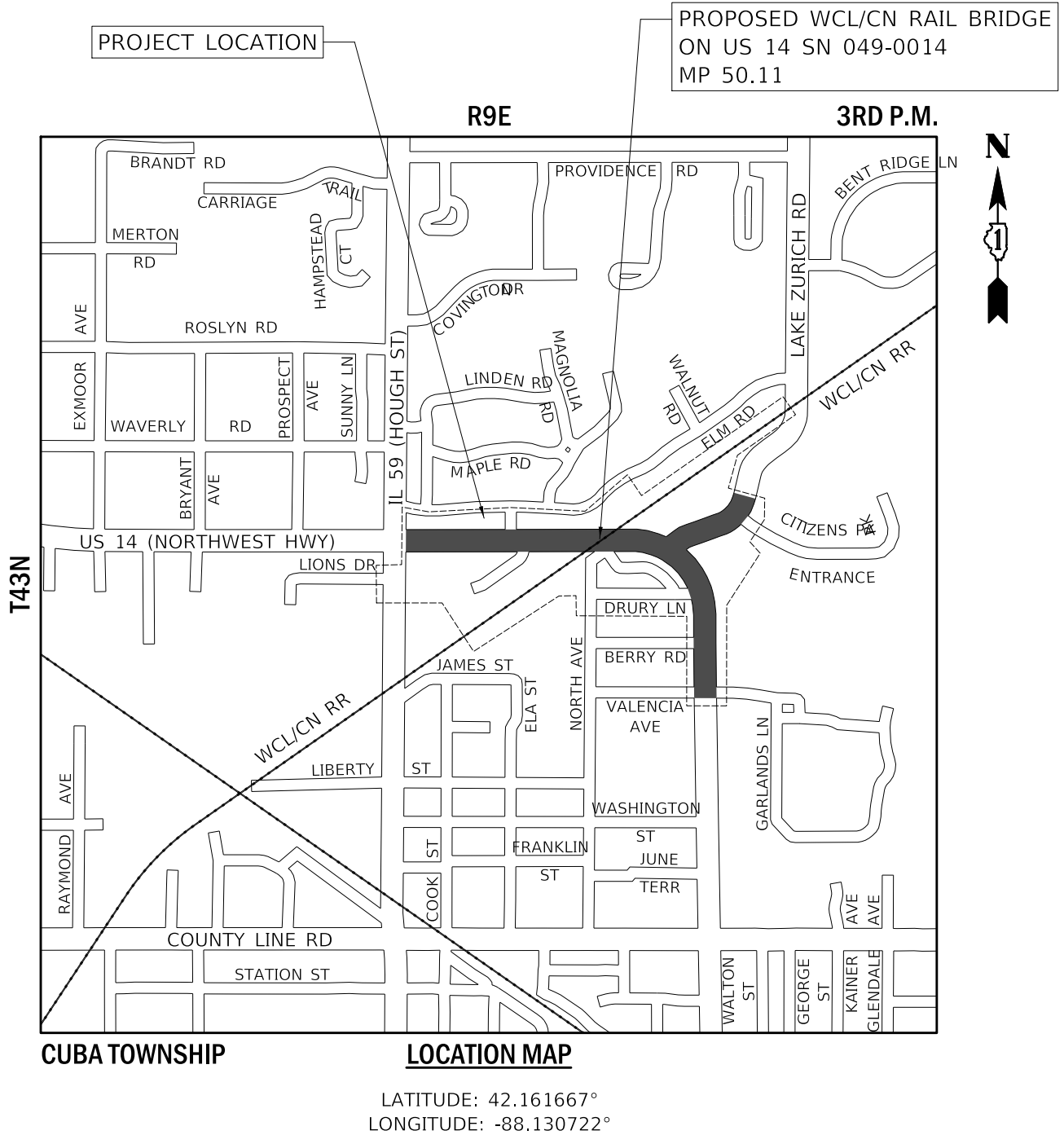
11/13/2023
Date



Station	815	810	805	800	795	790	785	780
820	815	810	805	800	795	790	785	780

PROPOSED RAILROAD BRIDGE
 EX RR ROW
 PR SHOULDER EL. 818.15
 UNDERGROUND LIGHTING
 4" UNDERDRAIN
 18" RCP SS
 30" MINIMUM
 1.75'
 4" UNDERDRAIN
 15' RCP SS
 36" RCP SS
 12'x7' BOX CULVERT
 EX PART AT PR R/L
 EX PART AT PR R/L

 CMITech Two River Plaza, Suite 1400 1400 River Street T44-830/73-3800 Fax: 830-773-3979 www.cmit-tech.com		213+00	214+00	215+00	216+00	217+00	218+00	219+00	220+00	221+00	US ROUTE 14 15" STORM SEWER CROSSING				F.A.P. NO. RTE.		SECTION	COUNTYSTATE	TOTAL SHEET NO.
USER NAME ■ ■ ■ ■ ■ DRAWN ■ PLOT SCALE ■ 10.0000' / 1" ■ CHECKED ■ DATE ■ 06/20/2014 PLOT DATE ■ 06/20/2014 www.cmit-tech.com		DESIGNED ■		REVISED ■		DRAWN ■		REVISED ■		FAC 830-773-3800		13+000B+00-65		305		6144		ILLINOIS FED. AID PROJECT SHEETS OF 57A.	
		DATE		REVISED		DATE		REVISED		DATE		REVISED		DATE		REVISED		DATE	



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
15" STORM SEWER CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation
 Street: 201 West Center Court
 City: Schaumburg State: IL Zip: 60196-1096
 Contact Name and Title: Andy Rabadi, PE - Railroad Engineer
 Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____
 Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.
 Street: 2 Pierce Place, Suite 1400
 City: Itasca State: IL Zip: 60143
 Contact Name and Title: Derek Mall, PE - Senior Project Manager
 Phone Number: 630.735.3361 Consultant's Project #: _____
 Email Address: dmall@civiltechinc.com
 Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)


Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)
 Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)
 Village of Barrington County: Lake State: IL
 Utility Location – Railroad Mile Post: 50.11 plus 29.70 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)
 Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
 If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1614751 °, Longitude: -88.1310561 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
 Name of Submitter


 Signature

630.735.3361
 Telephone #

11/13/2023
 Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood _____
☐ New: ☐ Steel or ☐ Wood _____

B. Number of Guys/Anchors on Property _____

C. Cross arm Overhang _____ ft.

D. Maximum Voltage _____

E. Number of Wires/Cables/Pairs/Strands (please specify # and type) _____

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

G. Clearance Over Railroad Company's Wires _____ ft.

H. Clearance Over Railroad Company's Tracks _____ ft.

I. Casing Length (Property Line to Property Line) _____ ft.

J. Size & Kind of Pipe or Duct _____

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify) _____

L. Size and Type of Wire/Cable _____

M. Insulated _____

N. Bare/Open Wire _____

O. Stranded _____

P. Solid _____

Q. Angle of Crossing _____ °

R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) 65.167 ft.

B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. 9.58 ft.

Derek Mall
Name of Submitter

Derek H. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☒ Sewer (specify type): Gravity Storm
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

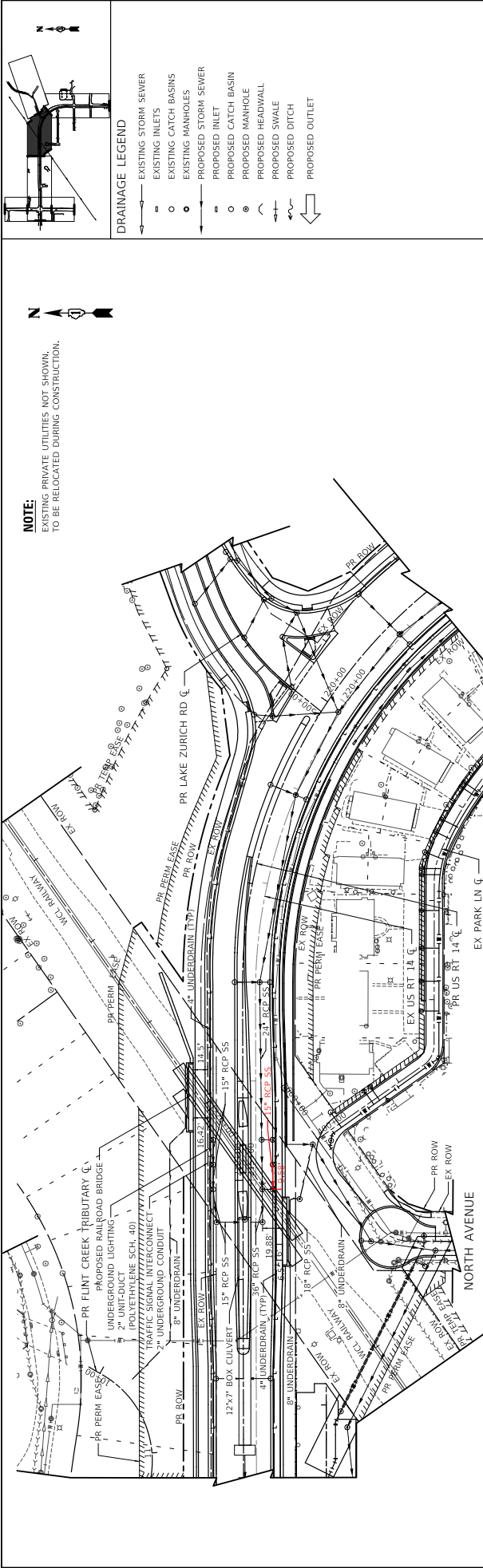
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>15in</u>	_____
B. Outside Diameter:	<u>17.25in</u>	_____
C. Wall Thickness:	<u>2.25in</u>	_____
D. Pipe Material:	<u>Concrete</u>	_____
E. Specification/Grade or class:	<u>Class A Type 2</u>	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>27.62</u> ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)	_____	
U. Depth of pipe below the ground. (not beneath tracks)	<u>3.47</u>	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

Derek Mall
Name of Submitter

Derek N. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date



Section 13-00000-02 GS, Contra

Village of Barrington, Lak

820

815

810

805

800

795

790

785

780

814.50

819.57

812.50

819.51

810.50

819.36

808.50

819.25

806.50

819.16

819.01

804.50

802.50

818.89

818.79

798.58

818.61

797.00

818.39

795.80

818.15

794.97

817.90

794.53

817.73

794.46

817.59

794.77

817.28

795.45

816.88

796.52

816.50

816.18

797.96

815.92

799.78

801.78

815.64

PROPOSED RAILROAD BRIDGE

EX RR ROW

EX RR ROW

PR SHOOFLY (EL. 818.15)

EX PANT AT PR PEL

UNDERGROUND LIGHTING 2" UNIDRIFT POLYETHYLENE SCH. 40

PR PEL

4" UNDERDRAIN

30" MINIMUM

18" RCP SS

11.71

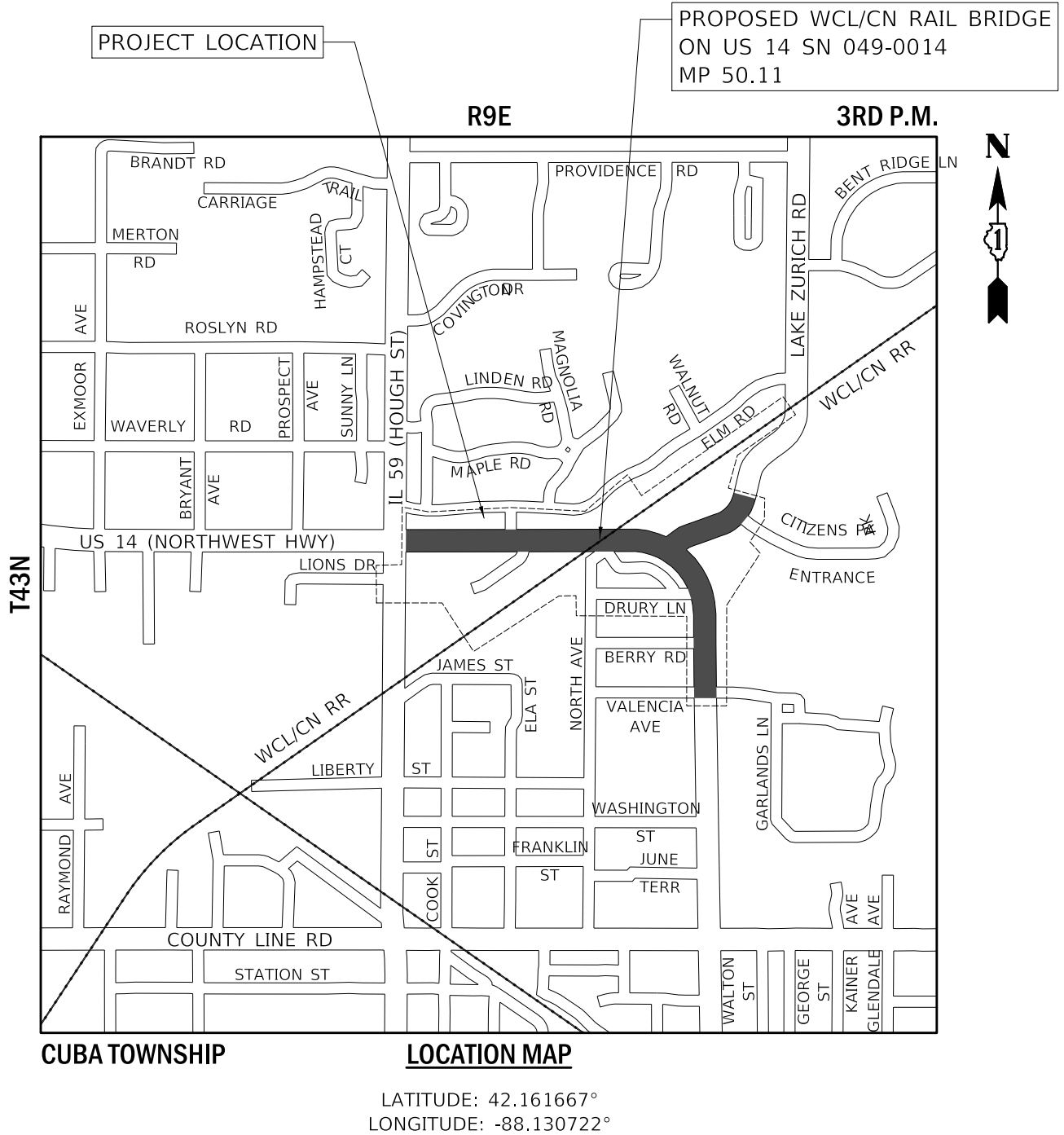
4" UNDERDRAIN

15" RCP SS

38" RCP SS

12x7' BOX CULVERT

[illegible]



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

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US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
15" STORM SEWER CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation

Street: 201 West Center Court

City: Schaumburg State: IL Zip: 60196-1096

Contact Name and Title: Andy Rabadi, PE - Railroad Engineer

Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____

Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #: _____

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus -75.13 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)


Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1616397 °, Longitude: -88.1307389 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood _____
☐ New: ☐ Steel or ☐ Wood _____

B. Number of Guys/Anchors on Property _____

C. Cross arm Overhang _____ ft.

D. Maximum Voltage _____

E. Number of Wires/Cables/Pairs/Strands (please specify # and type) _____

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

G. Clearance Over Railroad Company's Wires _____ ft.

H. Clearance Over Railroad Company's Tracks _____ ft.

I. Casing Length (Property Line to Property Line) _____ ft.

J. Size & Kind of Pipe or Duct _____

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify) _____

L. Size and Type of Wire/Cable _____

M. Insulated _____

N. Bare/Open Wire _____

O. Stranded _____

P. Solid _____

Q. Angle of Crossing _____ °

R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) 65.167 ft.


B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. 20 ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- ☒ Sewer (specify type): Gravity Storm
- ☐ Steam
- ☐ Air
- ☐ Water (specify type): _____
- ☒ Underground
- ☐ Overhead

- ☐ Natural Gas
- ☐ Petroleum Products
- ☐ Chemical (specify type): _____
- ☐ Other (please specify): _____
- ☐ Crossing
- ☐ Longitudinal

8. Pipe Data

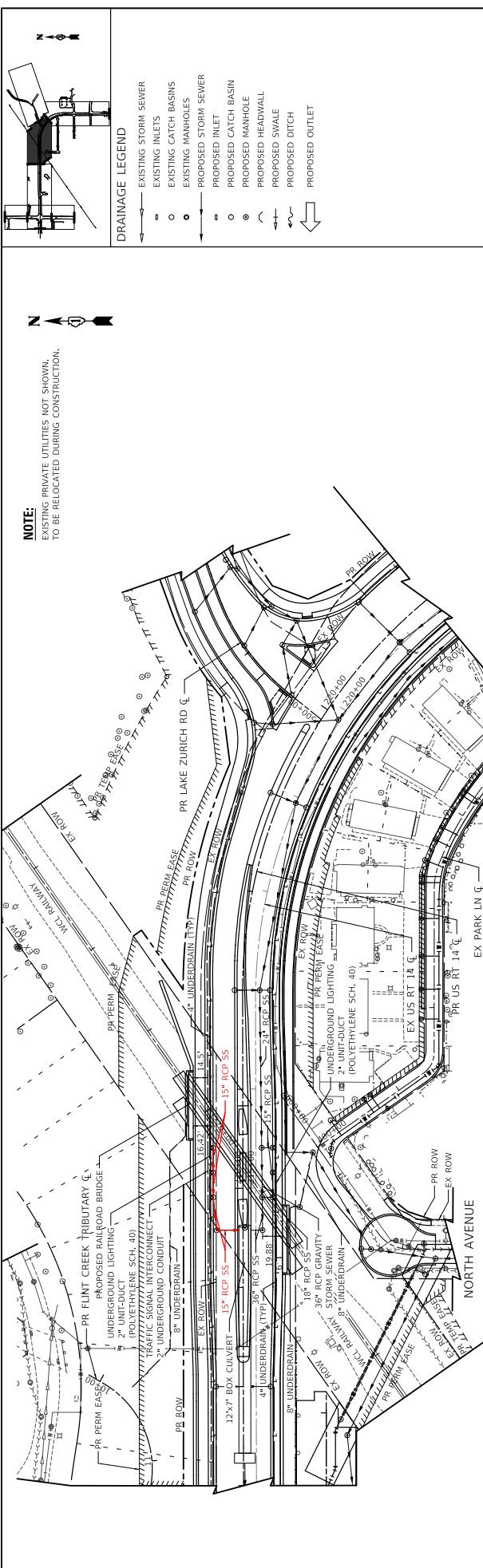
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>15in</u>	_____
B. Outside Diameter:	<u>17.25in</u>	_____
C. Wall Thickness:	<u>2.25in</u>	_____
D. Pipe Material:	<u>Concrete</u>	_____
E. Specification/Grade or class:	<u>Class A Type 2</u>	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below base of rail or top of ground. _____ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe _____ (Dry bore & jack, directional, tunnel, other – specify)		
U. Depth of pipe below the ground. (not beneath tracks)	<u>2.81</u>	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

Derek Mall
Name of Submitter


Derek N. Mall
Signature

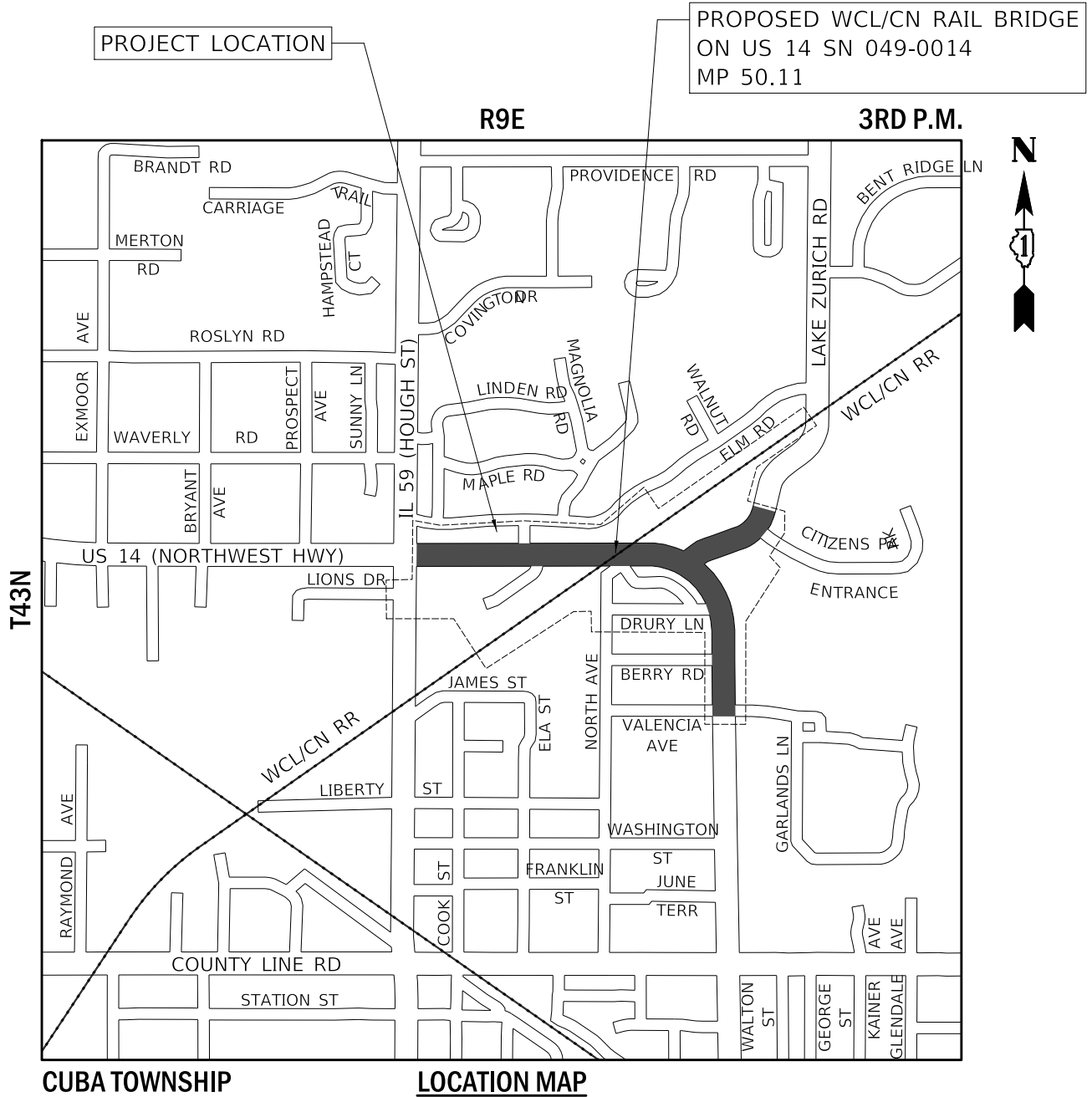
630.735.3361
Telephone #

11/13/2023
Date



Station	815	810	805	800	795	790	785	780
820	815	810	805	800	795	790	785	780

 CMITech Two River Plaza, Suite 1400 1400 West 14th Street Tulsa, Oklahoma 74107-7130 Tel: 800.773.8000 Fax: 800.773.8075 www.cmit-tech.com		USER NAME = jc DESIGNED - DRAWN - PLOT SCALE = 100.0000" / 1"	213+00 214+00 215+00 216+00 217+00	218+00 219+00 220+00 221+00	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		US ROUTE 14 15" STORM SEWER CROSSING		F.A.P. NO. RTE. 305	SECTION 1+000B+00-65	COUNTY LAKE	TOTAL SHEETS 6	SHEET 6
PLOT DATE = 06/20/2014		REVISION - CHECKED - DATE -	REVISION - REVISION - REVISION -	REVISION - REVISION - REVISION -	SCALE: 1" = 50'		SHEET OF	SHEETS 57A	TO STA.		ILLINOIS FED. AID PROJECT		



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
8" UNDERDRAIN CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

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Company's Legal Name: Illinois Department of Transportation

Street: 201 West Center Court

City: Schaumburg State: IL Zip: 60196-1096

Contact Name and Title: Andy Rabadi, PE - Railroad Engineer

Phone Number: 847-705-4248 Owner/Sponsor's Project #:

Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #:

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence:

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus -123.76 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)


Utility Location – Railroad Mile Post: plus ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1617160 °, Longitude: -88.1305918 °

Latitude: °, Longitude: °

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood _____
☐ New: ☐ Steel or ☐ Wood _____

B. Number of Guys/Anchors on Property _____

C. Cross arm Overhang _____ ft.

D. Maximum Voltage _____

E. Number of Wires/Cables/Pairs/Strands (please specify # and type) _____

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

G. Clearance Over Railroad Company's Wires _____ ft.

H. Clearance Over Railroad Company's Tracks _____ ft.

I. Casing Length (Property Line to Property Line) _____ ft.

J. Size & Kind of Pipe or Duct _____

K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify) _____

L. Size and Type of Wire/Cable _____

M. Insulated _____

N. Bare/Open Wire _____

O. Stranded _____

P. Solid _____

Q. Angle of Crossing _____ °

R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) _____ ft.


B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. _____ ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- | | |
|---|---|
| <input checked="" type="checkbox"/> Sewer (specify type): <u>Underdrain</u> | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Steam | <input type="checkbox"/> Petroleum Products |
| <input type="checkbox"/> Air | <input type="checkbox"/> Chemical (specify type): _____ |
| <input type="checkbox"/> Water (specify type): _____ | <input type="checkbox"/> Other (please specify): _____ |
| <input checked="" type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |

8. Pipe Data

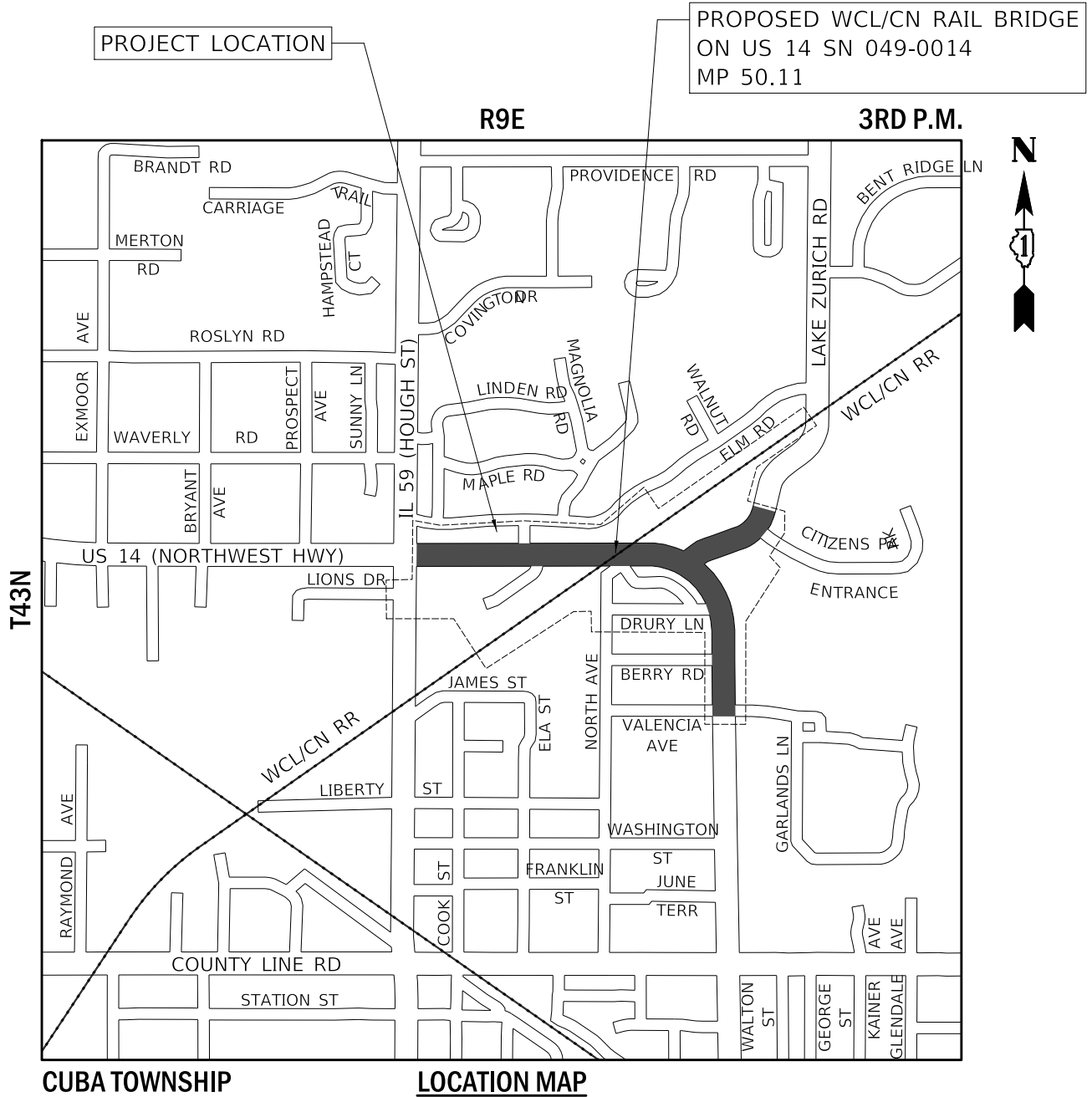
	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	<u>8in</u>	_____
B. Outside Diameter:	<u>9.232in</u>	_____
C. Wall Thickness:	<u>1.232in</u>	_____
D. Pipe Material:	<u>Polyethylene</u>	_____
E. Specification/Grade or class:	_____	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)	_____	_____psi
L. Length of Casing pipe:	_____	_____ft.
M. Casing pipe/uncased carrier pipe cathodically protected?	⊙ Y / N ⊙	
N. Hydrostatic pressure carrier pipe test pressure	_____	_____psi
O. Will casing pipe be vented?	⊙ Y / N ⊙	
P. Pipe Vent Size:	_____	_____in.
Q. Will casing pipe/uncased carrier pipe have a protective coating?	⊙ Y / N ⊙	
R. Protective Coating Type	_____	
S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>7.5</u> ft. (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)	<u>Trenched</u>	
U. Depth of pipe below the ground. (not beneath tracks)	<u>5.0</u>	_____ft.
V. Depth of pipe below ditches.	_____	_____ft.
W. Distance from centerline of track to face of jacking/receiving pits.	_____	_____ft.
X. Depth from base of rail to bottom of jacking /receiving pits.	_____	_____ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date



LATITUDE: 42.161667°
LONGITUDE: -88.130722°

US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:

...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
8" UNDERDRAIN CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation

Street: 201 West Center Court

City: Schaumburg State: IL Zip: 60196-1096

Contact Name and Title: Andy Rabadi, PE - Railroad Engineer

Phone Number: 847-705-4248 Owner/Sponsor's Project #:

Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.

Street: 2 Pierce Place, Suite 1400

City: Itasca State: IL Zip: 60143

Contact Name and Title: Derek Mall, PE - Senior Project Manager

Phone Number: 630.735.3361 Consultant's Project #:

Email Address: dmall@civiltechinc.com

Other Emails to include on correspondence:

3. Location Information (Attach a Copy of a Sketch Showing Location)

Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)

Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)

Village of Barrington County: Lake State: IL

Utility Location – Railroad Mile Post: 50.11 plus 60.13 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)

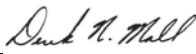
Utility Location – Railroad Mile Post: plus ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1614273 °, Longitude: -88.1311482 °

Latitude: °, Longitude: °

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

- ### A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
- ☐ New: ☐ Steel or ☐ Wood

- ### B. Number of Guys/Anchors on Property

- ### C. Cross arm Overhang

- #### D. Maximum Voltage

- E. Number of Wires/Cables/Pairs/Strands (please specify # and type)

- F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground

- ### G. Clearance Over Railroad Company's Wires

- #### H. Clearance Over Railroad Company's Tracks

- I. Casing Length (Property Line to Property Line)

- J. Size & Kind of Pipe or Duct

- K. Method: How is Pipe or Duct to be installed under the track (dry bore & jack, directional, tunnel, other – specify)

- #### L. Size and Type of Wire/Cable

- M. Insulated

- N. Bare/Open Wire

- O. Stranded

- P. Solid

- ### Q. Angle of Crossing

- R. Length of Span Crossing Tracks (unsupported length if above tracks)

6. Location References and Clearances of Facility (Encroachment)

- A. Width of Public Road (crossing track) _____ ft.

- B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

- C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

- D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

- E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. _____ ft.

Derek Mall
Name of Submitter

David H. Hall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- | | |
|---|---|
| <input checked="" type="checkbox"/> Sewer (specify type): <u>Underdrain</u> | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Steam | <input type="checkbox"/> Petroleum Products |
| <input type="checkbox"/> Air | <input type="checkbox"/> Chemical (specify type): _____ |
| <input type="checkbox"/> Water (specify type): _____ | <input type="checkbox"/> Other (please specify): _____ |
| <input checked="" type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |

8. Pipe Data

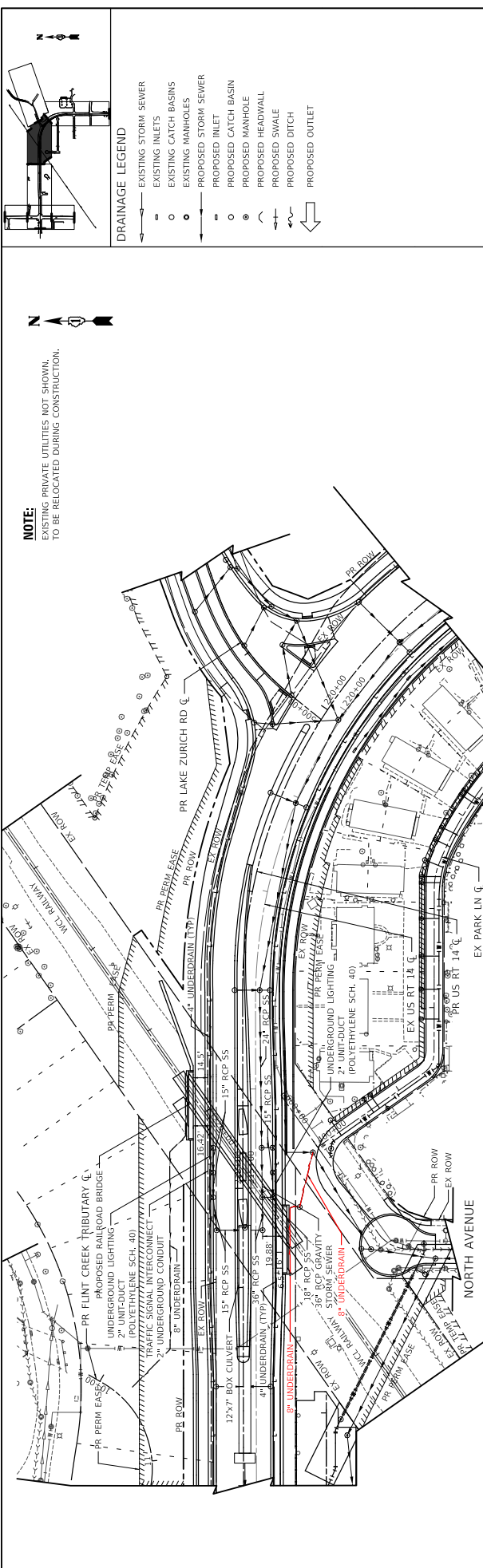
- | | CARRIER PIPE | CASING PIPE |
|--|---------------------|-------------|
| A. Inside Diameter: | <u>8in</u> | _____ |
| B. Outside Diameter: | <u>9.232in</u> | _____ |
| C. Wall Thickness: | <u>1.232in</u> | _____ |
| D. Pipe Material: | <u>Polyethylene</u> | _____ |
| E. Specification/Grade or class: | _____ | _____ |
| F. Min. Yield Point of Material | _____ | _____ |
| G. Process of Manufacture | _____ | _____ |
| H. Name of Manufacturer | _____ | _____ |
| I. Type of Joint | _____ | _____ |
| J. Working Pressure | _____ | _____ |
| K. Maximum operating pressure (by gauge) | _____ | _____psi |
| L. Length of Casing pipe: | _____ | _____ft. |
| M. Casing pipe/uncased carrier pipe cathodically protected? | ⊙ Y / N ⊙ | |
| N. Hydrostatic pressure carrier pipe test pressure | _____ | _____psi |
| O. Will casing pipe be vented? | ⊙ Y / N ⊙ | |
| P. Pipe Vent Size: | _____ | _____in. |
| Q. Will casing pipe/uncased carrier pipe have a protective coating? | ⊙ Y / N ⊙ | |
| R. Protective Coating Type | _____ | |
| S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>7.5</u> ft.
(Closest point of utility to any base of rail or ground) | | |
| T. Method of installing casing pipe /uncased carrier pipe
(Dry bore & jack, directional, tunnel, other – specify) | <u>Trenched</u> | |
| U. Depth of pipe below the ground. (not beneath tracks) | <u>5.0</u> | _____ft. |
| V. Depth of pipe below ditches. | _____ | _____ft. |
| W. Distance from centerline of track to face of jacking/receiving pits. | _____ | _____ft. |
| X. Depth from base of rail to bottom of jacking /receiving pits. | _____ | _____ft. |

Derek Mall
Name of Submitter


Derek H. Mall
Signature

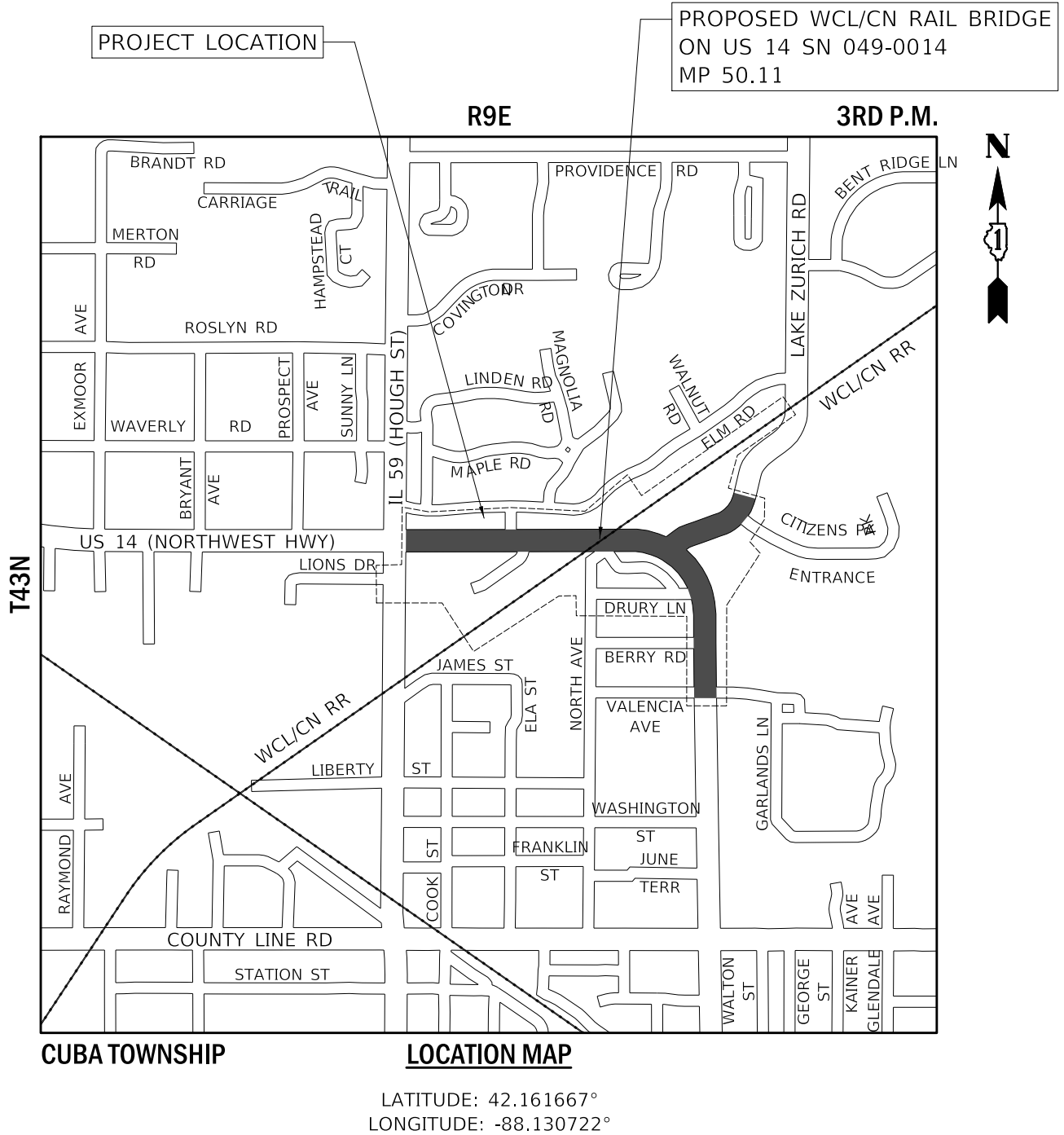
630.735.3361
Telephone #

11/13/2023
Date



Station	815	810	805	800	795	790	785	780
820	815	810	805	800	795	790	785	780

 CMI TECH www.cmitracker.com		USER NAME <input checked="" type="checkbox"/> PC Two River Plaza, Suite 1400 1400 W. 14th Street Tulsa, OK 74107-7330 Tel: 800.773.8000 Fax: 800.773.8075 Email: info@cmitracker.com	DESIGNED - DRAWN - CHECKED - DATE -	214+00 215+00 216+00 217+00	218+00 219+00 220+00 221+00	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		US ROUTE 14 8" UNDERDRAIN CROSSING		F.A.P. NO. SECTION RITE 13-00087-00-65 LAKE 6141	COUNTY ILLINOIS FED. AID PROJECT STA.	TOTAL SHEETS 61	SHEET OF 54 SCALE: 1" = 50' TO STA.
---	--	---	--	--------------------------------------	--------------------------------------	---	--	---------------------------------------	--	---	--	--------------------	---



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
Itasca, Illinois 60143
Tel: 630.773.3900
Fax: 630.773.3975
www.civiltechinc.com

US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:
...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
4" UNDERDRAIN CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation
 Street: 201 West Center Court
 City: Schaumburg State: IL Zip: 60196-1096
 Contact Name and Title: Andy Rabadi, PE - Railroad Engineer
 Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____
 Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.
 Street: 2 Pierce Place, Suite 1400
 City: Itasca State: IL Zip: 60143
 Contact Name and Title: Derek Mall, PE - Senior Project Manager
 Phone Number: 630.735.3361 Consultant's Project #: _____
 Email Address: dmall@civiltechinc.com
 Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)

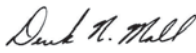
Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)
 Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)
 Village of Barrington County: Lake State: IL
 Utility Location – Railroad Mile Post: 50.11 plus -80.52 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)
 Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
 If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1616481 °, Longitude: -88.1307226 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
 Name of Submitter


 Signature

630.735.3361
 Telephone #

11/13/2023
 Date

APPLICATION FOR UTILITY OCCUPANCY

WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

- ### A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood
- ☐ New: ☐ Steel or ☐ Wood

- ### B. Number of Guys/Anchors on Property

- C. Cross arm Overhang _____ ft.

- D. Maximum Voltage _____

- E. Number of Wires/Cables/Pairs/Strands (please specify # and type) _____

- F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

- G. Clearance Over Railroad Company's Wires _____ ft.

- H. Clearance Over Railroad Company's Tracks _____ ft.

- I. Casing Length (Property Line to Property Line) _____ ft.

- J. Size & Kind of Pipe or Duct _____

- K. Method: How is Pipe or Duct to be installed under the track
(dry bore & jack, directional, tunnel, other – specify)

- L. Size and Type of Wire/Cable _____

- M. Insulated

- N. Bare/Open Wire _____

- ### O. Stranded

- P. Solid

- Q. Angle of Crossing _____°

- R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

- | | | |
|--|--------|-----|
| A. Width of Public Road (crossing track) | 65.167 | ft. |
|--|--------|-----|

- B. Distance From Each Facility (Encroachment) to Center Line of Main Track ft.

- C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

- D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

- E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. 16.92 ft.

Derek Mall
Name of Submitter

David H. Hall
Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- | | |
|---|---|
| <input checked="" type="checkbox"/> Sewer (specify type): <u>Underdrain</u> | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Steam | <input type="checkbox"/> Petroleum Products |
| <input type="checkbox"/> Air | <input type="checkbox"/> Chemical (specify type): _____ |
| <input type="checkbox"/> Water (specify type): _____ | <input type="checkbox"/> Other (please specify): _____ |
| <input checked="" type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |

8. Pipe Data

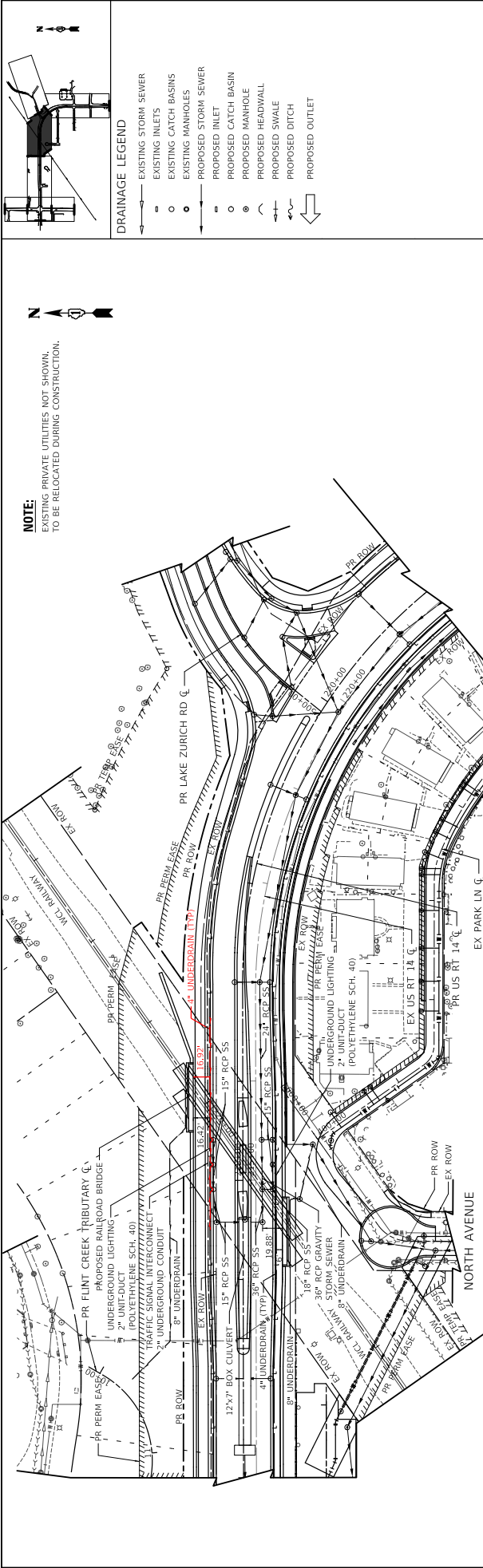
- | | CARRIER PIPE | CASING PIPE |
|--|---------------------|-------------|
| A. Inside Diameter: | <u>4in</u> | _____ |
| B. Outside Diameter: | <u>4.643in</u> | _____ |
| C. Wall Thickness: | <u>0.643in</u> | _____ |
| D. Pipe Material: | <u>Polyethylene</u> | _____ |
| E. Specification/Grade or class: | _____ | _____ |
| F. Min. Yield Point of Material | _____ | _____ |
| G. Process of Manufacture | _____ | _____ |
| H. Name of Manufacturer | _____ | _____ |
| I. Type of Joint | _____ | _____ |
| J. Working Pressure | _____ | _____ |
| K. Maximum operating pressure (by gauge) | _____ | _____psi |
| L. Length of Casing pipe: | _____ | _____ft. |
| M. Casing pipe/uncased carrier pipe cathodically protected? | ⊙ Y / N ⊙ | |
| N. Hydrostatic pressure carrier pipe test pressure | _____ | _____psi |
| O. Will casing pipe be vented? | ⊙ Y / N ⊙ | |
| P. Pipe Vent Size: | _____ | _____in. |
| Q. Will casing pipe/uncased carrier pipe have a protective coating? | ⊙ Y / N ⊙ | |
| R. Protective Coating Type | _____ | |
| S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>25.37</u> ft.
(Closest point of utility to any base of rail or ground) | | |
| T. Method of installing casing pipe /uncased carrier pipe
(Dry bore & jack, directional, tunnel, other – specify) | <u>Trenched</u> | |
| U. Depth of pipe below the ground. (not beneath tracks) | <u>1.75</u> | _____ft. |
| V. Depth of pipe below ditches. | _____ | _____ft. |
| W. Distance from centerline of track to face of jacking/receiving pits. | _____ | _____ft. |
| X. Depth from base of rail to bottom of jacking /receiving pits. | _____ | _____ft. |

Derek Mall
Name of Submitter

Derek N. Mall
Signature

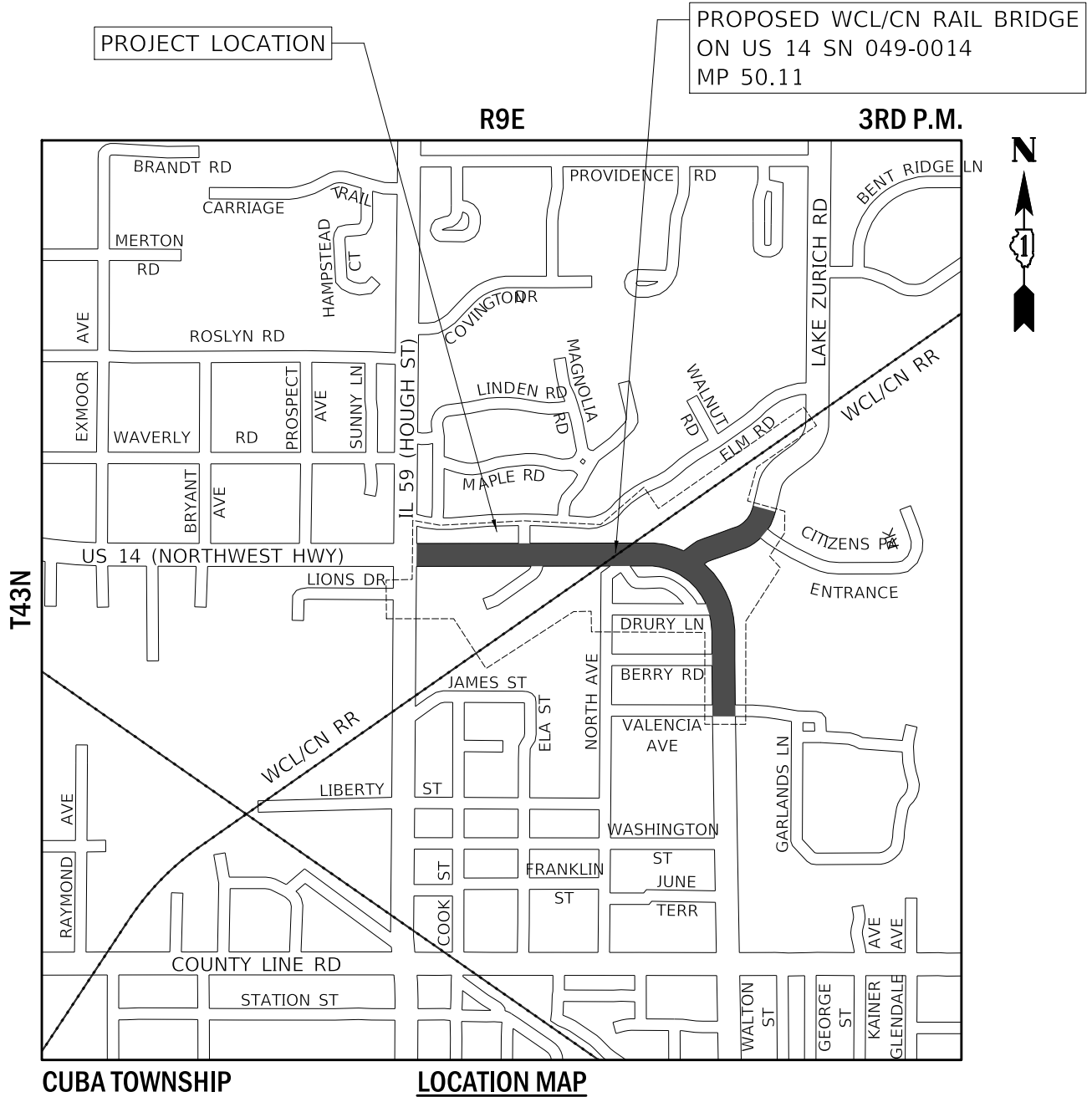
630.735.3361
Telephone #

11/13/2023
Date



ELEVATION	STATIONING	DESCRIPTION
815.64	801.78	
815.92	799.78	
816.18	797.96	
816.50	796.52	
816.88	795.45	
817.28	794.77	
817.59	794.46	
817.73	794.53	
817.90	794.97	
818.15	795.80	
818.39	797.00	
818.61	798.58	
818.79	800.50	
818.89	802.50	
819.01	804.50	
819.16	806.50	
819.25	808.50	
819.36	810.50	
819.51	812.50	
819.57	814.50	

[illegible]



US ROUTE 14 GRADE SEPARATION

LAKE ZURICH ROAD TO IL-59

BARRINGTON, ILLINOIS
OPERATING COMPANY: WCL

CHICAGO DIVISION
LEIGHTON SUB



Two Pierce Place, Suite 1400
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US ROUTE 14

F.A.U. RTE: 0305

SECTION: 11-00087-00-GS

COUNTY: LAKE

CONTRACT:



Southern Region

DESIGN DRAWN CHECKED APPRVD.

CADD FILE NAME:
...\\3509 CN Location Map.dgn

SHEET TITLE:

LOCATION MAP
4" UNDERDRAIN CROSSING

DRAWING No.

DATE:

SHEET: OF

APPLICATION FOR UTILITY OCCUPANCY

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

1. Owner/Sponsor's Information

Company's Legal Name: Illinois Department of Transportation
 Street: 201 West Center Court
 City: Schaumburg State: IL Zip: 60196-1096
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 Phone Number: 847-705-4248 Owner/Sponsor's Project #: _____
 Email Address: Andy.Rabadi@illinois.gov

2. Consultant's Information

Company's Legal Name: Civiltech Engineering, Inc.
 Street: 2 Pierce Place, Suite 1400
 City: Itasca State: IL Zip: 60143
 Contact Name and Title: Derek Mall, PE - Senior Project Manager
 Phone Number: 630.735.3361 Consultant's Project #: _____
 Email Address: dmall@civiltechinc.com
 Other Emails to include on correspondence: _____

3. Location Information (Attach a Copy of a Sketch Showing Location)


Nearest Public Road Crossing Street Name: U.S. 14 (Northwest Highway)
 Nearest Public Road Crossing DOT #: 260514W (# on Blue Sign at Crossing, e.g. 123456L)
 Village of Barrington County: Lake State: IL
 Utility Location – Railroad Mile Post: 50.11 plus 35.09 ft.
(Start Railroad Mile Post of nearest public road Mile Post to utility in feet)
 Utility Location – Railroad Mile Post: _____ plus _____ ft.
(End Railroad Mile Post of nearest public road Mile Post to utility in feet; if crossing please leave blank)

Please provide the coordinates for the point at which the utility will cross over or under the track(s).
 If it is a longitudinal to the tracks, please provide start and end coordinates.

Latitude: 42.1614667 °, Longitude: -88.1310724 °

Latitude: _____ °, Longitude: _____ °

Derek Mall
 Name of Submitter


 Signature

630.735.3361
 Telephone #

11/13/2023
 Date

APPLICATION FOR UTILITY OCCUPANCY
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Type of Occupancy (check all that apply):

- | | |
|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fiber Optic (# of Strands _____) |
| <input type="checkbox"/> Cable TV | <input type="checkbox"/> Copper Pair (# of Wires _____) |
| <input type="checkbox"/> Coaxial | <input type="checkbox"/> Electric |
| <input type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |
| <input type="checkbox"/> Other (please specify): _____ | |

5. Wire/Cable Data

A. Number of Poles/Towers on Property

- ☐ Existing: ☐ Steel or ☐ Wood _____
☐ New: ☐ Steel or ☐ Wood _____

B. Number of Guys/Anchors on Property _____

C. Cross arm Overhang _____ ft.

D. Maximum Voltage _____

E. Number of Wires/Cables/Pairs/Strands (please specify # and type) _____

F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft.

G. Clearance Over Railroad Company's Wires _____ ft.

H. Clearance Over Railroad Company's Tracks _____ ft.

I. Casing Length (Property Line to Property Line) _____ ft.

J. Size & Kind of Pipe or Duct _____

K. Method: How is Pipe or Duct to be installed under the track _____
(dry bore & jack, directional, tunnel, other – specify)

L. Size and Type of Wire/Cable _____

M. Insulated _____

N. Bare/Open Wire _____

O. Stranded _____

P. Solid _____

Q. Angle of Crossing _____ °

R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft.

6. Location References and Clearances of Facility (Encroachment)

A. Width of Public Road (crossing track) 65.167 ft.


B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft.

C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft.

D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft.

E. Distance and Direction from Bridge Abutment, Culvert, Switch, Road Crossing, etc. 6.5 ft.

Derek Mall
Name of Submitter


Signature

630.735.3361
Telephone #

11/13/2023
Date

APPLICATION FOR UTILITY OCCUPANCY

PIPE/CONDUIT INFORMATION

7. Type of Occupancy (check all that apply):

- | | |
|---|---|
| <input checked="" type="checkbox"/> Sewer (specify type): <u>Underdrain</u> | <input type="checkbox"/> Natural Gas |
| <input type="checkbox"/> Steam | <input type="checkbox"/> Petroleum Products |
| <input type="checkbox"/> Air | <input type="checkbox"/> Chemical (specify type): _____ |
| <input type="checkbox"/> Water (specify type): _____ | <input type="checkbox"/> Other (please specify): _____ |
| <input checked="" type="checkbox"/> Underground | <input type="checkbox"/> Crossing |
| <input type="checkbox"/> Overhead | <input type="checkbox"/> Longitudinal |

8. Pipe Data

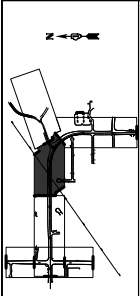
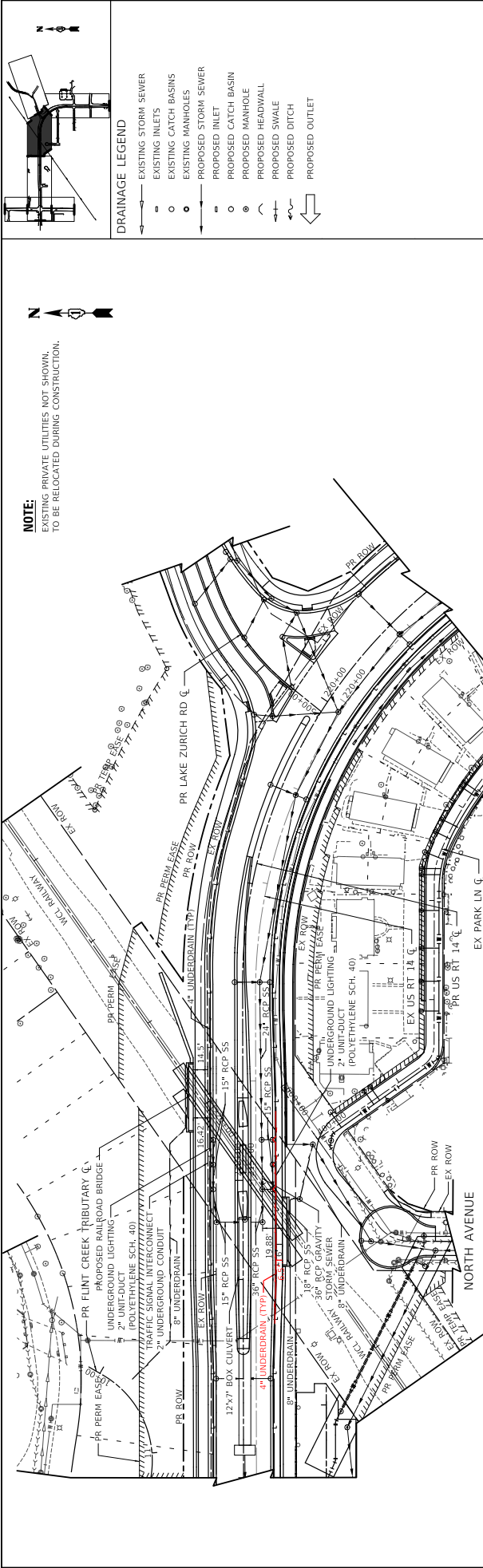
- | | CARRIER PIPE | CASING PIPE |
|--|---------------------|-------------|
| A. Inside Diameter: | <u>4in</u> | _____ |
| B. Outside Diameter: | <u>4.643in</u> | _____ |
| C. Wall Thickness: | <u>0.643in</u> | _____ |
| D. Pipe Material: | <u>Polyethylene</u> | _____ |
| E. Specification/Grade or class: | _____ | _____ |
| F. Min. Yield Point of Material | _____ | _____ |
| G. Process of Manufacture | _____ | _____ |
| H. Name of Manufacturer | _____ | _____ |
| I. Type of Joint | _____ | _____ |
| J. Working Pressure | _____ | _____ |
| K. Maximum operating pressure (by gauge) | _____ | _____psi |
| L. Length of Casing pipe: | _____ | _____ft. |
| M. Casing pipe/uncased carrier pipe cathodically protected? | ⊙ Y / N ⊙ | |
| N. Hydrostatic pressure carrier pipe test pressure | _____ | _____psi |
| O. Will casing pipe be vented? | ⊙ Y / N ⊙ | |
| P. Pipe Vent Size: | _____ | _____in. |
| Q. Will casing pipe/uncased carrier pipe have a protective coating? | ⊙ Y / N ⊙ | |
| R. Protective Coating Type | _____ | |
| S. Depth of top of casing or uncased carrier pipe below <u>base of rail</u> or top of ground. <u>25.42</u> ft.
(Closest point of utility to any base of rail or ground) | _____ | |
| T. Method of installing casing pipe /uncased carrier pipe
(Dry bore & jack, directional, tunnel, other – specify) | <u>Trenched</u> | |
| U. Depth of pipe below the ground. (not beneath tracks) | <u>1.75</u> | _____ft. |
| V. Depth of pipe below ditches. | _____ | _____ft. |
| W. Distance from centerline of track to face of jacking/receiving pits. | _____ | _____ft. |
| X. Depth from base of rail to bottom of jacking /receiving pits. | _____ | _____ft. |

Derek Mall
Name of Submitter

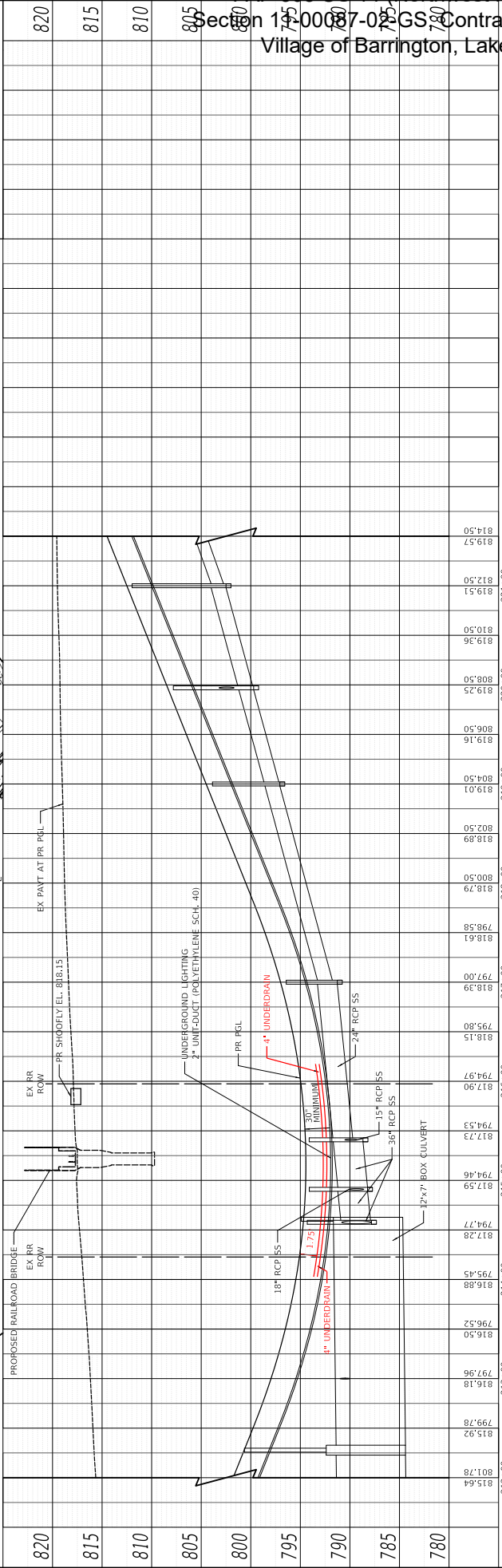
Derek N. Mall
Signature

630.735.3361
Telephone #

11/13/2023
Date



NOTE:
EXISTING PRIVATE UTILITIES NOT SHOWN.
TO BE RELOCATED DURING CONSTRUCTION.



STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION		US ROUTE 14 4" UNDERDRAIN CROSSING		SHEET 14 OF 50 SCALE: 1" = 50'
PROJECT NO. 11-00087-02-05 COUNTY ST. 305 SECTION 11-00087-02-05 CONTRACT NO. 11-00087-02-05	SHEET 14 OF 50 SCALE: 1" = 50'	SHEET 14 OF 50 SCALE: 1" = 50'	SHEET 14 OF 50 SCALE: 1" = 50'	SHEET 14 OF 50 SCALE: 1" = 50'

NO.	BY	DATE
1	BY	DATE
2	BY	DATE
3	BY	DATE
4	BY	DATE
5	BY	DATE
6	BY	DATE
7	BY	DATE
8	BY	DATE
9	BY	DATE
10	BY	DATE



Illinois Environmental Protection Agency

1021 North Grand Avenue East • P.O. Box 19276 • Springfield • Illinois • 62794-9276 • (217) 782-3397

Uncontaminated Soil Certification by Licensed Professional Engineer or Licensed Professional Geologist for Use of Uncontaminated Soil as Fill in a CCDD or Uncontaminated Soil Fill Operation LPC-663

Revised in accordance with 35 Ill. Adm. Code 1100, as
amended by PCB R2012-009 (eff. Aug. 27, 2012)

This certification form is to be used by professional engineers and professional geologists to certify, pursuant to 35 Ill. Adm. Code 1100.205(a)(1)(B), that soil (i) is uncontaminated soil and (ii) is within a pH range of 6.26 to 9.0. If you have questions about this form, please telephone the Bureau of Land Permit Section at 217/524-3300.

This form may be completed online, saved locally, printed and signed, and submitted to prospective clean construction or demolition debris (CCDD) fill operations or uncontaminated soil fill operations.

I. Source Location Information

(Describe the location of the source of the uncontaminated soil)

Project Name: FAP 305 - US 14 (Northwest Highway) Office Phone Number, if available: _____

Physical Site Location (address, including number and street):

101-135 W. Northwest Highway, (ISGS Site No. 2599A-1)

City: Barrington State: IL Zip Code: _____

County: Lake Township: _____

Lat/Long of approximate center of site in decimal degrees (DD.ddddd) to five decimal places (e.g., 40.67890, -90.12345):

Latitude: 42.16141 Longitude: -88.13624

(Decimal Degrees)

(-Decimal Degrees)

Identify how the lat/long data were determined:

☒ GPS ☐ Map Interpolation ☐ Photo Interpolation ☐ Survey ☐ Other

IEPA Site Number(s), if assigned: BOL: _____ BOW: _____ BOA: _____

Approximate Start Date (mm/dd/yyyy): TBD Approximate End Date (mm/dd/yyyy): TBD

Estimated Volume of debris (cu. Yd.): 3

II. Owner/Operator Information for Source Site

Site Owner

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

Site Operator

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

This Agency is authorized to require this information under Section 4 and Title X of the Environmental Protection Act (415 ILCS 5/4, 5/39). Failure to disclose this information may result in: a civil penalty of not to exceed \$50,000 for the violation and an additional civil penalty of not to exceed \$10,000 for each day during which the violation continues (415 ILCS 5/42). This form has been approved by the Forms Management Center.

III. Basis for Certification and Attachments

For each item listed below, reference the attachments to this form that provide the required information.

a. A Description of the soil sample points and how they were determined to be sufficient in number and appropriately located 35 Ill. Adm. Code 1100.610(a)]:

LOCATION CB21-1 WAS SAMPLED ALONG THE COMMERCIAL BUILDING PROPERTY. SEE FIGURE 3-3, AND TABLE 4-1 OF THE PRELIMINARY SITE INVESTIGATION REPORT FOR SAMPLING DETAILS.

b. Analytical soil testing results to show that soil chemical constituents comply with the maximum allowable concentrations established pursuant to 35 Ill. Adm. Code Part 1100, Subpart F and that the soil pH is within the range of 6.25 to 9.0,including the documentation of chain of custody control, a copy of the lab analysis; the accreditation status of the laboratory performing the analysis; and certification by an authorized agent of the laboratory that the analysis has been performed in accordance with the Agency's rules for the accreditation of environmental and the scope of the accreditation [35 Ill. Adm. Code 1100.201 (g), 1100.205(a), 1100.610]:

EUROFINS ANALYTICAL REPORT - JOB ID: 500-246805-1. ALSO SEE FIGURE 4-3 OF THE PRELIMINARY SITE INVESTIGATION REPORT.

IV. Certification Statement, Signature and Seal of Licensed Professional Engineer or Licensed Professional Geologist

I, Michael A. Castillo, P.G. (name of licensed professional engineer or geologist) certify under penalty of law that the information submitted, including but not limited to, all attachments and other information, is to the best of my knowledge and belief, true, accurate and complete. In accordance with the Environmental Protection Act [415 ILCS 5/22.51 or 22.51a] and 35 Ill. Adm. Code 1100.205(a), I certify that the soil from this site is uncontaminated soil. I also certify that the soil pH is within the range of 6.25 to 9.0. In addition, I certify that the soil has not been removed from the site as part of a cleanup or removal of contaminants. All necessary documentation is attached.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

Company Name:Weston Solutions, Inc.

Street Address:300 Knightsbridge Parkway; Suite 360

City:LincolnshireState: ILZip Code: 60069

Phone:(224) 864-7200

Michael A. Castillo, P.G.

Printed Name:

Michael A. Castillo

Licensed Professional Engineer or

Licensed Professional Geologist Signature:

12 August 2024

Date:



P.E or L.P.G. Seal:



Illinois Environmental Protection Agency

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Uncontaminated Soil Certification by Licensed Professional Engineer or Licensed Professional Geologist for Use of Uncontaminated Soil as Fill in a CCDD or Uncontaminated Soil Fill Operation LPC-663

Revised in accordance with 35 Ill. Adm. Code 1100, as
amended by PCB R2012-009 (eff. Aug. 27, 2012)

This certification form is to be used by professional engineers and professional geologists to certify, pursuant to 35 Ill. Adm. Code 1100.205(a)(1)(B), that soil (i) is uncontaminated soil and (ii) is within a pH range of 6.26 to 9.0. If you have questions about this form, please telephone the Bureau of Land Permit Section at 217/524-3300.

This form may be completed online, saved locally, printed and signed, and submitted to prospective clean construction or demolition debris (CCDD) fill operations or uncontaminated soil fill operations.

I. Source Location Information

(Describe the location of the source of the uncontaminated soil)

Project Name: FAP 305 - US 14 (Northwest Highway) Office Phone Number, if available: _____

Physical Site Location (address, including number and street):

ISGS Site Nos. 2599A-3, 2599A-4, 2599A-6, & 2599A-11, 100-300 blocks of W. NW Highway, 107 Elm Rd, & 113 Elm Rd

City: Barrington State: IL Zip Code: 60010

County: Lake Township: _____

Lat/Long of approximate center of site in decimal degrees (DD.ddddd) to five decimal places (e.g., 40.67890, -90.12345):

Latitude: 42.16174 Longitude: -88.1316

(Decimal Degrees)

(-Decimal Degrees)

Identify how the lat/long data were determined:

☒ GPS ☐ Map Interpolation ☐ Photo Interpolation ☐ Survey ☐ Other

IEPA Site Number(s), if assigned: BOL: _____ BOW: _____ BOA: _____

Approximate Start Date (mm/dd/yyyy): TBD Approximate End Date (mm/dd/yyyy): TBD

Estimated Volume of debris (cu. Yd.): 35,680

II. Owner/Operator Information for Source Site

Site Owner

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

Site Operator

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

This Agency is authorized to require this information under Section 4 and Title X of the Environmental Protection Act (415 ILCS 5/4, 5/39). Failure to disclose this information may result in: a civil penalty of not to exceed \$50,000 for the violation and an additional civil penalty of not to exceed \$10,000 for each day during which the violation continues (415 ILCS 5/42). This form has been approved by the Forms Management Center.

Uncontaminated Soil Certification

III. Basis for Certification and Attachments

For each item listed below, reference the attachments to this form that provide the required information.

- a. A Description of the soil sample points and how they were determined to be sufficient in number and appropriately located 35 Ill. Adm. Code 1100.610(a)]:

LOCATIONS ROW-7, ROW-9, ROW-14, ROW-16 THROUGH ROW-19, ROW-21, ROW-22, ROW-26, ROW-27, ROW-29N1, ROW-29N2, ROW-29S1, ROW-29S2, AND BP-2 WERE SAMPLED ALONG THE IDOT ROW. SEE FIGURE 3-1 through 3-3, AND TABLE 4-1 OF THE PRELIMINARY SITE INVESTIGATION REPORT FOR SAMPLING DETAILS.

- b. Analytical soil testing results to show that soil chemical constituents comply with the maximum allowable concentrations established pursuant to 35 Ill. Adm. Code Part 1100, Subpart F and that the soil pH is within the range of 6.25 to 9.0, including the documentation of chain of custody control, a copy of the lab analysis; the accreditation status of the laboratory performing the analysis; and certification by an authorized agent of the laboratory that the analysis has been performed in accordance with the Agency's rules for the accreditation of environmental and the scope of the accreditation [35 Ill. Adm. Code 1100.201 (g), 1100.205(a), 1100.610]:

EUROFINS ANALYTICAL REPORTS - JOB IDS: 500-246805-1, 500-246806-1, 500-246858-1, 500-246859-1, 500-246880-1, 500-246967-1, 500-248976-1, and 500-248977-1 . ALSO SEE FIGURES 4-1 THROUGH 4-3 OF THE PRELIMINARY SITE INVESTIGATION REPORT.

IV. Certification Statement, Signature and Seal of Licensed Professional Engineer or Licensed Professional Geologist

I, Michael A. Castillo, P.G. (name of licensed professional engineer or geologist) certify under penalty of law that the information submitted, including but not limited to, all attachments and other information, is to the best of my knowledge and belief, true, accurate and complete. In accordance with the Environmental Protection Act [415 ILCS 5/22.51 or 22.51a] and 35 Ill. Adm. Code 1100.205(a), I certify that the soil from this site is uncontaminated soil. I also certify that the soil pH is within the range of 6.25 to 9.0. In addition, I certify that the soil has not been removed from the site as part of a cleanup or removal of contaminants. All necessary documentation is attached.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

Company Name: Weston Solutions, Inc.
Street Address: 300 Knightsbridge Parkway; Suite 360
City: Lincolnshire State: IL Zip Code: 60069
Phone: (224) 864-7200

Michael A. Castillo, P.G.
Printed Name: _____


Licensed Professional Engineer or
Licensed Professional Geologist Signature:

Date: _____

P.E or L.P.G. Seal:



Illinois Environmental Protection Agency

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Uncontaminated Soil Certification by Licensed Professional Engineer or Licensed Professional Geologist for Use of Uncontaminated Soil as Fill in a CCDD or Uncontaminated Soil Fill Operation LPC-663

Revised in accordance with 35 Ill. Adm. Code 1100, as
amended by PCB R2012-009 (eff. Aug. 27, 2012)

This certification form is to be used by professional engineers and professional geologists to certify, pursuant to 35 Ill. Adm. Code 1100.205(a)(1)(B), that soil (i) is uncontaminated soil and (ii) is within a pH range of 6.26 to 9.0. If you have questions about this form, please telephone the Bureau of Land Permit Section at 217/524-3300.

This form may be completed online, saved locally, printed and signed, and submitted to prospective clean construction or demolition debris (CCDD) fill operations or uncontaminated soil fill operations.

I. Source Location Information

(Describe the location of the source of the uncontaminated soil)

Project Name: FAP 305 - US 14 (Northwest Highway) Office Phone Number, if available: _____

Physical Site Location (address, including number and street):

Residences and Vacant Lot, (ISGS Site No. 2599A-8), Various Addresses

City: Barrington State: IL Zip Code: 60010

County: Lake Township: _____

Lat/Long of approximate center of site in decimal degrees (DD.ddddd) to five decimal places (e.g., 40.67890, -90.12345):

Latitude: 42.16188 Longitude: -88.1341

(Decimal Degrees)

(-Decimal Degrees)

Identify how the lat/long data were determined:

☒ GPS ☐ Map Interpolation ☐ Photo Interpolation ☐ Survey ☐ Other

IEPA Site Number(s), if assigned: BOL: _____ BOW: _____ BOA: _____

Approximate Start Date (mm/dd/yyyy): TBD Approximate End Date (mm/dd/yyyy): TBD

Estimated Volume of debris (cu. Yd.): 7,055

II. Owner/Operator Information for Source Site

Site Owner

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

Site Operator

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

This Agency is authorized to require this information under Section 4 and Title X of the Environmental Protection Act (415 ILCS 5/4, 5/39). Failure to disclose this information may result in: a civil penalty of not to exceed \$50,000 for the violation and an additional civil penalty of not to exceed \$10,000 for each day during which the violation continues (415 ILCS 5/42). This form has been approved by the Forms Management Center.

Uncontaminated Soil Certification

III. Basis for Certification and Attachments

For each item listed below, reference the attachments to this form that provide the required information.

- a. A Description of the soil sample points and how they were determined to be sufficient in number and appropriately located 35 Ill. Adm. Code 1100.610(a)]:

LOCATION R40-1, R40-2, R49-1, AND R49-3 WERE SAMPLED AT THE RESIDENCES & VACANT LOT PROPERTY. SEE FIGURES 3-1 AND 3-2, AND TABLE 4-1 OF THE PRELIMINARY SITE INVESTIGATION REPORT FOR SAMPLING DETAILS.

- b. Analytical soil testing results to show that soil chemical constituents comply with the maximum allowable concentrations established pursuant to 35 Ill. Adm. Code Part 1100, Subpart F and that the soil pH is within the range of 6.25 to 9.0, including the documentation of chain of custody control, a copy of the lab analysis; the accreditation status of the laboratory performing the analysis; and certification by an authorized agent of the laboratory that the analysis has been performed in accordance with the Agency's rules for the accreditation of environmental and the scope of the accreditation [35 Ill. Adm. Code 1100.201 (g), 1100.205(a), 1100.610]:

EUROFINS ANALYTICAL REPORT - JOB ID: 500-246739-1. ALSO SEE FIGURE 4-1 OF THE PRELIMINARY SITE INVESTIGATION REPORT.


IV. Certification Statement, Signature and Seal of Licensed Professional Engineer or Licensed Professional Geologist

I, Michael A. Castillo, P.G. (name of licensed professional engineer or geologist) certify under penalty of law that the information submitted, including but not limited to, all attachments and other information, is to the best of my knowledge and belief, true, accurate and complete. In accordance with the Environmental Protection Act [415 ILCS 5/22.51 or 22.51a] and 35 Ill. Adm. Code 1100.205(a), I certify that the soil from this site is uncontaminated soil. I also certify that the soil pH is within the range of 6.25 to 9.0. In addition, I certify that the soil has not been removed from the site as part of a cleanup or removal of contaminants. All necessary documentation is attached.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

Company Name: Weston Solutions, Inc.
 Street Address: 300 Knightsbridge Parkway; Suite 360
 City: Lincolnshire State: IL Zip Code: 60069
 Phone: (224) 864-7200

Michael A. Castillo, P.G.
 Printed Name: _____


 Licensed Professional Engineer or
 Licensed Professional Geologist Signature:

Date: _____



P.E or L.P.G. Seal:



Illinois Environmental Protection Agency

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Uncontaminated Soil Certification
by Licensed Professional Engineer or Licensed Professional Geologist
for Use of Uncontaminated Soil as Fill in a CCDD or Uncontaminated Soil Fill Operation LPC-663

Revised in accordance with 35 Ill. Adm. Code 1100, as
amended by PCB R2012-009 (eff. Aug. 27, 2012)

This certification form is to be used by professional engineers and professional geologists to certify, pursuant to 35 Ill. Adm. Code 1100.205(a)(1)(B), that soil (i) is uncontaminated soil and (ii) is within a pH range of 6.26 to 9.0. If you have questions about this form, please telephone the Bureau of Land Permit Section at 217/524-3300.

This form may be completed online, saved locally, printed and signed, and submitted to prospective clean construction or demolition debris (CCDD) fill operations or uncontaminated soil fill operations.

I. Source Location Information

(Describe the location of the source of the uncontaminated soil)

Project Name: FAP 305 - US 14 (Northwest Highway) Office Phone Number, if available: _____

Physical Site Location (address, including number and street):

511 N Lake Zurich Rd, (ISGS Site No. 2599A-12)

City: Barrington State: IL Zip Code: 60010

County: Lake Township: _____

Lat/Long of approximate center of site in decimal degrees (DD.ddddd) to five decimal places (e.g., 40.67890, -90.12345):

Latitude: 42.16192 Longitude: -88.12761

(Decimal Degrees) (-Decimal Degrees)

Identify how the lat/long data were determined:

☒ GPS ☐ Map Interpolation ☐ Photo Interpolation ☐ Survey ☐ Other

IEPA Site Number(s), if assigned: BOL: _____ BOW: _____ BOA: _____

Approximate Start Date (mm/dd/yyyy): TBD Approximate End Date (mm/dd/yyyy): TBD

Estimated Volume of debris (cu. Yd.): 10,162

II. Owner/Operator Information for Source Site

Site Owner

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

Site Operator

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

This Agency is authorized to require this information under Section 4 and Title X of the Environmental Protection Act (415 ILCS 5/4, 5/39). Failure to disclose this information may result in: a civil penalty of not to exceed \$50,000 for the violation and an additional civil penalty of not to exceed \$10,000 for each day during which the violation continues (415 ILCS 5/42). This form has been approved by the Forms Management Center.

Uncontaminated Soil Certification

III. Basis for Certification and Attachments

For each item listed below, reference the attachments to this form that provide the required information.

- a. A Description of the soil sample points and how they were determined to be sufficient in number and appropriately located 35 Ill. Adm. Code 1100.610(a)]:

LOCATION CP51-1 THROUGH CP51-6 WAS SAMPLED ALONG THE CITIZENS PARK PROPERTY. SEE FIGURE 3-3, AND TABLE 4-1 OF THE PRELIMINARY SITE INVESTIGATION REPORT FOR SAMPLING DETAILS.

- b. Analytical soil testing results to show that soil chemical constituents comply with the maximum allowable concentrations established pursuant to 35 Ill. Adm. Code Part 1100, Subpart F and that the soil pH is within the range of 6.25 to 9.0, including the documentation of chain of custody control, a copy of the lab analysis; the accreditation status of the laboratory performing the analysis; and certification by an authorized agent of the laboratory that the analysis has been performed in accordance with the Agency's rules for the accreditation of environmental and the scope of the accreditation [35 Ill. Adm. Code 1100.201 (g), 1100.205(a), 1100.610]:

EUROFINS ANALYTICAL REPORT - JOB ID: 500-246742-1. ALSO SEE FIGURE 4-3 OF THE PRELIMINARY SITE INVESTIGATION REPORT.

IV. Certification Statement, Signature and Seal of Licensed Professional Engineer or Licensed Professional Geologist

I, Michael A. Castillo, P.G. (name of licensed professional engineer or geologist) certify under penalty of law that the information submitted, including but not limited to, all attachments and other information, is to the best of my knowledge and belief, true, accurate and complete. In accordance with the Environmental Protection Act [415 ILCS 5/22.51 or 22.51a] and 35 Ill. Adm. Code 1100.205(a), I certify that the soil from this site is uncontaminated soil. I also certify that the soil pH is within the range of 6.25 to 9.0. In addition, I certify that the soil has not been removed from the site as part of a cleanup or removal of contaminants. All necessary documentation is attached.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

Company Name: Weston Solutions, Inc.
Street Address: 300 Knightsbridge Parkway; Suite 360
City: Lincolnshire State: IL Zip Code: 60069
Phone: (224) 864-7200

Michael A. Castillo, P.G.
Printed Name: _____

Michael A. Castillo

Licensed Professional Engineer or
Licensed Professional Geologist Signature:

Date: _____



P.E or L.P.G. Seal:



Illinois Environmental Protection Agency

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Uncontaminated Soil Certification by Licensed Professional Engineer or Licensed Professional Geologist for Use of Uncontaminated Soil as Fill in a CCDD or Uncontaminated Soil Fill Operation LPC-663

Revised in accordance with 35 Ill. Adm. Code 1100, as
amended by PCB R2012-009 (eff. Aug. 27, 2012)

This certification form is to be used by professional engineers and professional geologists to certify, pursuant to 35 Ill. Adm. Code 1100.205(a)(1)(B), that soil (i) is uncontaminated soil and (ii) is within a pH range of 6.26 to 9.0. If you have questions about this form, please telephone the Bureau of Land Permit Section at 217/524-3300.

This form may be completed online, saved locally, printed and signed, and submitted to prospective clean construction or demolition debris (CCDD) fill operations or uncontaminated soil fill operations.

I. Source Location Information

(Describe the location of the source of the uncontaminated soil)

Project Name: FAP 305 - US 14 (Northwest Highway) Office Phone Number, if available: _____

Physical Site Location (address, including number and street):

Various Residential Buildings and Vacant Lot (ISGS Site No. 2599A-13)

City: Barrington State: IL Zip Code: 60010

County: Lake Township: _____

Lat/Long of approximate center of site in decimal degrees (DD.ddddd) to five decimal places (e.g., 40.67890, -90.12345):

Latitude: 42.16099 Longitude: -88.12995

(Decimal Degrees) (-Decimal Degrees)

Identify how the lat/long data were determined:

☒ GPS ☐ Map Interpolation ☐ Photo Interpolation ☐ Survey ☐ Other

IEPA Site Number(s), if assigned: BOL: _____ BOW: _____ BOA: _____

Approximate Start Date (mm/dd/yyyy): TBD Approximate End Date (mm/dd/yyyy): TBD

Estimated Volume of debris (cu. Yd.): 3,434

II. Owner/Operator Information for Source Site

Site Owner

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

Site Operator

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

This Agency is authorized to require this information under Section 4 and Title X of the Environmental Protection Act (415 ILCS 5/4, 5/39). Failure to disclose this information may result in: a civil penalty of not to exceed \$50,000 for the violation and an additional civil penalty of not to exceed \$10,000 for each day during which the violation continues (415 ILCS 5/42). This form has been approved by the Forms Management Center.

Uncontaminated Soil Certification

III. Basis for Certification and Attachments

For each item listed below, reference the attachments to this form that provide the required information.

a. A Description of the soil sample points and how they were determined to be sufficient in number and appropriately located 35 Ill. Adm. Code 1100.610(a)]:

LOCATIONS RV53-1, RV53-4 THROUGH RV53-8 WERE SAMPLED ALONG THE VARIOUS RESIDENTIAL PROPERTIES AND VACANT LOT. SEE FIGURE 3-4, AND TABLE 4-1 OF THE PRELIMINARY SITE INVESTIGATION REPORT FOR SAMPLING DETAILS.

b. Analytical soil testing results to show that soil chemical constituents comply with the maximum allowable concentrations established pursuant to 35 Ill. Adm. Code Part 1100, Subpart F and that the soil pH is within the range of 6.25 to 9.0, including the documentation of chain of custody control, a copy of the lab analysis; the accreditation status of the laboratory performing the analysis; and certification by an authorized agent of the laboratory that the analysis has been performed in accordance with the Agency's rules for the accreditation of environmental and the scope of the accreditation [35 Ill. Adm. Code 1100.201 (g), 1100.205(a), 1100.610]:

EUROFINS ANALYTICAL REPORT - JOB ID: 500-246804-1 AND 500-246964-1. ALSO SEE FIGURE 4-4 OF THE PRELIMINARY SITE INVESTIGATION REPORT.

IV. Certification Statement, Signature and Seal of Licensed Professional Engineer or Licensed Professional Geologist

I, Michael A. Castillo, P.G. (name of licensed professional engineer or geologist) certify under penalty of law that the information submitted, including but not limited to, all attachments and other information, is to the best of my knowledge and belief, true, accurate and complete. In accordance with the Environmental Protection Act [415 ILCS 5/22.51 or 22.51a] and 35 Ill. Adm. Code 1100.205(a), I certify that the soil from this site is uncontaminated soil. I also certify that the soil pH is within the range of 6.25 to 9.0. In addition, I certify that the soil has not been removed from the site as part of a cleanup or removal of contaminants. All necessary documentation is attached.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

Company Name: Weston Solutions, Inc.
Street Address: 300 Knightsbridge Parkway; Suite 360
City: Lincolnshire State: IL Zip Code: 60069
Phone: (224) 864-7200

Michael A. Castillo, P.G.
Printed Name:


Licensed Professional Engineer or
Licensed Professional Geologist Signature:

Date: _____



P.E or L.P.G. Seal:



Illinois Environmental Protection Agency

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Uncontaminated Soil Certification by Licensed Professional Engineer or Licensed Professional Geologist for Use of Uncontaminated Soil as Fill in a CCDD or Uncontaminated Soil Fill Operation LPC-663

Revised in accordance with 35 Ill. Adm. Code 1100, as
amended by PCB R2012-009 (eff. Aug. 27, 2012)

This certification form is to be used by professional engineers and professional geologists to certify, pursuant to 35 Ill. Adm. Code 1100.205(a)(1)(B), that soil (i) is uncontaminated soil and (ii) is within a pH range of 6.26 to 9.0. If you have questions about this form, please telephone the Bureau of Land Permit Section at 217/524-3300.

This form may be completed online, saved locally, printed and signed, and submitted to prospective clean construction or demolition debris (CCDD) fill operations or uncontaminated soil fill operations.

I. Source Location Information

(Describe the location of the source of the uncontaminated soil)

Project Name: FAP 305 - US 14 (Northwest Highway) Office Phone Number, if available: _____

Physical Site Location (address, including number and street):

505 North Northwest Hwy, (ISGS Site No. 2599A-14)

City: Barrington State: IL Zip Code: 60010

County: Lake Township: _____

Lat/Long of approximate center of site in decimal degrees (DD.ddddd) to five decimal places (e.g., 40.67890, -90.12345):

Latitude: 42.15957 Longitude: -88.12826

(Decimal Degrees)

(-Decimal Degrees)

Identify how the lat/long data were determined:

☒ GPS ☐ Map Interpolation ☐ Photo Interpolation ☐ Survey ☐ Other

IEPA Site Number(s), if assigned: BOL: _____ BOW: _____ BOA: _____

Approximate Start Date (mm/dd/yyyy): TBD Approximate End Date (mm/dd/yyyy): TBD

Estimated Volume of debris (cu. Yd.): 1,462

II. Owner/Operator Information for Source Site

Site Owner

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

Site Operator

Name: Illinois Department of Transportation

Street Address: 201 W. Center Court

PO Box: _____

City: Schaumburg State: IL

Zip Code: 60196 Phone: _____

Contact: Vanessa Ruiz

Email, if available: Vanessa.Ruiz@illinois.gov

This Agency is authorized to require this information under Section 4 and Title X of the Environmental Protection Act (415 ILCS 5/4, 5/39). Failure to disclose this information may result in: a civil penalty of not to exceed \$50,000 for the violation and an additional civil penalty of not to exceed \$10,000 for each day during which the violation continues (415 ILCS 5/42). This form has been approved by the Forms Management Center.

Uncontaminated Soil Certification

III. Basis for Certification and Attachments

For each item listed below, reference the attachments to this form that provide the required information.

- a. A Description of the soil sample points and how they were determined to be sufficient in number and appropriately located 35 Ill. Adm. Code 1100.610(a)]:

LOCATION BP-2 WAS SAMPLED ALONG THE BARRINGTON PUBLIC LIBRARY PROPERTY. SEE FIGURE 3-2, AND TABLE 4-1 OF THE PRELIMINARY SITE INVESTIGATION REPORT FOR SAMPLING DETAILS.

- b. Analytical soil testing results to show that soil chemical constituents comply with the maximum allowable concentrations established pursuant to 35 Ill. Adm. Code Part 1100, Subpart F and that the soil pH is within the range of 6.25 to 9.0, including the documentation of chain of custody control, a copy of the lab analysis; the accreditation status of the laboratory performing the analysis; and certification by an authorized agent of the laboratory that the analysis has been performed in accordance with the Agency's rules for the accreditation of environmental and the scope of the accreditation [35 Ill. Adm. Code 1100.201 (g), 1100.205(a), 1100.610]:

EUROFINS ANALYTICAL REPORT - JOB ID: 500-246859-1. ALSO SEE FIGURE X-X OF THE PRELIMINARY SITE INVESTIGATION REPORT.


IV. Certification Statement, Signature and Seal of Licensed Professional Engineer or Licensed Professional Geologist

I, Michael A. Castillo, P.G. (name of licensed professional engineer or geologist) certify under penalty of law that the information submitted, including but not limited to, all attachments and other information, is to the best of my knowledge and belief, true, accurate and complete. In accordance with the Environmental Protection Act [415 ILCS 5/22.51 or 22.51a] and 35 Ill. Adm. Code 1100.205(a), I certify that the soil from this site is uncontaminated soil. I also certify that the soil pH is within the range of 6.25 to 9.0. In addition, I certify that the soil has not been removed from the site as part of a cleanup or removal of contaminants. All necessary documentation is attached.

Any person who knowingly makes a false, fictitious, or fraudulent material statement, orally or in writing, to the Illinois EPA commits a Class 4 felony. A second or subsequent offense after conviction is a Class 3 felony. (415 ILCS 5/44(h))

Company Name: Weston Solutions, Inc.
 Street Address: 300 Knightsbridge Parkway; Suite 360
 City: Lincolnshire State: IL Zip Code: 60069
 Phone: (224) 864-7200

Michael A. Castillo, P.G.
 Printed Name: _____


 Licensed Professional Engineer or
 Licensed Professional Geologist Signature:

Date: _____



P.E or L.P.G. Seal:



DEPARTMENT OF THE ARMY

PERMIT

PERMITTEE: Marie Hansen
Village of Barrington

APPLICATION: LRC-2012-00468

ISSUING OFFICE: U.S. Army Corps of Engineers, Chicago District

DATE: September 25, 2024

You are hereby authorized to perform work in accordance with the terms and conditions specified below.

Note: The term "you" and its derivatives, as used in this authorization, means the permittee or any future transferee. The term "this office" refers to the U.S. Army Corps of Engineers, Chicago District.

PROJECT DESCRIPTION: U.S. Route 14 Grade Separation at CN/EJ&E Railway in Barrington, Lake County, Illinois as described in your notification and as shown on the plans titled, "F.A.P Route 0305 US 14 (Northwest Highway) – IL 59 (Hough Street) to Valencia Avenue – Roadway Reconstruction and Grade Separation" dated March 28, 2024, prepared by Civiltech.

PROJECT LOCATION: Along U.S. Route 14 east of IL-59 in Barrington, Lake County, IL, Latitude 42.161487, Longitude -88.131026).

GENERAL CONDITIONS:

1. The time limit for completing the authorized work ends five (5) years from when the Federal official, designated to act for the Secretary of the Army, has signed below. If you find that you need more time to complete the authorized activity(s), submit your request for a time extension to this office for consideration at least 60 days before the above date

is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. Please note that this site is within the aboriginal homelands of several American Indian Tribes. If any cultural, archaeological or historical resources are unearthed during activities authorized by this permit, work in that area must be stopped immediately and the Corps, State Historic Preservation Office and/or Tribal Historic Preservation Office must be contacted for further instruction. The Corps will initiate the coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing on the National Register of Historic Places.
4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. You shall comply with the water quality certification issued under Section 401 of the Clean Water Act by the Illinois Environmental Protection Agency for the project. Conditions of the certification are conditions of this authorization. For your convenience, a copy of the certification is attached if it contains such conditions.
6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being accomplished in accordance with the terms and conditions of your permit.

The following special conditions are a requirement of your authorization:

1. This authorization is based on the materials submitted as part of application number LRC-2012-00468. Failure to comply with the terms and conditions of this authorization may result in suspension and revocation of your authorization.
2. You shall undertake and complete the project as described in the plans titled, "F.A.P Route 0305 US 14 (Northwest Highway) – IL 59 (Hough Street) to Valencia Avenue – Roadway Reconstruction and Grade Separation" dated March 28, 2024, prepared by Civiltech.
3. You shall fully implement the Project Mitigation Document titled, "Stream Mitigation Management Plan – U.S. Route 14 Underpass Project – Barrington, Lake County, Illinois", dated September 20, 2024, prepared by Huff & Huff, A Subsidiary of GZA. The management areas must meet the performance standards in accordance with the

approved mitigation document. Your responsibility to complete the required compensatory mitigation will not be considered fulfilled until you have demonstrated compensatory mitigation project success and have received written verification of that success from the U.S. Army Corps of Engineers.

4. To offset wetland impacts, 0.02 acres of wetland credits must be purchased from the Mill Creek Wetland Mitigation Bank prior to the commencement of construction.
5. This site is within the aboriginal homelands of several American Indian Tribes. If any human remains, Native American cultural items or archaeological evidence are discovered during any phase of this project, interested Tribes request immediate consultation with the entity of jurisdiction for the location of discovery. In such case, please contact Mr. Soren Hall by telephone at (312) 846-5532, or email at Soren.G.Hall@usae.army.mil.
6. To avoid potential impacts to the northern long-eared bat (*Myotis septentrionalis*), tree clearing (trees 3" DBH or greater) shall only occur between October 1 and March 31 of any construction year.
7. This authorization is contingent upon implementing and maintaining soil erosion and sediment controls in a serviceable condition throughout the duration of the project. You shall comply with the Lake County Stormwater Management Commission (LCSMC)'s written and verbal recommendations regarding the soil erosion and sediment control (SESC) plan and the installation and maintenance requirements of the SESC practices on-site.
 - a. You shall schedule a preconstruction meeting with LCSMC to discuss the SESC plan and the installation and maintenance requirements of the SESC practices on the site.
 - b. You shall notify the LCSMC or the LCSMC's designated agent of any changes or modifications to the approved plan set. Field conditions during project construction may require the implementation of additional SESC measures. If you fail to implement corrective measures, this office may require more frequent site inspections to ensure the installed SESC measures are acceptable.
 - c. Prior to commencement of any in-stream work, you shall submit constructions plans and a detailed narrative disclosing the contractor's preferred method of cofferdam and dewatering method to the LCSMC . Work in the waterway shall NOT commence until the LCSMC notifies you, in writing, that the plans have been approved.
8. You shall ensure that the areas identified within the Maintenance and Monitoring Plan Limits, as depicted in the approved mitigation document referenced in Special Condition 3, are protected through a permanent deed restriction. The approved construction drawings and USACE authorization number must be included as an exhibit in the deed and recorded with the Registrar of Deeds or other appropriate office charged with the responsibility for maintaining records of title or interest in real estate property. Recording

of the approved deed restriction shall occur upon approval from this office and within 180 days of being transferred from the State of Illinois to the Village of Barrington.

9. The Village of Barrington will allocate financial resources necessary through a formal resolution that they are committed to the Stream Mitigation Management Plan and will dedicate the appropriate funds. The resolution will be completed within 3 months of permit issuance. Documented proof of financial assurances shall be submitted to the must be forwarded to the USACE's attention upon receipt, which must be prior to commencing construction.
10. You are responsible for all work authorized herein and for ensuring that all contractors are aware of the terms and conditions of this authorization.
11. A copy of this authorization must be present at the project site during all phases of construction.
12. You shall notify this office of any proposed modifications to the project, including revisions to any of the plans or documents cited in this authorization. You must receive approval from this office before work affected by the proposed modification is performed.
13. You shall notify this office prior to the transfer of this authorization and liabilities associated with compliance with its terms and conditions. The transferee must sign the authorization in the space provided and forward a copy of the authorization to this office.
14. Work in the waterway should be timed to take place during low or no-flow conditions. Low flow conditions are flow at or below the normal water elevation.
15. The plan will be designed to allow for the conveyance of the 2-year peak flow past the work area without overtopping the cofferdam. The Corps has the discretion to reduce this requirement if documented by the applicant to be infeasible or unnecessary.
16. Water shall be isolated from the in-stream work area using a cofferdam constructed of non-erodible materials (steel sheets, aqua barriers, rip rap and geotextile liner, etc.). Earthen cofferdams are not permissible.
17. The cofferdam must be constructed from the upland area and no equipment may enter flowing water at any time. If the installation of the cofferdam cannot be completed from shore and access is needed to reach the area to be coffered, other measures, such as the construction of a causeway, will be necessary to ensure that equipment does not enter the water. Once the cofferdam is in place and the isolated area is dewatered, equipment may enter the coffered area to perform the required work.
18. If bypass pumping is necessary, the intake hose shall be placed on a stable surface or floated to prevent sediment from entering the hose. The bypass discharge shall be placed on a non-erodible, energy dissipating surface prior to rejoining the stream flow and shall

not cause erosion. Filtering of bypass water is not necessary unless the bypass water has become sediment-laden as a result of the current construction activities.

19. During dewatering of the coffered work area, all sediment-laden water must be filtered to remove sediment. Possible options for sediment removal include baffle systems, anionic polymers systems, dewatering bags, or other appropriate methods. Water shall have sediment removed prior to being re-introduced to the downstream waterway. A stabilized conveyance from the dewatering device to the waterway must be identified in the plan. Discharge water is considered clean if it does not result in a visually identifiable degradation of water clarity.
20. The portion of the side slope that is above the observed water elevation shall be stabilized as specified in the plans prior to accepting flows. The substrate and toe of slope that has been disturbed due to construction activities shall be restored to proposed or pre-construction conditions and fully stabilized prior to accepting flows.

Further Information:

1. Congressional Authorities. You have been authorized to undertake the activity described above pursuant to:

() Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(x) Section 404 of the Clean Water Act (33 U.S.C. 1344).

() Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this Authorization.

a. This permit does not obviate the need to obtain other federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. The Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on the behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modifications, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in the reliance on the information you provided.

5. Reevaluation of Permit Decision. The office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (see 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General Condition 1 established a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

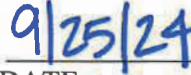
Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this authorization.



PERMITTEE

Marie Hansen

Village of Barrington



DATE

LRC-2012-00468

Corps Authorization Number

This authorization becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

Teralyn Pompeii

Digitally signed by Teralyn

Pompeii

Date: 2024.09.25 16:23:53 -05'00'

25 September 2024

For and on behalf of

Colonel Kenneth P. Rockwell

Commander, Chicago District

DATE

If the structures or work authorized by this authorization are still in existence at the time the property is transferred, the terms and conditions of this authorization will continue to be binding on the new owner(s) of the property. To validate the transfer of this authorization and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below. The document shall be attached to a copy of the permit and submitted to the Corps.

CORPS PROJECT NUMBER

TRANSFeree

DATE

ADDRESS

TELEPHONE

ACCESSIBLE PEDESTRIAN SIGNALS (APS) (BDE)

Effective: April 1, 2003

Revised: January 1, 2022

Description. This work shall consist of furnishing and installing accessible pedestrian signals (APS). Each APS shall consist of an interactive vibrotactile pedestrian pushbutton with speaker, an informational sign, a light emitting diode (LED) indicator light, a solid-state electronic control board, a power supply, wiring, and mounting hardware. The APS shall meet the requirements of the MUTCD and Sections 801 and 888 of the Standard Specifications, except as modified herein.

Electrical Requirements. The APS shall operate with systems providing 95 to 130 VAC, 60 Hz and throughout an ambient air temperature range of -29 to +160 °F (-34 to +70 °C).

The APS shall contain a power protection circuit consisting of both fuse and transient protection.

Audible Indications. A pushbutton locator tone shall sound at each pushbutton and shall be deactivated during the associated walk indication and when associated traffic signals are in flashing mode. Pushbutton locator tones shall have a duration of 0.15 seconds or less and shall repeat at 1-second intervals. Each actuation of the pushbutton shall be accompanied by the speech message "Wait".

If two accessible pedestrian pushbuttons are placed less than 10 ft (3 m) apart or placed on the same pole, the audible walk indication shall be a speech walk message. This message shall sound throughout the WALK interval only. The verbal message shall be modeled after: "Street Name, Walk Sign is on to cross Street Name." For signalized intersections utilizing exclusive pedestrian phasing, the verbal message shall be "Walk sign is on for all crossings". In addition, a speech pushbutton information message shall be provided by actuating the APS pushbutton when the WALK interval is not timing. This verbal message shall be modeled after: "Wait. Wait to cross 'Street Name' at 'Street Name'".

Where two accessible pedestrian pushbuttons are separated by at least 10 ft (3 m), the walk indication shall be an audible percussive tone. It shall repeat at 8 to 10 ticks per second with a dominant frequency of 880 Hz.

Automatic volume adjustments in response to ambient traffic sound level shall be provided up to a maximum volume of 100 dBA. Locator tone and verbal messages shall be no more than 5 dB louder than ambient sound.

At locations with railroad interconnection, an additional speech message stating "Walk time shortened when train approaches" shall be used after the speech walk message. At locations with emergency vehicle preemption, an additional speech message "Walk time shortened when emergency vehicle approaches" shall be used after the speech walk message.

Pedestrian Pushbutton. Pedestrian pushbuttons shall be at least 2 in. (50 mm) in diameter or width. The force required to activate the pushbutton shall be no greater than 3.5 lb (15.5 N).

A red LED shall be located on or near the pushbutton which, when activated, acknowledges the pedestrians request to cross the street.

Signage. A sign shall be located immediately above the pedestrian pushbutton and parallel to the crosswalk controlled by the pushbutton. The sign shall conform to one of the following standard MUTCD designs: R10-3, R10-3a, R10-3e, R10-3i, R10-4, and R10-4a.

Tactile Arrow. A tactile arrow, pointing in the direction of travel controlled by a pushbutton, shall be provided on the pushbutton.

Vibrotactile Feature. The pushbutton shall pulse when depressed and shall vibrate continuously throughout the WALK interval.

Method of Measurement. This work will be measured for payment as each, per pushbutton.

Basis of Payment. This work will be paid for at the contract unit price per each for ACCESSIBLE PEDESTRIAN SIGNALS.

80099

AGGREGATE SUBGRADE IMPROVEMENT (BDE)

Effective: April 1, 2012

Revised: April 1, 2022

Add the following Section to the Standard Specifications:

“SECTION 303. AGGREGATE SUBGRADE IMPROVEMENT

303.01 Description. This work shall consist of constructing an aggregate subgrade improvement (ASI).

303.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.07
(b) Reclaimed Asphalt Pavement (RAP)	1031.09

303.03 Equipment. The vibratory roller shall be according to Article 1101.01, or as approved by the Engineer. Vibratory machines, such as tampers, shall be used in areas where rollers do not fit.

303.04 Soil Preparation. The minimum immediate bearing value (IBV) of the soil below the improved subgrade shall be according to the Department’s “Subgrade Stability Manual” for the aggregate thickness specified.

303.05 Placing and Compacting. The maximum nominal lift thickness of aggregate gradations CA 2, CA 6, and CA 10 when compacted shall be 9 in. (225 mm). The maximum nominal lift thickness of aggregate gradations CS 1, CS 2, and RR 1 when compacted shall be 24 in. (600 mm).

The top surface of the aggregate subgrade improvement shall consist of a layer of capping aggregate gradations CA 6 or CA 10 that is 3 in. (75 mm) thick after compaction. Capping aggregate will not be required when aggregate subgrade improvement is used as a cubic yard pay item for undercut applications.

Each lift of aggregate shall be compacted to the satisfaction of the Engineer. If the moisture content of the material is such that compaction cannot be obtained, sufficient water shall be added so that satisfactory compaction can be obtained.

303.06 Finishing and Maintenance. The aggregate subgrade improvement shall be finished to the lines, grades, and cross sections shown on the plans, or as directed by the Engineer. The aggregate subgrade improvement shall be maintained in a smooth and compacted condition.

303.07 Method of Measurement. This work will be measured for payment according to Article 311.08.

303.08 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) or ton (metric ton) for AGGREGATE SUBGRADE IMPROVEMENT or at the contract unit price per square yard (square meter) for AGGREGATE SUBGRADE IMPROVEMENT, of the thickness specified.”

Add the following to Section 1004 of the Standard Specifications:

“1004.07 Coarse Aggregate for Aggregate Subgrade Improvement (ASI). The aggregate shall be according to Article 1004.01 and the following.

(a) Description. The coarse aggregate shall be crushed gravel, crushed stone, or crushed concrete. In applications where greater than 24 in. (600 mm) of ASI material is required, gravel may be used below the top 12 in (300 mm) of ASI.

(b) Quality. The coarse aggregate shall consist of sound durable particles reasonably free of deleterious materials.

(c) Gradation.

(1) The coarse aggregate gradation for total ASI thickness less than or equal to 12 in. (300 mm) shall be CA 2, CA 6, CA 10, or CS 1.

The coarse aggregate gradation for total ASI thickness greater than 12 in. (300 mm) shall be CS 1 or CS 2 as shown below or RR 1 according to Article 1005.01(c).

	COARSE AGGREGATE SUBGRADE GRADATIONS				
Grad No.	Sieve Size and Percent Passing				
	8”	6”	4”	2”	#4
CS 1	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20
CS 2		100	80 ± 10	25 ± 15	

	COARSE AGGREGATE SUBGRADE GRADATIONS (Metric)				
Grad No.	Sieve Size and Percent Passing				
	200 mm	150 mm	100 mm	50 mm	4.75 mm
CS 1	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20
CS 2		100	80 ± 10	25 ± 15	

(2) Capping aggregate shall be gradation CA 6 or CA 10.”

Add the following to Article 1031.09 of the Standard Specifications:

“(b) RAP in Aggregate Subgrade Improvement (ASI). RAP in ASI shall be according to Articles 1031.01(a), 1031.02(a), 1031.06(a)(1), and 1031.06(a)(2), and the following.

- (1) The testing requirements of Article 1031.03 shall not apply.
- (2) Crushed RAP used for the lower lift may be mechanically blended with aggregate gradations CS 1, CS 2, and RR 1 but it shall be no greater than 40 percent of the total product volume. RAP agglomerations shall be no greater than 4 in. (100 mm).
- (3) For capping aggregate, well graded RAP having 100 percent passing the 1 1/2 in. (38 mm) sieve may be used when aggregate gradations CS 1, CS 2, CA 2, or RR 1 are used in the lower lift. FRAP will not be permitted as capping material.

Blending shall be through calibrated interlocked feeders or a calibrated blending plant such that the prescribed blending percentage is maintained throughout the blending process. The calibration shall have an accuracy of ± 2.0 percent of the actual quantity of material delivered."

80274

BITUMINOUS MATERIALS COST ADJUSTMENTS (BDE)

Effective: November 2, 2006

Revised: August 1, 2017

Description. Bituminous material cost adjustments will be made to provide additional compensation to the Contractor, or credit to the Department, for fluctuations in the cost of bituminous materials when optioned by the Contractor. The bidder shall indicate with their bid whether or not this special provision will be part of the contract.

The adjustments shall apply to permanent and temporary hot-mix asphalt (HMA) mixtures, bituminous surface treatments (cover and seal coats), and preventative maintenance type surface treatments that are part of the original proposed construction, or added as extra work and paid for by agreed unit prices. The adjustments shall not apply to bituminous prime coats, tack coats, crack filling/sealing, joint filling/sealing, or extra work paid for at a lump sum price or by force account.

Method of Adjustment. Bituminous materials cost adjustments will be computed as follows.

$$CA = (BPI_P - BPI_L) \times (\%AC_V / 100) \times Q$$

Where: CA = Cost Adjustment, \$.

BPI_P = Bituminous Price Index, as published by the Department for the month the work is performed, \$/ton (\$/metric ton).

BPI_L = Bituminous Price Index, as published by the Department for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price, \$/ton (\$/metric ton).

%AC_V = Percent of virgin Asphalt Cement in the Quantity being adjusted. For HMA mixtures, the % AC_V will be determined from the adjusted job mix formula. For bituminous materials applied, a performance graded or cutback asphalt will be considered to be 100% AC_V and undiluted emulsified asphalt will be considered to be 65% AC_V.

Q = Authorized construction Quantity, tons (metric tons) (see below).

For HMA mixtures measured in square yards: $Q, \text{ tons} = A \times D \times (G_{mb} \times 46.8) / 2000$. For HMA mixtures measured in square meters: $Q, \text{ metric tons} = A \times D \times (G_{mb} \times 1) / 1000$. When computing adjustments for full-depth HMA pavement, separate calculations will be made for the binder and surface courses to account for their different G_{mb} and % AC_V.

For bituminous materials measured in gallons: $Q, \text{ tons} = V \times 8.33 \text{ lb/gal} \times SG / 2000$

For bituminous materials measured in liters: $Q, \text{ metric tons} = V \times 1.0 \text{ kg/L} \times SG / 1000$

Where: A = Area of the HMA mixture, sq yd (sq m).

D = Depth of the HMA mixture, in. (mm).

G_{mb} = Average bulk specific gravity of the mixture, from the approved mix design.

V = Volume of the bituminous material, gal (L).
SG = Specific Gravity of bituminous material as shown on the bill of lading.

Basis of Payment. Bituminous materials cost adjustments may be positive or negative but will only be made when there is a difference between the BPI_L and BPI_P in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(BPI_L - BPI_P) \div BPI_L\} \times 100$$

Bituminous materials cost adjustments will be calculated for each calendar month in which applicable bituminous material is placed; and will be paid or deducted when all other contract requirements for the work placed during the month are satisfied. The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

|

80173

BUILDING REMOVAL WITH ASBESTOS ABATEMENT (BDE)

Effective: September 1, 1990

Revised: August 1, 2022

Description. This work shall consist of the removal and disposal of 2 building(s), including all foundations, retaining walls, and piers, down to a plane 1 ft (300 mm) below the ultimate bottom of building elevation or proposed bottom of construction elevation. The building(s) are identified as follows:

<u>Bldg. No.</u>	<u>Parcel No.</u>	<u>Location</u>	<u>Description</u>
1	1MF118	550 Shorely Drive	One story brick garage structure
2	1MF0111	557 N. Hough St	One story brick commercial structure

CONSTRUCTION REQUIREMENTS

General. The IEPA's "State of Illinois Demolition/Renovation/Asbestos Project Notification Form" shall be submitted and a copy sent to the Engineer. It shall be updated if there is a change in the start and/or finish date or if the quantity of asbestos changes by more than 20 percent.

Asbestos abatement work shall be performed by an IDPH licensed Contractor prequalified with the Illinois Capital Development Board who has an on-site supervisor licensed by IDPH and employs workers licensed by IDPH. This work shall be completed according to the requirements of the U.S. Environmental Protection Agency (USEPA), IEPA, OSHA, and local regulatory agencies.

Discontinuance of Utilities. The Contractor shall arrange for the discontinuance of all utility services and the removal of the metering devices that serve the building(s) according to the respective requirements and regulations of the city, county, or utility companies involved. The Contractor shall disconnect and seal the service outlets.

Posting. Upon execution of the contract and prior to the removal of any buildings, the Contractor shall paint or stencil, in contrasting colors of an oil base paint, on all sides of each building or structure, the following posting:

NO TRESPASSING
VIOLATORS WILL BE PROSECUTED

The postings shall be positioned prominently on the structure(s) so they can be easily read and at a sufficient height to prevent defacing.

Asbestos Abatement. Friable asbestos containing building materials (ACBMs) and Category II non-friable ACBMs shall be removed from the building(s) prior to demolition. Category II non-friable ACBMs include asbestos containing transite boards, siding, and other cementitious materials (cement pipe or highly weathered roofing shingles/materials) which have a likelihood of becoming friable during typical demolition activities (by crumbling, pulverizing, or otherwise reducing to powder) making them regulated asbestos containing materials (RACM). Removed ACBM shall be kept separate from non-ACBM demolition debris for purposes of transport and disposal.

Category I non-friable ACBM may be kept in place for demolition or removal of the building unless it has become friable as determined by the ACBM inspector. If the Contractor demolishes the building(s) with the non-friable asbestos in place, the following shall apply.

- (a) The Contractor shall continuously wet the non-friable ACBM and other building debris with water during demolition and loading for disposal.
- (b) The Contractor shall dispose of all demolition debris as ACBM.

The Contractor shall perform air monitoring during asbestos abatement activities. Air sampling shall be conducted by a qualified air sampling professional. Air sampling shall be conducted according to NIOSH Method 7400. Air monitoring equipment shall be calibrated and maintained in proper operating condition. The Contractor shall submit a copy of the air sampling professional's certificate to the Engineer. The results of the tests, and daily calibration and maintenance records shall be kept on site and be available to the Engineer upon request.

Personal monitoring shall be conducted per applicable OSHA regulations. Excursion limits shall be monitored daily, and corrective actions taken immediately to bring excursions within OSHA permissible exposure limits.

When asbestos is removed prior to demolition, clearance testing per IDPH shall be conducted upon the removal of ACBM.

Submittals. The following submittals shall be made to the Engineer prior to the start of the asbestos abatement:

- (a) Manufacturer's certification stating that vacuums, ventilation equipment, and other equipment required to contain airborne fibers conform to ANSI 29.2.
- (b) A listing of the brand name, manufacturer, and specification of all sealants or surfactants to be used.
- (c) Proof that arrangements for transport and disposal of ACBMs have been obtained (i.e., a letter of authorization to utilize designated landfill).
- (d) A detailed work plan of the Contractor's anticipated procedures including the location and layout of decontamination units, the sequencing of work, the respiratory protection plan, a

site safety plan, a disposal plan, and a detailed description of the methods to be used to control pollution.

- (e) Proof of the Contractor's prequalification with Capital Development Board and employee certifications with IDPH.

Submittals that shall be made upon completion of abatement work:

- (f) Copies of waste chain-of-custodies, trip tickets, shipping manifests, or disposal receipts for asbestos waste materials removed from the work area.
- (g) Copies of each day's work site entry logbook with information on worker and visitor access.
- (h) Logs documenting filter changes on respirators, HEPA vacuums, negative pressure ventilation units, and other engineering controls.
- (i) Test results of any bulk material analysis and air sampling data collected during the abatement including results of any on-site testing by any federal, state, or local agency.

Any holes, such as basements, shall be backfilled according to Article 502.10.

Basis of Payment. This work will be paid for at the contract lump sum unit price for BUILDING REMOVAL NO. 1 and 2.

Removal and disposal of friable ACBM will be paid for at the contract lump sum unit price for REMOVAL AND DISPOSAL OF FRIABLE ASBESTOS, BUILDING NO. 2.

Removal and disposal of non-friable ACBM will be paid for at the contract lump sum unit price for REMOVAL AND DISPOSAL OF NON-FRIABLE ASBESTOS, BUILDING NO. 2.

5026I

CEMENT, TYPE IL (BDE)

Effective: August 1, 2023

Add the following to Article 302.02 of the Standard Specifications:

“(k) Type IL Portland-Limestone Cement1001”

Revise Note 2 of Article 352.02 of the Standard Specifications to read:

“Note 2. Either Type I or Type IA portland cement or Type IL portland-limestone cement shall be used.”

Revise Note 1 of Article 404.02 of the Standard Specifications to read:

“Note 1. The cement shall be Type I portland cement or Type IL portland-limestone cement.”

Revise Article 1019.02(a) of the Standard Specifications to read:

“(a) Cement, Type I or IL1001”

80449

COMPENSABLE DELAY COSTS (BDE)

Effective: June 2, 2017

Revised: April 1, 2019

Revise Article 107.40(b) of the Standard Specifications to read:

“(b) Compensation. Compensation will not be allowed for delays, inconveniences, or damages sustained by the Contractor from conflicts with facilities not meeting the above definition; or if a conflict with a utility in an unanticipated location does not cause a shutdown of the work or a documentable reduction in the rate of progress exceeding the limits set herein. The provisions of Article 104.03 notwithstanding, compensation for delays caused by a utility in an unanticipated location will be paid according to the provisions of this Article governing minor and major delays or reduced rate of production which are defined as follows.

- (1) Minor Delay. A minor delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two hours, but not to exceed two weeks.
- (2) Major Delay. A major delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two weeks.
- (3) Reduced Rate of Production Delay. A reduced rate of production delay occurs when the rate of production on the work in conflict with the utility in an unanticipated location decreases by more than 25 percent and lasts longer than seven calendar days.”

Revise Article 107.40(c) of the Standard Specifications to read:

“(c) Payment. Payment for Minor, Major, and Reduced Rate of Production Delays will be made as follows.

- (1) Minor Delay. Labor idled which cannot be used on other work will be paid for according to Article 109.04(b)(1) and (2) for the time between start of the delay and the minimum remaining hours in the work shift required by the prevailing practice in the area.

Equipment idled which cannot be used on other work, and which is authorized to standby on the project site by the Engineer, will be paid for according to Article 109.04(b)(4).

- (2) Major Delay. Labor will be the same as for a minor delay.

Equipment will be the same as for a minor delay, except Contractor-owned equipment will be limited to two weeks plus the cost of move-out to either the

Contractor's yard or another job and the cost to re-mobilize, whichever is less. Rental equipment may be paid for longer than two weeks provided the Contractor presents adequate support to the Department (including lease agreement) to show retaining equipment on the job is the most economical course to follow and in the public interest.

- (3) Reduced Rate of Production Delay. The Contractor will be compensated for the reduced productivity for labor and equipment time in excess of the 25 percent threshold for that portion of the delay in excess of seven calendar days. Determination of compensation will be in accordance with Article 104.02, except labor and material additives will not be permitted.

Payment for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be determined according to Article 109.13."

Revise Article 108.04(b) of the Standard Specifications to read:

"(b) No working day will be charged under the following conditions.

- (1) When adverse weather prevents work on the controlling item.
- (2) When job conditions due to recent weather prevent work on the controlling item.
- (3) When conduct or lack of conduct by the Department or its consultants, representatives, officers, agents, or employees; delay by the Department in making the site available; or delay in furnishing any items required to be furnished to the Contractor by the Department prevents work on the controlling item.
- (4) When delays caused by utility or railroad adjustments prevent work on the controlling item.
- (5) When strikes, lock-outs, extraordinary delays in transportation, or inability to procure critical materials prevent work on the controlling item, as long as these delays are not due to any fault of the Contractor.
- (6) When any condition over which the Contractor has no control prevents work on the controlling item."

Revise Article 109.09(f) of the Standard Specifications to read:

- "(f) Basis of Payment. After resolution of a claim in favor of the Contractor, any adjustment in time required for the work will be made according to Section 108. Any adjustment in the costs to be paid will be made for direct labor, direct materials, direct equipment, direct jobsite overhead, direct offsite overhead, and other direct costs allowed by the resolution. Adjustments in costs will not be made for interest charges, loss of anticipated profit, undocumented loss of efficiency, home office overhead and unabsorbed overhead

other than as allowed by Article 109.13, lost opportunity, preparation of claim expenses and other consequential indirect costs regardless of method of calculation.

The above Basis of Payment is an essential element of the contract and the claim cost recovery of the Contractor shall be so limited.”

Add the following to Section 109 of the Standard Specifications.

“109.13 Payment for Contract Delay. Compensation for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be allowed when such costs result from a delay meeting the criteria in the following table.

Contract Type	Cause of Delay	Length of Delay
Working Days	Article 108.04(b)(3) or Article 108.04(b)(4)	No working days have been charged for two consecutive weeks.
Completion Date	Article 108.08(b)(1) or Article 108.08(b)(7)	The Contractor has been granted a minimum two week extension of contract time, according to Article 108.08.

Payment for each of the various costs will be according to the following.

- (a) Escalated Material and/or Labor Costs. When the delay causes work, which would have otherwise been completed, to be done after material and/or labor costs have increased, such increases will be paid. Payment for escalated material costs will be limited to the increased costs substantiated by documentation furnished by the Contractor. Payment for escalated labor costs will be limited to those items in Article 109.04(b)(1) and (2), except the 35 percent and 10 percent additives will not be permitted.
- (b) Extended Project Overhead. For the duration of the delay, payment for extended project overhead will be paid as follows.
 - (1) Direct Jobsite and Offsite Overhead. Payment for documented direct jobsite overhead and documented direct offsite overhead, including onsite supervisory and administrative personnel, will be allowed according to the following table.

Original Contract Amount	Supervisory and Administrative Personnel
Up to \$5,000,000	One Project Superintendent
Over \$ 5,000,000 - up to \$25,000,000	One Project Manager, One Project Superintendent or Engineer, and One Clerk
Over \$25,000,000 - up to \$50,000,000	One Project Manager, One Project Superintendent, One Engineer, and

	One Clerk
Over \$50,000,000	One Project Manager, Two Project Superintendents, One Engineer, and One Clerk

(2) Home Office and Unabsorbed Overhead. Payment for home office and unabsorbed overhead will be calculated as 8 percent of the total delay cost.

(c) Extended Traffic Control. Traffic control required for an extended period of time due to the delay will be paid for according to Article 109.04.

When an extended traffic control adjustment is paid under this provision, an adjusted unit price as provided for in Article 701.20(a) for increase or decrease in the value of work by more than ten percent will not be paid.

Upon payment for a contract delay under this provision, the Contractor shall assign subrogation rights to the Department for the Department's efforts of recovery from any other party for monies paid by the Department as a result of any claim under this provision. The Contractor shall fully cooperate with the Department in its efforts to recover from another party any money paid to the Contractor for delay damages under this provision."

80384

CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)

Effective: June 1, 2010

Revised: November 1, 2014

The reduction of emissions of particulate matter (PM) for off-road equipment shall be accomplished by installing retrofit emission control devices. The term “equipment” refers to diesel fuel powered devices rated at 50 hp and above, to be used on the jobsite in excess of seven calendar days over the course of the construction period on the jobsite (including rental equipment).

Contractor and subcontractor diesel powered off-road equipment assigned to the contract shall be retrofitted using the phased in approach shown below. Equipment that is of a model year older than the year given for that equipment’s respective horsepower range shall be retrofitted:

Effective Dates	Horsepower Range	Model Year
June 1, 2010 ^{1/}	600-749	2002
	750 and up	2006
June 1, 2011 ^{2/}	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 ^{2/}	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.

2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

- a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (<http://www.epa.gov/cleandiesel/verification/verif-list.htm>), or verified by the California Air Resources Board (CARB) (<http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>); or
- b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit

device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

Diesel Retrofit Deficiency Deduction

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be \$1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected.

Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

80261

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (DBE)

Effective: September 1, 2000

Revised: March 2, 2019

FEDERAL OBLIGATION. The Department of Transportation, as a recipient of federal financial assistance, is required to take all necessary and reasonable steps to ensure nondiscrimination in the award and administration of contracts. Consequently, the federal regulatory provisions of 49 CFR Part 26 apply to this contract concerning the utilization of disadvantaged business enterprises. For the purposes of this Special Provision, a disadvantaged business enterprise (DBE) means a business certified by the Department in accordance with the requirements of 49 CFR Part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory.

STATE OBLIGATION. This Special Provision will also be used by the Department to satisfy the requirements of the Business Enterprise for Minorities, Females, and Persons with Disabilities Act, 30 ILCS 575. When this Special Provision is used to satisfy state law requirements on 100 percent state-funded contracts, the federal government has no involvement in such contracts (not a federal-aid contract) and no responsibility to oversee the implementation of this Special Provision by the Department on those contracts. DBE participation on 100 percent state-funded contracts will not be credited toward fulfilling the Department's annual overall DBE goal required by the US Department of Transportation to comply with the federal DBE program requirements.

CONTRACTOR ASSURANCE. The Contractor makes the following assurance and agrees to include the assurance in each subcontract the Contractor signs with a subcontractor.

The Contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of contracts funded in whole or in part with federal or state funds. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (a) Withholding progress payments;
- (b) Assessing sanctions;
- (c) Liquidated damages; and/or
- (d) Disqualifying the Contractor from future bidding as non-responsible.

OVERALL GOAL SET FOR THE DEPARTMENT. As a requirement of compliance with 49 CFR Part 26, the Department has set an overall goal for DBE participation in its federally assisted contracts. That goal applies to all federal-aid funds the Department will expend in its federally assisted contracts for the subject reporting fiscal year. The Department is required to make a

good faith effort to achieve the overall goal. The dollar amount paid to all approved DBE companies performing work called for in this contract is eligible to be credited toward fulfillment of the Department's overall goal.

CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. This contract includes a specific DBE utilization goal established by the Department. The goal has been included because the Department has determined the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies. The determination is based on an assessment of the type of work, the location of the work, and the availability of DBE companies to do a part of the work. The assessment indicates, in the absence of unlawful discrimination and in an arena of fair and open competition, DBE companies can be expected to perform **24%** of the work. This percentage is set as the DBE participation goal for this contract. Consequently, in addition to the other award criteria established for this contract, the Department will only award this contract to a bidder who makes a good faith effort to meet this goal of DBE participation in the performance of the work. A bidder makes a good faith effort for award consideration if either of the following is done in accordance with the procedures set for in this Special Provision:

- (a) The bidder documents enough DBE participation has been obtained to meet the goal or,
- (b) The bidder documents a good faith effort has been made to meet the goal, even though the effort did not succeed in obtaining enough DBE participation to meet the goal.

DBE LOCATOR REFERENCES. Bidders shall consult the IL UCP DBE Directory as a reference source for DBE-certified companies. In addition, the Department maintains a letting and item specific DBE locator information system whereby DBE companies can register their interest in providing quotes on particular bid items advertised for letting. Information concerning DBE companies willing to quote work for particular contracts may be obtained by contacting the Department's Bureau of Small Business Enterprises at telephone number (217) 785-4611, or by visiting the Department's website at:

<http://www.idot.illinois.gov/doing-business/certifications/disadvantaged-business-enterprise-certification/il-ucp-directory/index>.

BIDDING PROCEDURES. Compliance with this Special Provision is a material bidding requirement and failure of the bidder to comply will render the bid not responsive.

The bidder shall submit a DBE Utilization Plan (form SBE 2026), and a DBE Participation Statement (form SBE 2025) for each DBE company proposed for the performance of work to achieve the contract goal, with the bid. If the Utilization Plan indicates the contract goal will not be met, documentation of good faith efforts shall also be submitted. The documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor is selected over a DBE for work on the contract. The required forms and documentation must be submitted as a single .pdf file using the "Integrated Contractor Exchange (iCX)" application within the Department's "EBids System".

The Department will not accept a Utilization Plan if it does not meet the bidding procedures set forth herein and the bid will be declared not responsive. In the event the bid is declared not responsive, the Department may elect to cause the forfeiture of the penal sum of the bidder's proposal guaranty and may deny authorization to bid the project if re-advertised for bids.

GOOD FAITH EFFORT PROCEDURES. The contract will not be awarded until the Utilization Plan is approved. All information submitted by the bidder must be complete, accurate and adequately document enough DBE participation has been obtained or document the good faith efforts of the bidder, in the event enough DBE participation has not been obtained, before the Department will commit to the performance of the contract by the bidder. The Utilization Plan will be approved by the Department if the Utilization Plan documents sufficient commercially useful DBE work to meet the contract goal or the bidder submits sufficient documentation of a good faith effort to meet the contract goal pursuant to 49 CFR Part 26, Appendix A. This means the bidder must show that all necessary and reasonable steps were taken to achieve the contract goal. Necessary and reasonable steps are those which, by their scope, intensity and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not successful. The Department will consider the quality, quantity, and intensity of the kinds of efforts the bidder has made. Mere *pro forma* efforts, in other words efforts done as a matter of form, are not good faith efforts; rather, the bidder is expected to have taken genuine efforts that would be reasonably expected of a bidder actively and aggressively trying to obtain DBE participation sufficient to meet the contract goal.

- (a) The following is a list of types of action that the Department will consider as part of the evaluation of the bidder's good faith efforts to obtain participation. These listed factors are not intended to be a mandatory checklist and are not intended to be exhaustive. Other factors or efforts brought to the attention of the Department may be relevant in appropriate cases and will be considered by the Department.
 - (1) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBE companies that have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBE companies to respond to the solicitation. The bidder must determine with certainty if the DBE companies are interested by taking appropriate steps to follow up initial solicitations.
 - (2) Selecting portions of the work to be performed by DBE companies in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the Contractor might otherwise prefer to perform these work items with its own forces.
 - (3) Providing interested DBE companies with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

- (4) a. Negotiating in good faith with interested DBE companies. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBE companies that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBE companies to perform the work.
- b. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBE companies is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also the ability or desire of a bidder to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders are not, however, required to accept higher quotes from DBE companies if the price difference is excessive or unreasonable. In accordance with the above Bidding Procedures, the documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.
- (5) Not rejecting DBE companies as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.
- (6) Making efforts to assist interested DBE companies in obtaining bonding, lines of credit, or insurance as required by the recipient or Contractor.
- (7) Making efforts to assist interested DBE companies in obtaining necessary equipment, supplies, materials, or related assistance or services.
- (8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBE companies.
- (b) If the Department determines the bidder has made a good faith effort to secure the work commitment of DBE companies to meet the contract goal, the Department will award the contract provided it is otherwise eligible for award. If the Department determines the

bidder has failed to meet the requirements of this Special Provision or that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan that the bid is not responsive. The notification will also include a statement of reasons for the adverse determination. If the Utilization Plan is not approved because it is deficient as a technical matter, unless waived by the Department, the bidder will be notified and will be allowed no more than a five calendar day period to cure the deficiency.

- (c) The bidder may request administrative reconsideration of an adverse determination by emailing the Department at "DOT.DBE.UP@illinois.gov" within the five calendar days after the receipt of the notification of the determination. The determination shall become final if a request is not made on or before the fifth calendar day. A request may provide additional written documentation or argument concerning the issues raised in the determination statement of reasons, provided the documentation and arguments address efforts made prior to submitting the bid. The request will be reviewed by the Department's Reconsideration Officer. The Reconsideration Officer will extend an opportunity to the bidder to meet in person to consider all issues of documentation and whether the bidder made a good faith effort to meet the goal. After the review by the Reconsideration Officer, the bidder will be sent a written decision within ten working days after receipt of the request for reconsideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid not responsive.

CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work anticipated to be performed and paid for upon satisfactory completion. The Department is only able to count toward the achievement of the overall goal and the contract goal the value of payments made for the work actually performed by DBE companies. In addition, a DBE must perform a commercially useful function on the contract to be counted. A commercially useful function is generally performed when the DBE is responsible for the work and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The Department and Contractor are governed by the provisions of 49 CFR Part 26.55(c) on questions of commercially useful functions as it affects the work. Specific counting guidelines are provided in 49 CFR Part 26.55, the provisions of which govern over the summary contained herein.

- (a) DBE as the Contractor: 100 percent goal credit for that portion of the work performed by the DBE's own forces, including the cost of materials and supplies. Work that a DBE subcontracts to a non-DBE does not count toward the DBE goals.
- (b) DBE as a joint venture Contractor: 100 percent goal credit for that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work performed by the DBE's own forces.

- (c) DBE as a subcontractor: 100 percent goal credit for the work of the subcontract performed by the DBE's own forces, including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the DBE subcontractor from the Contractor or its affiliates. Work that a DBE subcontractor in turn subcontracts to a non-DBE does not count toward the DBE goal.
- (d) DBE as a trucker: 100 percent goal credit for trucking participation provided the DBE is responsible for the management and supervision of the entire trucking operation for which it is responsible. At least one truck owned, operated, licensed, and insured by the DBE must be used on the contract. Credit will be given for the following:
 - (1) The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
 - (2) The DBE may also lease trucks from a non-DBE firm, including from an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement.
- (e) DBE as a material supplier:
 - (1) 60 percent goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.
 - (2) 100 percent goal credit for the cost of materials or supplies obtained from a DBE manufacturer.
 - (3) 100 percent credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a DBE regular dealer or DBE manufacturer.

CONTRACT COMPLIANCE. Compliance with this Special Provision is an essential part of the contract. The Department is prohibited by federal regulations from crediting the participation of a DBE included in the Utilization Plan toward either the contract goal or the Department's overall goal until the amount to be applied toward the goals has been paid to the DBE. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan. After approval of the Utilization Plan and award of the contract, the Utilization Plan and individual DBE Participation Statements become part of the contract. If the Contractor did not succeed in obtaining enough DBE participation to achieve the advertised contract goal, and the Utilization Plan was approved and contract awarded based upon a determination of good faith, the total dollar value of DBE work calculated in the approved Utilization Plan as a percentage of the awarded contract value shall become the amended contract goal. All work indicated for performance by an approved DBE shall be performed, managed, and supervised by the DBE executing the DBE Participation Commitment Statement.

- (a) NO AMENDMENT. No amendment to the Utilization Plan may be made without prior written approval from the Department's Bureau of Small Business Enterprises. All requests for amendment to the Utilization Plan shall be emailed to the Department at DOT.DBE.UP@illinois.gov.
- (b) CHANGES TO WORK. Any deviation from the DBE condition-of-award or contract plans, specifications, or special provisions must be approved, in writing, by the Department as provided elsewhere in the Contract. The Contractor shall notify affected DBEs in writing of any changes in the scope of work which result in a reduction in the dollar amount condition-of-award to the contract. Where the revision includes work committed to a new DBE subcontractor, not previously involved in the project, then a Request for Approval of Subcontractor, Department form BC 260A or AER 260A, must be signed and submitted. If the commitment of work is in the form of additional tasks assigned to an existing subcontract, a new Request for Approval of Subcontractor will not be required. However, the Contractor must document efforts to assure the existing DBE subcontractor is capable of performing the additional work and has agreed in writing to the change.
- (c) SUBCONTRACT. The Contractor must provide copies of DBE subcontracts to the Department upon request. Subcontractors shall ensure that all lower tier subcontracts or agreements with DBEs to supply labor or materials be performed in accordance with this Special Provision.
- (d) ALTERNATIVE WORK METHODS. In addition to the above requirements for reductions in the condition of award, additional requirements apply to the two cases of Contractor-initiated work substitution proposals. Where the contract allows alternate work methods which serve to delete or create underruns in condition of award DBE work, and the Contractor selects that alternate method or, where the Contractor proposes a substitute work method or material that serves to diminish or delete work committed to a DBE and replace it with other work, then the Contractor must demonstrate one of the following:
- (1) The replacement work will be performed by the same DBE (as long as the DBE is certified in the respective item of work) in a modification of the condition of award; or
 - (2) The DBE is aware its work will be deleted or will experience underruns and has agreed in writing to the change. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so; or
 - (3) The DBE is not capable of performing the replacement work or has declined to perform the work at a reasonable competitive price. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so.

- (e) TERMINATION AND REPLACEMENT PROCEDURES. The Contractor shall not terminate or replace a DBE listed on the approved Utilization Plan, or perform with other forces work designated for a listed DBE except as provided in this Special Provision. The Contractor shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the Contractor obtains the Department's written consent as provided in subsection (a) of this part. Unless Department consent is provided for termination of a DBE subcontractor, the Contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the DBE in the Utilization Plan.

As stated above, the Contractor shall not terminate or replace a DBE subcontractor listed in the approved Utilization Plan without prior written consent. This includes, but is not limited to, instances in which the Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm. Written consent will be granted only if the Bureau of Small Business Enterprises agrees, for reasons stated in its concurrence document, that the Contractor has good cause to terminate or replace the DBE firm. Before transmitting to the Bureau of Small Business Enterprises any request to terminate and/or substitute a DBE subcontractor, the Contractor shall give notice in writing to the DBE subcontractor, with a copy to the Bureau, of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor shall give the DBE five days to respond to the Contractor's notice. The DBE so notified shall advise the Bureau and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Bureau should not approve the Contractor's action. If required in a particular case as a matter of public necessity, the Bureau may provide a response period shorter than five days.

For purposes of this paragraph, good cause includes the following circumstances:

- (1) The listed DBE subcontractor fails or refuses to execute a written contract;
- (2) The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Contractor;
- (3) The listed DBE subcontractor fails or refuses to meet the Contractor's reasonable, nondiscriminatory bond requirements;
- (4) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
- (5) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1200 or applicable state law.

- (6) The Contractor has determined the listed DBE subcontractor is not a responsible contractor;
- (7) The listed DBE subcontractor voluntarily withdraws from the projects and provides written notice to the Contractor of its withdrawal;
- (8) The listed DBE is ineligible to receive DBE credit for the type of work required;
- (9) A DBE owner dies or becomes disabled with the result that the listed DBE subcontractor is unable to complete its work on the contract;
- (10) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the Contractor seeks to terminate a DBE it relied upon to obtain the contract so that the Contractor can self-perform the work for which the DBE contractor was engaged or so that the Contractor can substitute another DBE or non-DBE contractor after contract award.

When a DBE is terminated or fails to complete its work on the Contract for any reason, the Contractor shall make a good faith effort to find another DBE to substitute for the original DBE to perform at least the same amount of work under the contract as the terminated DBE to the extent needed to meet the established Contract goal. The good faith efforts shall be documented by the Contractor. If the Department requests documentation under this provision, the Contractor shall submit the documentation within seven days, which may be extended for an additional seven days if necessary at the request of the Contractor. The Department will provide a written determination to the Contractor stating whether or not good faith efforts have been demonstrated.

- (f) FINAL PAYMENT. After the performance of the final item of work or delivery of material by a DBE and final payment therefore to the DBE by the Contractor, but not later than 30 calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Agreement on Department form SBE 2115 to the Resident Engineer. If full and final payment has not been made to the DBE, the DBE Payment Agreement shall indicate whether a disagreement as to the payment required exists between the Contractor and the DBE or if the Contractor believes the work has not been satisfactorily completed. If the Contractor does not have the full amount of work indicated in the Utilization Plan performed by the DBE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages. The Contractor may request an administrative reconsideration of any amount deducted as damages pursuant to subsection (h) of this part.
- (g) ENFORCEMENT. The Department reserves the right to withhold payment to the Contractor to enforce the provisions of this Special Provision. Final payment shall not be

made on the contract until such time as the Contractor submits sufficient documentation demonstrating achievement of the goal in accordance with this Special Provision or after liquidated damages have been determined and collected.

- (h) RECONSIDERATION. Notwithstanding any other provision of the contract, including but not limited to Article 109.09 of the Standard Specifications, the Contractor may request administrative reconsideration of a decision to deduct the amount of the goal not achieved as liquidated damages. A request to reconsider shall be delivered to the Contract Compliance Section and shall be handled and considered in the same manner as set forth in paragraph (c) of "Good Faith Effort Procedures" of this Special Provision, except a final decision that a good faith effort was not made during contract performance to achieve the goal agreed to in the Utilization Plan shall be the final administrative decision of the Department. The result of the reconsideration process is not administratively appealable to the U.S. Department of Transportation.

80029

FUEL COST ADJUSTMENT (BDE)

Effective: April 1, 2009

Revised: August 1, 2017

Description. Fuel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in fuel prices when optioned by the Contractor. The bidder shall indicate with their bid whether or not this special provision will be part of the contract. Failure to indicate "Yes" for any category of work will make that category of work exempt from fuel cost adjustment.

General. The fuel cost adjustment shall apply to contract pay items as grouped by category. The adjustment shall only apply to those categories of work checked "Yes", and only when the cumulative plan quantities for a category exceed the required threshold. Adjustments to work items in a category, either up or down, and extra work paid for by agreed unit price will be subject to fuel cost adjustment only when the category representing the added work was subject to the fuel cost adjustment. Extra work paid for at a lump sum price or by force account will not be subject to fuel cost adjustment. Category descriptions and thresholds for application and the fuel usage factors which are applicable to each are as follows:

(a) Categories of Work.

- (1) Category A: Earthwork. Contract pay items performed under Sections 202, 204, and 206 including any modified standard or nonstandard items where the character of the work to be performed is considered earthwork. The cumulative total of all applicable item plan quantities shall exceed 25,000 cu yd (20,000 cu m). Included in the fuel usage factor is a weighted average 0.10 gal/cu yd (0.50 liters/cu m) factor for trucking.
- (2) Category B: Subbases and Aggregate Base Courses. Contract pay items constructed under Sections 311, 312 and 351 including any modified standard or nonstandard items where the character of the work to be performed is considered construction of a subbase or aggregate, stabilized or modified base course. The cumulative total of all applicable item plan quantities shall exceed 5000 tons (4500 metric tons). Included in the fuel usage factor is a 0.60 gal/ton (2.50 liters/metric ton) factor for trucking.
- (3) Category C: Hot-Mix Asphalt (HMA) Bases, Pavements and Shoulders. Contract pay items constructed under Sections 355, 406, 407 and 482 including any modified standard or nonstandard items where the character of the work to be performed is considered HMA bases, pavements and shoulders. The cumulative total of all applicable item plan quantities shall exceed 5000 tons (4500 metric tons). Included in the fuel usage factor is 0.60 gal/ton (2.50 liters/metric ton) factor for trucking.
- (4) Category D: Portland Cement Concrete (PCC) Bases, Pavements and Shoulders. Contract pay items constructed under Sections 353, 420, 421 and 483 including any

modified standard or nonstandard items where the character of the work to be performed is considered PCC base, pavement or shoulder. The cumulative total of all applicable item plan quantities shall exceed 7500 sq yd (6000 sq m). Included in the fuel usage factor is 1.20 gal/cu yd (5.94 liters/cu m) factor for trucking.

- (5) Category E: Structures. Structure items having a cumulative bid price that exceeds \$250,000 for pay items constructed under Sections 502, 503, 504, 505, 512, 516 and 540 including any modified standard or nonstandard items where the character of the work to be performed is considered structure work when similar to that performed under these sections and not included in categories A through D.

(b) Fuel Usage Factors.

English Units		
Category	Factor	Units
A - Earthwork	0.34	gal / cu yd
B – Subbase and Aggregate Base courses	0.62	gal / ton
C – HMA Bases, Pavements and Shoulders	1.05	gal / ton
D – PCC Bases, Pavements and Shoulders	2.53	gal / cu yd
E – Structures	8.00	gal / \$1000

Metric Units		
Category	Factor	Units
A - Earthwork	1.68	liters / cu m
B – Subbase and Aggregate Base courses	2.58	liters / metric ton
C – HMA Bases, Pavements and Shoulders	4.37	liters / metric ton
D – PCC Bases, Pavements and Shoulders	12.52	liters / cu m
E – Structures	30.28	liters / \$1000

(c) Quantity Conversion Factors.

Category	Conversion	Factor
B	sq yd to ton	0.057 ton / sq yd / in depth
	sq m to metric ton	0.00243 metric ton / sq m / mm depth
C	sq yd to ton	0.056 ton / sq yd / in depth
	sq m to metric ton	0.00239 m ton / sq m / mm depth
D	sq yd to cu yd	0.028 cu yd / sq yd / in depth
	sq m to cu m	0.001 cu m / sq m / mm depth

Method of Adjustment. Fuel cost adjustments will be computed as follows.

$$CA = (FPI_P - FPI_L) \times FUF \times Q$$

Where: CA = Cost Adjustment, \$
FPI_P = Fuel Price Index, as published by the Department for the month the work is performed, \$/gal (\$/liter)
FPI_L = Fuel Price Index, as published by the Department for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price, \$/gal (\$/liter)
FUF = Fuel Usage Factor in the pay item(s) being adjusted
Q = Authorized construction Quantity, tons (metric tons) or cu yd (cu m)

The entire FUF indicated in paragraph (b) will be used regardless of use of trucking to perform the work.

Basis of Payment. Fuel cost adjustments may be positive or negative but will only be made when there is a difference between the FPI_L and FPI_P in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(FPI_L - FPI_P) \div FPI_L\} \times 100$$

Fuel cost adjustments will be calculated for each calendar month in which applicable work is performed; and will be paid or deducted when all other contract requirements for the items of work are satisfied. The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

80229

HOT-MIX ASPHALT (BDE)

Effective: January 1, 2024

Revise the second paragraph of Articles 1030.07(a)(11) and 1030.08(a)(9) of the Standard Specifications to read:

“When establishing the target density, the HMA maximum theoretical specific gravity (G_{mm}) will be based on the running average of four available Department test results for that project. If less than four G_{mm} test results are available, an average of all available Department test results for that project will be used. The initial G_{mm} will be the last available Department test result from a QMP project. If there is no available Department test result from a QMP project, the Department mix design verification test result will be used as the initial G_{mm} .”

In the Supplemental Specifications, replace the revision for the end of the third paragraph of Article 1030.09(h)(2) with the following:

“When establishing the target density, the HMA maximum theoretical specific gravity (G_{mm}) will be the Department mix design verification test result.”

Revise the tenth paragraph of Article 1030.10 of the Standard Specifications to read:

“Production is not required to stop after a test strip has been constructed.”

80456

HOT-MIX ASPHALT – LONGITUDINAL JOINT SEALANT (BDE)

Effective: November 1, 2022

Revised: August 1, 2023

Add the following after the second sentence in the eighth paragraph of Article 406.06(h)(2) of the Standard Specifications:

“If rain is forecasted and traffic is to be on the LJS or if pickup/tracking of the LJS material is likely, the LJS shall be covered immediately following its application with FA 20 fine aggregate mechanically spread uniformly at a rate of 1.5 ± 0.5 lb/sq yd (0.75 ± 0.25 kg/sq m). Fine aggregate landing outside of the LJS shall be removed prior to application of tack coat.”

Add the following after the first sentence in the ninth paragraph of Article 406.06(h)(2) of the Standard Specifications:

“LJS half-width shall be applied at a width of 9 ± 1 in. (225 ± 25 mm) in the immediate lane to be placed with the outside edge flush with the joint of the next HMA lift. The vertical face of any longitudinal joint remaining in place shall also be coated.”

Add the following after the eleventh paragraph of Article 406.06(h)(2) of the Standard Specifications:

“LJS Half-Width Application Rate, lb/ft (kg/m) ^{1/}			
Lift Thickness, in. (mm)	Coarse Graded Mixture (IL-19.0, IL-19.0L, IL-9.5, IL-9.5L, IL-4.75)	Fine Graded Mixture (IL-9.5FG)	SMA Mixture (SMA-9.5, SMA-12.5)
$\frac{3}{4}$ (19)	0.44 (0.66)		
1 (25)	0.58 (0.86)		
$1 \frac{1}{4}$ (32)	0.66 (0.98)	0.44 (0.66)	
$1 \frac{1}{2}$ (38)	0.74 (1.10)	0.48 (0.71)	0.63 (0.94)
$1 \frac{3}{4}$ (44)	0.82 (1.22)	0.52 (0.77)	0.69 (1.03)
2 (50)	0.90 (1.34)	0.56 (0.83)	0.76 (1.13)
$\geq 2 \frac{1}{4}$ (60)	0.98 (1.46)		

1/ The application rate includes a surface demand for liquid. The thickness of the LJS may taper from the center of the application to a lesser thickness on the edge of the application, provided the correct width and application rate are maintained.”

Revise the second paragraph of Article 406.13(b) of the Standard Specifications to read:

“Aggregate for covering tack, LJS, or FLS will not be measured for payment.”

Add the following to the end of the second paragraph of Article 406.14 of the Standard Specifications:

“Longitudinal joint sealant (LJS) half-width will be paid for at the contract unit price per foot (meter) for LONGITUDINAL JOINT SEALANT, HALF-WIDTH.”

80446

PERFORMANCE GRADED ASPHALT BINDER (BDE)

Effective: January 1, 2023

Revise Article 1032.05 of the Standard Specifications to read:

“1032.05 Performance Graded Asphalt Binder. These materials will be accepted according to the Bureau of Materials Policy Memorandum, “Performance Graded Asphalt Binder Qualification Procedure.” The Department will maintain a qualified producer list. These materials shall be free from water and shall not foam when heated to any temperature below the actual flash point. Air blown asphalt, recycle engine oil bottoms (ReOB), and polyphosphoric acid (PPA) modification shall not be used.

When requested, producers shall provide the Engineer with viscosity/temperature relationships for the performance graded asphalt binders delivered and incorporated in the work.

- (a) Performance Graded (PG) Asphalt Binder. The asphalt binder shall meet the requirements of AASHTO M 320, Table 1 “Standard Specification for Performance Graded Asphalt Binder” for the grade shown on the plans and the following.

Test	Parameter
Small Strain Parameter (AASHTO PP 113) BBR, ΔT_c , 40 hrs PAV (40 hrs continuous or 2 PAV at 20 hrs)	-5 °C min.

- (b) Modified Performance Graded (PG) Asphalt Binder. The asphalt binder shall meet the requirements of AASHTO M 320, Table 1 “Standard Specification for Performance Graded Asphalt Binder” for the grade shown on the plans.

Asphalt binder modification shall be performed at the source, as defined in the Bureau of Materials Policy Memorandum, “Performance Graded Asphalt Binder Qualification Procedure.”

Modified asphalt binder shall be safe to handle at asphalt binder production and storage temperatures or HMA construction temperatures. Safety Data Sheets (SDS) shall be provided for all asphalt modifiers.

- (1) Polymer Modification (SB/SBS or SBR). Elastomers shall be added to the base asphalt binder to achieve the specified performance grade and shall be either a styrene-butadiene diblock, triblock copolymer without oil extension, or a styrene-butadiene rubber. The polymer modified asphalt binder shall be smooth, homogeneous, and be according to the requirements shown in Table 1 or 2 for the grade shown on the plans.

Table 1 - Requirements for Styrene-Butadiene Copolymer (SB/SBS) Modified Asphalt Binders		
Test	Asphalt Grade SB/SBS PG 64-28 SB/SBS PG 70-22	Asphalt Grade SB/SBS PG 64-34 SB/SBS PG 70-28 SB/SBS PG 76-22 SB/SBS PG 76-28
Separation of Polymer ITP, "Separation of Polymer from Asphalt Binder" Difference in °F (°C) of the softening point between top and bottom portions	4 (2) max.	4 (2) max.
TESTS ON RESIDUE FROM ROLLING THIN FILM OVEN TEST (AASHTO T 240)		
Elastic Recovery ASTM D 6084, Procedure A, 77 °F (25 °C), 100 mm elongation, %	60 min.	70 min.

Table 2 - Requirements for Styrene-Butadiene Rubber (SBR) Modified Asphalt Binders		
Test	Asphalt Grade SBR PG 64-28 SBR PG 70-22	Asphalt Grade SB/SBS PG 64-34 SB/SBS PG 70-28 SBR PG 76-22 SBR PG 76-28
Separation of Polymer ITP, "Separation of Polymer from Asphalt Binder" Difference in °F (°C) of the softening point between top and bottom portions	4 (2) max.	4 (2) max.
Toughness ASTM D 5801, 77 °F (25 °C), 20 in./min. (500 mm/min.), in.-lbs (N-m)	110 (12.5) min.	110 (12.5) min.
Tenacity ASTM D 5801, 77 °F (25 °C), 20 in./min. (500 mm/min.), in.-lbs (N-m)	75 (8.5) min.	75 (8.5) min.
TESTS ON RESIDUE FROM ROLLING THIN FILM OVEN TEST (AASHTO T 240)		
Elastic Recovery ASTM D 6084, Procedure A, 77 °F (25 °C), 100 mm elongation, %	40 min.	50 min.

- (2) Ground Tire Rubber (GTR) Modification. GTR modification is the addition of recycled ground tire rubber to liquid asphalt binder to achieve the specified performance grade. GTR shall be produced from processing automobile and/or truck tires by the ambient

grinding method or micronizing through a cryogenic process. GTR shall not exceed 1/16 in. (2 mm) in any dimension and shall not contain free metal particles, moisture that would cause foaming of the asphalt, or other foreign materials. A mineral powder (such as talc) meeting the requirements of AASHTO M 17 may be added, up to a maximum of four percent by weight of GTR to reduce sticking and caking of the GTR particles. When tested in accordance with Illinois Modified AASHTO T 27 “Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates” or AASHTO PP 74 “Standard Practice for Determination of Size and Shape of Glass Beads Used in Traffic Markings by Means of Computerized Optical Method”, a 50 g sample of the GTR shall conform to the following gradation requirements.

Sieve Size	Percent Passing
No. 16 (1.18 mm)	100
No. 30 (600 μ m)	95 \pm 5
No. 50 (300 μ m)	> 20

GTR modified asphalt binder shall be tested for rotational viscosity according to AASHTO T 316 using spindle S27. GTR modified asphalt binder shall be tested for original dynamic shear and RTFO dynamic shear according to AASHTO T 315 using a gap of 2 mm.

The GTR modified asphalt binder shall meet the requirements of Table 3.

Table 3 - Requirements for Ground Tire Rubber (GTR) Modified Asphalt Binders		
Test	Asphalt Grade GTR PG 64-28 GTR PG 70-22	Asphalt Grade GTR PG 76-22 GTR PG 76-28 GTR PG 70-28
TESTS ON RESIDUE FROM ROLLING THIN FILM OVEN TEST (AASHTO T 240)		
Elastic Recovery ASTM D 6084, Procedure A, 77 °F (25 °C), 100 mm elongation, %	60 min.	70 min.

- (3) Softener Modification (SM). Softener modification is the addition of organic compounds, such as engineered flux, bio-oil blends, modified vegetable oils, glycol amines, and fatty acid derivatives, to the base asphalt binder to achieve the specified performance grade. Softeners shall be dissolved, dispersed, or reacted in the asphalt binder to enhance its performance and shall remain compatible with the asphalt binder with no separation. Softeners shall not be added to modified PG asphalt binder as defined in Articles 1032.05(b)(1) or 1032.05(b)(2).

An Attenuated Total Reflectance-Fourier Transform Infrared spectrum (ATR-FTIR) shall be collected for both the softening compound as well as the softener modified

asphalt binder at the dose intended for qualification. The ATR-FTIR spectra shall be collected on unaged softener modified binder, 20-hour Pressurized Aging Vessel (PAV) aged softener modified binder, and 40-hour PAV aged softener modified binder. The ATR-FTIR shall be collected in accordance with Illinois Test Procedure 601. The electronic files spectral files (in one of the following extensions or equivalent: *.SPA, *.SPG, *.IRD, *.IFG, *.CSV, *.SP, *.IRS, *.GAML, *. [0-9], *.IGM, *.ABS, *.DRT, *.SBM, *.RAS) shall be submitted to the Central Bureau of Materials.

Softener modified asphalt binders shall meet the requirements in Table 4.

Table 4 - Requirements for Softener Modified Asphalt Binders	
Test	Asphalt Grade
	SM PG 46-28 SM PG 46-34 SM PG 52-28 SM PG 52-34 SM PG 58-22 SM PG 58-28 SM PG 64-22
Small Strain Parameter (AASHTO PP 113) BBR, ΔT_c , 40 hrs PAV (40 hrs continuous or 2 PAV at 20 hrs)	-5°C min.
Large Strain Parameter (Illinois Modified AASHTO T 391) DSR/LAS Fatigue Property, $\Delta G^* _{peak}$, 40 hrs PAV (40 hrs continuous or 2 PAV at 20 hrs)	≥ 54 %

The following grades may be specified as tack coats.

Asphalt Grade	Use
PG 58-22, PG 58-28, PG 64-22	Tack Coat"

Revise Article 1031.06(c)(1) and 1031.06(c)(2) of the Standard Specifications to read:

“(1) RAP/RAS. When RAP is used alone or RAP is used in conjunction with RAS, the percentage of virgin ABR shall not exceed the amounts listed in the following table.

HMA Mixtures - RAP/RAS Maximum ABR % ^{1/ 2/}			
Ndesign	Binder	Surface	Polymer Modified Binder or Surface ^{3/}
30	30	30	10
50	25	15	10
70	15	10	10
90	10	10	10

1/ For Low ESAL HMA shoulder and stabilized subbase, the RAP/RAS ABR shall not exceed 50 percent of the mixture.

- 2/ When RAP/RAS ABR exceeds 20 percent, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent ABR would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).
- 3/ The maximum ABR percentages for ground tire rubber (GTR) modified mixes shall be equivalent to the percentages specified for SBS/SBR polymer modified mixes.
- (2) FRAP/RAS. When FRAP is used alone or FRAP is used in conjunction with RAS, the percentage of virgin asphalt binder replacement shall not exceed the amounts listed in the following table.

HMA Mixtures - FRAP/RAS Maximum ABR % ^{1/ 2/}			
Ndesign	Binder	Surface	Polymer Modified Binder or Surface ^{3/}
30	55	45	15
50	45	40	15
70	45	35	15
90	45	35	15
SMA	- -	- -	25
IL-4.75	- -	- -	35

- 1/ For Low ESAL HMA shoulder and stabilized subbase, the FRAP/RAS ABR shall not exceed 50 percent of the mixture.
- 2/ When FRAP/RAS ABR exceeds 20 percent for all mixes, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent ABR would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).
- 3/ The maximum ABR percentages for GTR modified mixes shall be equivalent to the percentages specified for SBS/SBR polymer modified mixes."

Add the following to the end of Note 2 of Article 1030.03 of the Standard Specifications.

"A dedicated storage tank for the ground tire rubber (GTR) modified asphalt binder shall be provided. This tank shall be capable of providing continuous mechanical mixing throughout and/or recirculation of the asphalt binder to provide a uniform mixture. The tank shall be heated and capable of maintaining the temperature of the asphalt binder at 300 °F to 350 °F (149 °C to 177 °C). The asphalt binder metering systems of dryer drum plants shall be calibrated with the actual GTR modified asphalt binder material with an accuracy of ± 0.40 percent."

PORTLAND CEMENT CONCRETE (BDE)

Effective: August 1, 2023

Revise the second paragraph of Article 1103.03(a)(4) the Standard Specifications to read:

“The dispenser system shall provide a visual indication that the liquid admixture is actually entering the batch, such as via a transparent or translucent section of tubing or by independent check with an integrated secondary metering device. If approved by the Engineer, an alternate indicator may be used for admixtures dosed at rates of 25 oz/cwt (1630 mL/100 kg) or greater, such as accelerating admixtures, corrosion inhibitors, and viscosity modifying admixtures.”

80451

PREFORMED PLASTIC PAVEMENT MARKING (BDE)

Effective: June 2, 2024

Revise Article 1095.03(h) of the Standard Specifications to read:

“(h) Glass Beads. Glass beads shall be colorless and uniformly distributed throughout the yellow and white portions of the material only. A top coating of beads shall be bonded to or directly embedded into the surface of the markings such that the beads are not easily removed when the film is scratched firmly with a thumb nail.

The glass bead refractive index shall be tested using the liquid immersion method.

Type B material shall have an inner mix of glass beads with a minimum refractive index of 1.50 and a top coating of ceramic beads bonded to top urethane wear surface with a minimum refractive index of 1.70. Beads with a refractive index greater than 1.80 shall not be used.

Type C material shall have glass beads with a minimum refractive index of 1.50 and a layer of skid resistant ceramic particles bonded to the top urethane wear surface. The urethane wear surface shall have a nominal thickness of 5 mils (0.13 mm).”

Revise Article 1095.03(n) of the Standard Specifications to read:

“(n) Sampling and Inspection.

(1) Sample. Prior to approval and use of preformed plastic pavement markings, the manufacturer shall submit a notarized certification from an independent laboratory, together with the results of all tests, stating that the material meets the requirements as set forth herein. The independent laboratory test report shall state the lot tested, the manufacturer’s name, and the date of manufacture.

After initial approval by the Department, samples and certification by the manufacturer shall be submitted for each subsequent batch used. The manufacturer shall submit a certification stating that the material meets the requirements as set forth herein and is essentially identical to the material sent for qualification. The certification shall state the lot tested, the manufacturer’s name, and the date of manufacture.

(2) Inspection. The Contractor shall provide a manufacturer’s certification to the Engineer stating the material meets all requirements of this specification. All material samples for acceptance tests will be taken or witnessed by a representative of the Bureau of Materials and will be submitted to the Engineer of Materials, 126 East Ash Street, Springfield, Illinois 62704-4766 at least 30 days in advance of the pavement marking operations.”

RAILROAD PROTECTIVE LIABILITY INSURANCE (BDE)

Effective: December 1, 1986

Revised: January 1, 2022

Description. Railroad Protective Liability and Property Damage Liability Insurance shall be carried according to Article 107.11 of the Standard Specifications. A separate policy is required for each railroad unless otherwise noted.

NAMED INSURED & ADDRESS	NUMBER & SPEED OF PASSENGER TRAINS	NUMBER & SPEED OF FREIGHT TRAINS
Wisconsin Central, Ltd Finance / Insurance Mail 17641 S. Ashland Avenue Homewood, IL 60430	0 trains/day @ 0 mph	17 trains/day @ 45 mph
Class 1 RR (Y or N): Y DOT/AAR No.: 260 514W RR Division: CHICAGO	RR Mile Post: 50.10 RR Sub-Division: LEITHTON	
For Freight/Passenger Information Contact: Paul Chojenski For Insurance Information Contact: Rob Glass		Phone: 708.332.3557 Phone: 708.332.6673

Class 1 RR (Y or N):

DOT/AAR No.:

RR Division:

RR Mile Post:

RR Sub-Division:

For Freight/Passenger Information Contact:

For Insurance Information Contact:

Phone:

Phone:

Basis of Payment. Providing Railroad Protective Liability and Property Damage Liability Insurance will be paid for at the contract unit price per Lump Sum for RAILROAD PROTECTIVE LIABILITY INSURANCE.

3426I

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES (BDE)

Effective: January 1, 2024

Revised: April 1, 2024

Revise the first paragraph of Article 669.04 of the Standard Specifications to read:

“669.04 Regulated Substances Monitoring. Regulated substances monitoring includes environmental observation and field screening during regulated substances management activities. The excavated soil and groundwater within the work areas shall be managed as either uncontaminated soil, hazardous waste, special waste, or non-special waste.

As part of the regulated substances monitoring, the monitoring personnel shall perform and document the applicable duties listed on form BDE 2732 “Regulated Substances Monitoring Daily Record (RSM DR)”.

Revise the first two sentences of the nineteenth paragraph of Article 669.05 of the Standard Specifications to read:

“The Contractor shall coordinate waste disposal approvals with the disposal facility and provide the specific analytical testing requirements of that facility. The Contractor shall make all arrangements for collection, transportation, and analysis of landfill acceptance testing.”

Revise the last paragraph of Article 669.05 of the Standard Specifications to read:

“The Contractor shall select a permitted landfill facility or CCDD/USFO facility meeting the requirements of 35 Ill. Admin. Code Parts 810-814 or Part 1100, respectively. The Department will review and approve or reject the facility proposed by the Contractor based upon information provided in BDE 2730. The Contractor shall verify whether the selected facility is compliant with those applicable standards as mandated by their permit and whether the facility is presently, has previously been, or has never been, on the United States Environmental Protection Agency (U.S. EPA) National Priorities List or the Resource Conservation and Recovery Act (RCRA) List of Violating Facilities. The use of a Contractor selected facility shall in no manner delay the construction schedule or alter the Contractor's responsibilities as set forth.”

Revise the first paragraph of Article 669.07 of the Standard Specifications to read:

“669.07 Temporary Staging. Soil classified according to Articles 669.05(a)(2), (b)(1), or (c) may be temporarily staged at the Contractor's option. All other soil classified according to Articles 669.05(a)(1), (a)(3), (a)(4), (a)(5), (a)(6), or (b)(2) shall be managed and disposed of without temporary staging to the greatest extent practicable. If circumstances beyond the Contractor's control require temporary staging of these latter materials, the Contractor shall request approval from the Engineer in writing.

Topsoil for re-use as final cover which has been field screened and found not to exhibit PID readings over daily background readings as documented on the BDE 2732, visual staining or

odors, and is classified according to Articles 669.05(a)(2), (a)(3), (a)(4), (b)(1), or (c) may be temporarily staged at the Contractor's option."

Add the following paragraph after the sixth paragraph of Article 669.11 of the Standard Specifications.

"The sampling and testing of effluent water derived from dewatering discharges for priority pollutants volatile organic compounds (VOCs), priority pollutants semi-volatile organic compounds (SVOCs), or priority pollutants metals, will be paid for at the contract unit price per each for VOCS GROUNDWATER ANALYSIS using EPA Method 8260B, SVOCS GROUNDWATER ANALYSIS using EPA Method 8270C, or RCRA METALS GROUNDWATER ANALYSIS using EPA Methods 6010B and 7471A. This price shall include transporting the sample from the job site to the laboratory."

Revise the first sentence of the eight paragraph of Article 669.11 of the Standard Specifications to read:

"Payment for temporary staging of soil classified according to Articles 669.05(a)(1), (a)(3), (a)(4), (a)(5), (a)(6), or (b)(2) to be managed and disposed of, if required and approved by the Engineer, will be paid according to Article 109.04."

80455

SEEDING (BDE)

Effective: November 1, 2022

Revise Article 250.07 of the Standard Specifications to read:

“250.07 Seeding Mixtures. The classes of seeding mixtures and combinations of mixtures will be designated in the plans.

When an area is to be seeded with two or more seeding classes, those mixtures shall be applied separately on the designated area within a seven day period. Seeding shall occur prior to placement of mulch cover. A Class 7 mixture can be applied at any time prior to applying any seeding class or added to them and applied at the same time.

TABLE 1 - SEEDING MIXTURES			
Class - Type	Seeds	lb/acre (kg/hectare)	
1 Lawn Mixture 1/	Kentucky Bluegrass	100 (110)	
	Perennial Ryegrass	60 (70)	
	<i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue)	40 (50)	
1A Salt Tolerant Lawn Mixture 1/	Kentucky Bluegrass	60 (70)	
	Perennial Ryegrass	20 (20)	
	<i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue)	20 (20)	
	<i>Festuca brevipila</i> (Hard Fescue)	20 (20)	
	<i>Puccinellia distans</i> (Fults Saltgrass or Salty Alkaligrass)	60 (70)	
1B Low Maintenance Lawn Mixture 1/	Turf-Type Fine Fescue 3/	150 (170)	
	Perennial Ryegrass	20 (20)	
	Red Top	10 (10)	
	<i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue)	20 (20)	
2 Roadside Mixture 1/	<i>Lolium arundinaceum</i> (Tall Fescue)	100 (110)	
	Perennial Ryegrass	50 (55)	
	<i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue)	40 (50)	
	Red Top	10 (10)	
2A Salt Tolerant Roadside Mixture 1/	<i>Lolium arundinaceum</i> (Tall Fescue)	60 (70)	
	Perennial Ryegrass	20 (20)	
	<i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue)	30 (20)	
	<i>Festuca brevipila</i> (Hard Fescue)	30 (20)	
	<i>Puccinellia distans</i> (Fults Saltgrass or Salty Alkaligrass)	60 (70)	
3 Northern Illinois Slope Mixture 1/	<i>Elymus canadensis</i>	5 (5)	
	(Canada Wild Rye) 5/		
	Perennial Ryegrass	20 (20)	
	Alsike Clover 4/	5 (5)	
	<i>Desmanthus illinoensis</i>	2 (2)	
	(Illinois Bundleflower) 4/ 5/		
	<i>Schizachyrium scoparium</i>	12 (12)	
	(Little Bluestem) 5/		
	<i>Bouteloua curtipendula</i>	10 (10)	
	(Side-Oats Grama) 5/		
	<i>Puccinellia distans</i> (Fults Saltgrass or Salty Alkaligrass)	30 (35)	
	Oats, Spring	50 (55)	
	Slender Wheat Grass 5/	15 (15)	
	Buffalo Grass 5/ 7/	5 (5)	
3A Southern Illinois Slope Mixture 1/	Perennial Ryegrass	20 (20)	
	<i>Elymus canadensis</i>	20 (20)	
	(Canada Wild Rye) 5/		
	<i>Panicum virgatum</i> (Switchgrass) 5/	10 (10)	
	<i>Schizachyrium scoparium</i>	12 (12)	
	(Little Blue Stem) 5/		
	<i>Bouteloua curtipendula</i>	10 (10)	
	(Side-Oats Grama) 5/		
	<i>Dalea candida</i>	5 (5)	
	(White Prairie Clover) 4/ 5/		
	<i>Rudbeckia hirta</i> (Black-Eyed Susan) 5/	5 (5)	
	Oats, Spring	50 (55)	

Class – Type		Seeds	lb/acre (kg/hectare)
4	Native Grass 2/ 6/	<i>Andropogon gerardi</i>	4 (4)
		(Big Blue Stem) 5/	
		<i>Schizachyrium scoparium</i>	5 (5)
		(Little Blue Stem) 5/	
		<i>Bouteloua curtipendula</i>	5 (5)
		(Side-Oats Grama) 5/	
		<i>Elymus canadensis</i>	1 (1)
		(Canada Wild Rye) 5/	
		<i>Panicum virgatum</i> (Switch Grass) 5/	1 (1)
		<i>Sorghastrum nutans</i> (Indian Grass) 5/	2 (2)
4A	Low Profile Native Grass 2/ 6/	Annual Ryegrass	25 (25)
		Oats, Spring	25 (25)
		Perennial Ryegrass	15 (15)
		<i>Schizachyrium scoparium</i>	5 (5)
		(Little Blue Stem) 5/	
		<i>Bouteloua curtipendula</i>	5 (5)
		(Side-Oats Grama) 5/	
		<i>Elymus canadensis</i>	1 (1)
		(Canada Wild Rye) 5/	
		<i>Sporobolus heterolepis</i>	0.5 (0.5)
4B	Wetland Grass and Sedge Mixture 2/ 6/	Annual Ryegrass	25 (25)
		Oats, Spring	25 (25)
		Wetland Grasses (species below) 5/	6 (6)
		<u>Species:</u>	<u>% By Weight</u>
		<i>Calamagrostis canadensis</i> (Blue Joint Grass)	12
		<i>Carex lacustris</i> (Lake-Bank Sedge)	6
		<i>Carex slipata</i> (Awl-Fruited Sedge)	6
		<i>Carex stricta</i> (Tussock Sedge)	6
		<i>Carex vulpinoidea</i> (Fox Sedge)	6
		<i>Eleocharis acicularis</i> (Needle Spike Rush)	3
		<i>Eleocharis obtusa</i> (Blunt Spike Rush)	3
		<i>Glyceria striata</i> (Fowl Manna Grass)	14
		<i>Juncus effusus</i> (Common Rush)	6
		<i>Juncus tenuis</i> (Slender Rush)	6
		<i>Juncus torreyi</i> (Torrey's Rush)	6
		<i>Leersia oryzoides</i> (Rice Cut Grass)	10
		<i>Scirpus acutus</i> (Hard-Stemmed Bulrush)	3
		<i>Scirpus atrovirens</i> (Dark Green Rush)	3
		<i>Bolboschoenus fluviatilis</i> (River Bulrush)	3
		<i>Schoenoplectus tabernaemontani</i> (Softstem Bulrush)	3
		<i>Spartina pectinata</i> (Cord Grass)	4

Class – Type	Seeds	lb/acre (kg/hectare)
5	Forb with Annuals Mixture 2/ 5/ 6/	Annuals Mixture (Below) Forb Mixture (Below)
		1 (1) 10 (10)
	Annuals Mixture - Mixture not exceeding 25 % by weight of any one species, of the following:	
	<i>Coreopsis lanceolata</i> (Sand Coreopsis) <i>Leucanthemum maximum</i> (Shasta Daisy) <i>Gaillardia pulchella</i> (Blanket Flower) <i>Ratibida columnifera</i> (Prairie Coneflower) <i>Rudbeckia hirta</i> (Black-Eyed Susan)	
	Forb Mixture - Mixture not exceeding 5 % by weight PLS of any one species, of the following:	
	<i>Amorpha canescens</i> (Lead Plant) 4/ <i>Anemone cylindrica</i> (Thimble Weed) <i>Asclepias tuberosa</i> (Butterfly Weed) <i>Aster azureus</i> (Sky Blue Aster) <i>Symphyotrichum leave</i> (Smooth Aster) <i>Aster novae-angliae</i> (New England Aster) <i>Baptisia leucantha</i> (White Wild Indigo) 4/ <i>Coreopsis palmata</i> (Prairie Coreopsis) <i>Echinacea pallida</i> (Pale Purple Coneflower) <i>Eryngium yuccifolium</i> (Rattlesnake Master) <i>Helianthus mollis</i> (Downy Sunflower) <i>Heliopsis helianthoides</i> (Ox-Eye) <i>Liatris aspera</i> (Rough Blazing Star) <i>Liatris pycnostachya</i> (Prairie Blazing Star) <i>Monarda fistulosa</i> (Prairie Bergamot) <i>Parthenium integrifolium</i> (Wild Quinine) <i>Dalea candida</i> (White Prairie Clover) 4/ <i>Dalea purpurea</i> (Purple Prairie Clover) 4/ <i>Physostegia virginiana</i> (False Dragonhead) <i>Potentilla arguta</i> (Prairie Cinquefoil) <i>Ratibida pinnata</i> (Yellow Coneflower) <i>Rudbeckia subtomentosa</i> (Fragrant Coneflower) <i>Silphium laciniatum</i> (Compass Plant) <i>Silphium terebinthinaceum</i> (Prairie Dock) <i>Oligoneuron rigidum</i> (Rigid Goldenrod) <i>Tradescantia ohiensis</i> (Spiderwort) <i>Veronicastrum virginicum</i> (Culver's Root)	

Class – Type		Seeds	lb/acre (kg/hectare)
5A	Large Flower Native Forb Mixture 2/ 5/ 6/	Forb Mixture (see below)	5 (5)
	<u>Species:</u>	<u>% By Weight</u>	
	<i>Aster novae-angliae</i> (New England Aster)	5	
	<i>Echinacea pallida</i> (Pale Purple Coneflower)	10	
	<i>Helianthus mollis</i> (Downy Sunflower)	10	
	<i>Heliopsis helianthoides</i> (Ox-Eye)	10	
	<i>Liatris pycnostachya</i> (Prairie Blazing Star)	10	
	<i>Ratibida pinnata</i> (Yellow Coneflower)	5	
	<i>Rudbeckia hirta</i> (Black-Eyed Susan)	10	
	<i>Silphium laciniatum</i> (Compass Plant)	10	
	<i>Silphium terebinthinaceum</i> (Prairie Dock)	20	
	<i>Oligoneuron rigidum</i> (Rigid Goldenrod)	10	
5B	Wetland Forb 2/ 5/ 6/	Forb Mixture (see below)	2 (2)
	<u>Species:</u>	<u>% By Weight</u>	
	<i>Acorus calamus</i> (Sweet Flag)	3	
	<i>Angelica atropurpurea</i> (Angelica)	6	
	<i>Asclepias incarnata</i> (Swamp Milkweed)	2	
	<i>Aster puniceus</i> (Purple Stemmed Aster)	10	
	<i>Bidens cernua</i> (Beggarticks)	7	
	<i>Eutrochium maculatum</i> (Spotted Joe Pye Weed)	7	
	<i>Eupatorium perfoliatum</i> (Boneset)	7	
	<i>Helenium autumnale</i> (Autumn Sneezeweed)	2	
	<i>Iris virginica shrevei</i> (Blue Flag Iris)	2	
	<i>Lobelia cardinalis</i> (Cardinal Flower)	5	
	<i>Lobelia siphilitica</i> (Great Blue Lobelia)	5	
	<i>Lythrum alatum</i> (Winged Loosestrife)	2	
	<i>Physostegia virginiana</i> (False Dragonhead)	5	
	<i>Persicaria pensylvanica</i> (Pennsylvania Smartweed)	10	
	<i>Persicaria lapathifolia</i> (Curlytop Knotweed)	10	
	<i>Pycnanthemum virginianum</i> (Mountain Mint)	5	
	<i>Rudbeckia laciniata</i> (Cut-leaf Coneflower)	5	
	<i>Oligoneuron riddellii</i> (Riddell Goldenrod)	2	
	<i>Sparganium eurycarpum</i> (Giant Burreed)	5	
6	Conservation Mixture 2/ 6/	<i>Schizachyrium scoparium</i> (Little Blue Stem) 5/ <i>Elymus canadensis</i> (Canada Wild Rye) 5/ Buffalo Grass 5/ 7/ Vernal Alfalfa 4/ Oats, Spring	5 (5) 2 (2) 5 (5) 15 (15) 48 (55)
6A	Salt Tolerant Conservation Mixture 2/ 6/	<i>Schizachyrium scoparium</i> (Little Blue Stem) 5/ <i>Elymus canadensis</i> (Canada Wild Rye) 5/ Buffalo Grass 5/ 7/ Vernal Alfalfa 4/ Oats, Spring <i>Puccinellia distans</i> (Fulps Saltgrass or Salty Alkaligrass)	5 (5) 2 (2) 5 (5) 15 (15) 48 (55) 20 (20)
7	Temporary Turf Cover Mixture	Perennial Ryegrass Oats, Spring	50 (55) 64 (70)

Notes:

- 1/ Seeding shall be performed when the ambient temperature has been between 45 °F (7 °C) and 80 °F (27 °C) for a minimum of seven (7) consecutive days and is forecasted to be the same for the next five (5) days according to the National Weather Service.
- 2/ Seeding shall be performed in late fall through spring beginning when the ambient temperature has been below 45 °F (7 °C) for a minimum of seven (7) consecutive days and ending when the ambient temperature exceeds 80 °F (27 °C) according to the National Weather Service.
- 3/ Specific variety as shown in the plans or approved by the Engineer.
- 4/ Inoculation required.
- 5/ Pure Live Seed (PLS) shall be used.
- 6/ Fertilizer shall not be used.
- 7/ Seed shall be primed with KNO_3 to break dormancy and dyed to indicate such.

Seeding will be inspected after a period of establishment. The period of establishment shall be six (6) months minimum, but not to exceed nine (9) months. After the period of establishment, areas not exhibiting 75 percent uniform growth shall be interseeded or reseeded, as determined by the Engineer, at no additional cost to the Department."

80445

SHORT TERM AND TEMPORARY PAVEMENT MARKINGS (BDE)

Effective: April 1, 2024

Revised: April 2, 2024

Revise Article 701.02(d) of the Standard Specifications to read:

“(d) Pavement Marking Tapes (Note 3) 1095.06”

Add the following Note to the end of Article 701.02 of the Standard Specifications:

“Note 3. White or yellow pavement marking tape that is to remain in place longer than 14 days shall be Type IV tape.”

Revise Article 703.02(c) of the Standard Specifications to read:

“(c) Pavement Marking Tapes (Note 1) 1095.06”

Add the following Note to the end of Article 703.02 of the Standard Specifications:

“Note 1. White or yellow pavement marking tape that is to remain in place longer than 14 days shall be Type IV tape.”

Revise Article 1095.06 of the Standard Specifications to read:

“1095.06 Pavement Marking Tapes. Type I white or yellow marking tape shall consist of glass spheres embedded into a binder on a foil backing that is precoated with a pressure sensitive adhesive. The spheres shall be of uniform gradation and distributed evenly over the surface of the tape.

Type IV tape shall consist of white or yellow tape with wet reflective media incorporated to provide immediate and continuing retroreflection in wet and dry conditions. The wet retroreflective media shall be bonded to a durable polyurethane surface. The patterned surface shall have approximately 40 ± 10 percent of the surface area raised and presenting a near vertical face to traffic from any direction. The channels between the raised areas shall be substantially free of exposed reflective elements or particles.

Blackout tape shall consist of a matte black, non-reflective, patterned surface that is precoated with a pressure sensitive adhesive.

- (a) Color. The white and yellow markings shall meet the following requirements for daylight reflectance and color, when tested, using a color spectrophotometer with 45 degrees circumferential/zero degree geometry, illuminant D65, and two degree observer angle. The color instrument shall measure the visible spectrum from 380 to 720 nm with a wavelength measurement interval and spectral bandpass of 10 nm.

Color	Daylight Reflectance %Y
White	65 min.
Yellow *	36 - 59

*Shall match Aerospace Material Specification Standard 595 33538 (Orange Yellow) and the chromaticity limits as follows.

x	0.490	0.475	0.485	0.530
y	0.470	0.438	0.425	0.456

- (b) Retroreflectivity. The white and yellow markings shall be retroreflective. Reflective values measured in accordance with the photometric testing procedure of ASTM D 4061 shall not be less than those listed in the table below. The coefficient of retroreflected luminance, R_L , shall be expressed as average millicandelas/footcandle/sq ft (millicandelas/lux/sq m), measured on a 3.0 x 0.5 ft (900 mm x 150 mm) panel at 86 degree entrance angle.

Coefficient of Retroreflected Luminance, R_L , Dry					
Type I			Type IV		
Observation Angle	White	Yellow	Observation Angle	White	Yellow
0.2°	2700	2400	0.2°	1300	1200
0.5°	2250	2000	0.5°	1100	1000

Wet retroreflectance shall be measured for Type IV under wet conditions according to ASTM E 2177 and meet the following.

Wet Retroreflectance, Initial R_L	
Color	R_L 1.05/88.76
White	300
Yellow	200

- (c) Skid Resistance. The surface of Type IV and blackout markings shall provide a minimum skid resistance of 45 BPN when tested according to ASTM E 303.
- (d) Application. The pavement marking tape shall have a precoated pressure sensitive adhesive and shall require no activation procedures. Test pieces of the tape shall be applied according to the manufacturer's instructions and tested according to ASTM D 1000, Method A, except that a stiff, short bristle roller brush and heavy hand pressure will be substituted for the weighted rubber roller in applying the test pieces to the metal test panel. Material tested as directed above shall show a minimum adhesion value of 750 g/in. (30 g/mm) width at the temperatures specified in ASTM D 1000. The adhesive shall be resistant to oils, acids, solvents, and water, and shall not leave objectionable stains or residue after removal. The material shall be flexible and conformable to the texture of the pavement.

(e) Durability. Type IV and blackout tape shall be capable of performing for the duration of a normal construction season and shall then be capable of being removed intact or in large sections at pavement temperatures above 40 °F (4 °C) either manually or with a roll-up device without the use of sandblasting, solvents, or grinding. The Contractor shall provide a manufacturer's certification that the material meets the requirements for being removed after the following minimum traffic exposure based on transverse test decks with rolling traffic.

- (1) Time in place - 400 days
- (2) ADT per lane - 9,000 (28 percent trucks)
- (3) Axle hits - 10,000,000 minimum

Samples of the material applied to standard specimen plates will be measured for thickness and tested for durability in accordance with ASTM D 4060, using a CS-17 wheel and 1000-gram load, and shall meet the following criteria showing no significant change in color after being tested for the number of cycles indicated.

Test	Type I	Type IV	Blackout
Minimum Initial Thickness, mils (mm)	20 (0.51)	65 (1.65) ^{1/} 20 (0.51) ^{2/}	65 (1.65) ^{1/} 20 (0.51) ^{2/}
Durability (cycles)	5,000	1,500	1,500

1/ Measured at the thickest point of the patterned surface.

2/ Measured at the thinnest point of the patterned surface.

The pavement marking tape, when applied according to the manufacturer's recommended procedures, shall be weather resistant and shall show no appreciable fading, lifting, or shrinkage during the useful life of the marking. The tape, as applied, shall be of good appearance, free of cracks, and edges shall be true, straight, and unbroken.

(f) Sampling and Inspection.

(1) Sample. Prior to approval and use of Type IV pavement marking tape, the manufacturer shall submit a notarized certification from an independent laboratory, together with the results of all tests, stating that the material meets the requirements as set forth herein. The independent laboratory test report shall state the lot tested, the manufacturer's name, and the date of manufacture.

After initial approval by the Department, samples and certification by the manufacturer shall be submitted for each subsequent batch of Type IV tape used. The manufacturer shall submit a certification stating that the material meets the requirements as set forth herein and is essentially identical to the material sent for qualification. The certification shall state the lot tested, the manufacturer's name, and the date of manufacture.

- (2) Inspection. The Contractor shall provide a manufacturer's certification to the Engineer stating the material meets all requirements of this specification. All material samples for acceptance tests shall be taken or witnessed by a representative of the Bureau of Materials and shall be submitted to the Engineer of Materials, 126 East Ash Street, Springfield, Illinois 62704-4766 at least 30 days in advance of the pavement marking operations."

80457

SOURCE OF SUPPLY AND QUALITY REQUIREMENTS (BDE)

Effective: January 2, 2023

Add the following to Article 106.01 of the Standard Specifications:

“The final manufacturing process for construction materials and the immediately preceding manufacturing stage for construction materials shall occur within the United States. Construction materials shall include an article, material, or supply that is or consists primarily of the following.

- (a) Non-ferrous metals;
- (b) Plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
- (c) Glass (including optic glass);
- (d) Lumber;
- (e) Drywall.

Items consisting of two or more of the listed construction materials that have been combined through a manufacturing process, and items including at least one of the listed materials combined with a material that is not listed through a manufacturing process shall be exempt.”

80448

STEEL COST ADJUSTMENT (BDE)

Effective: April 2, 2004

Revised: January 1, 2022

Description. Steel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in steel prices when optioned by the Contractor. The bidder shall indicate with their bid whether or not this special provision will be part of the contract. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

- Metal Piling (excluding temporary sheet piling)
- Structural Steel
- Reinforcing Steel

Other steel materials such as dowel bars, tie bars, welded reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), and frames and grates will be subject to a steel cost adjustment when the pay items they are used in have a contract value of \$10,000 or greater.

The adjustments shall apply to the above items when they are part of the original proposed construction, or added as extra work and paid for by agreed unit prices. The adjustments shall not apply when the item is added as extra work and paid for at a lump sum price or by force account.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

- (a) The dates and quantity of steel, in lb (kg), shipped from the mill to the fabricator.
- (b) The quantity of steel, in lb (kg), incorporated into the various items of work covered by this special provision. The Department reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

$$SCA = Q \times D$$

Where: SCA = steel cost adjustment, in dollars
Q = quantity of steel incorporated into the work, in lb (kg)
D = price factor, in dollars per lb (kg)

$$D = MPI_M - MPI_L$$

Where: MPI_M = The Materials Cost Index for steel as published by the Engineering News-Record for the month the steel is shipped from the mill. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

MPI_L = The Materials Cost Index for steel as published by the Engineering News-Record for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price,. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

The unit weights (masses) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the MPI_M will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the MPI_L and MPI_M in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(MPI_L - MPI_M) \div MPI_L\} \times 100$$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the items of work are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

Attachment

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling)	
Furnishing Metal Pile Shells 12 in. (305 mm), 0.179 in. (3.80 mm) wall thickness)	23 lb/ft (34 kg/m)
Furnishing Metal Pile Shells 12 in. (305 mm), 0.250 in. (6.35 mm) wall thickness)	32 lb/ft (48 kg/m)
Furnishing Metal Pile Shells 14 in. (356 mm), 0.250 in. (6.35 mm) wall thickness)	37 lb/ft (55 kg/m)
Other piling	See plans
Structural Steel	See plans for weights (masses)
Reinforcing Steel	See plans for weights (masses)
Dowel Bars and Tie Bars	6 lb (3 kg) each
Welded Reinforcement	63 lb/100 sq ft (310 kg/sq m)
Guardrail	
Steel Plate Beam Guardrail, Type A w/steel posts	20 lb/ft (30 kg/m)
Steel Plate Beam Guardrail, Type B w/steel posts	30 lb/ft (45 kg/m)
Steel Plate Beam Guardrail, Types A and B w/wood posts	8 lb/ft (12 kg/m)
Steel Plate Beam Guardrail, Type 2	305 lb (140 kg) each
Steel Plate Beam Guardrail, Type 6	1260 lb (570 kg) each
Traffic Barrier Terminal, Type 1 Special (Tangent)	730 lb (330 kg) each
Traffic Barrier Terminal, Type 1 Special (Flared)	410 lb (185 kg) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms	
Traffic Signal Post	11 lb/ft (16 kg/m)
Light Pole, Tenon Mount and Twin Mount, 30 - 40 ft (9 – 12 m)	14 lb/ft (21 kg/m)
Light Pole, Tenon Mount and Twin Mount, 45 - 55 ft (13.5 – 16.5 m)	21 lb/ft (31 kg/m)
Light Pole w/Mast Arm, 30 - 50 ft (9 – 15.2 m)	13 lb/ft (19 kg/m)
Light Pole w/Mast Arm, 55 - 60 ft (16.5 – 18 m)	19 lb/ft (28 kg/m)
Light Tower w/Luminaire Mount, 80 - 110 ft (24 – 33.5 m)	31 lb/ft (46 kg/m)
Light Tower w/Luminaire Mount, 120 - 140 ft (36.5 – 42.5 m)	65 lb/ft (97 kg/m)
Light Tower w/Luminaire Mount, 150 - 160 ft (45.5 – 48.5 m)	80 lb/ft (119 kg/m)
Metal Railings (excluding wire fence)	
Steel Railing, Type SM	64 lb/ft (95 kg/m)
Steel Railing, Type S-1	39 lb/ft (58 kg/m)
Steel Railing, Type T-1	53 lb/ft (79 kg/m)
Steel Bridge Rail	52 lb/ft (77 kg/m)
Frames and Grates	
Frame	250 lb (115 kg)
Lids and Grates	150 lb (70 kg)

80127

SUBCONTRACTOR AND DBE PAYMENT REPORTING (BDE)

Effective: April 2, 2018

Add the following to Section 109 of the Standard Specifications.

“109.14 Subcontractor and Disadvantaged Business Enterprise Payment Reporting.
The Contractor shall report all payments made to the following parties:

- (a) first tier subcontractors;
- (b) lower tier subcontractors affecting disadvantaged business enterprise (DBE) goal credit;
- (c) material suppliers or trucking firms that are part of the Contractor's submitted DBE utilization plan.

The report shall be made through the Department's on-line subcontractor payment reporting system within 21 days of making the payment.”

80397

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)

Effective: November 2, 2017

Revised: April 1, 2019

Replace the second paragraph of Article 109.12 of the Standard Specifications with the following:

“This mobilization payment shall be made at least seven days prior to the subcontractor starting work. The amount paid shall be at the following percentage of the amount of the subcontract reported on form BC 260A submitted for the approval of the subcontractor’s work.

Value of Subcontract Reported on Form BC 260A	Mobilization Percentage
Less than \$10,000	25%
\$10,000 to less than \$20,000	20%
\$20,000 to less than \$40,000	18%
\$40,000 to less than \$60,000	16%
\$60,000 to less than \$80,000	14%
\$80,000 to less than \$100,000	12%
\$100,000 to less than \$250,000	10%
\$250,000 to less than \$500,000	9%
\$500,000 to \$750,000	8%
Over \$750,000	7%”

80391

SUBMISSION OF PAYROLL RECORDS (BDE)

Effective: April 1, 2021

Revised: November 2, 2023

FEDERAL AID CONTRACTS. Revise the following section of Check Sheet #1 of the Recurring Special Provisions to read:

“STATEMENTS AND PAYROLLS

The payroll records shall include the worker’s name, social security number, last known address, telephone number, email address, classification(s) of work actually performed, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof), daily and weekly number of hours actually worked in total, deductions made, and actual wages paid.

The Contractor and each subcontractor shall submit certified payroll records to the Department each week from the start to the completion of their respective work, except that full social security numbers, last known addresses, telephone numbers, and email addresses shall not be included on weekly submittals. Instead, the payrolls need only include an identification number for each employee (e.g., the last four digits of the employee’s social security number). The submittals shall be made using LCPTracker Pro software. The software is web-based and can be accessed at <https://lcptracker.com/>. When there has been no activity during a work week, a payroll record shall still be submitted with the appropriate option (“No Work”, “Suspended”, or “Complete”) selected.”

STATE CONTRACTS. Revise Item 3 of Section IV of Check Sheet #5 of the Recurring Special Provisions to read:

- “3. Submission of Payroll Records. The Contractor and each subcontractor shall, no later than the 15th day of each calendar month, file a certified payroll for the immediately preceding month to the Illinois Department of Labor (IDOL) through the Illinois Prevailing Wage Portal in compliance with the State Prevailing Wage Act (820 ILCS 130). The portal can be found on the IDOL website at <https://www2.illinois.gov/idol/Laws-Rules/CONMED/Pages/Prevailing-Wage-Portal.aspx>. Payrolls shall be submitted in the format prescribed by the IDOL.

In addition to filing certified payroll(s) with the IDOL, the Contractor and each subcontractor shall certify and submit payroll records to the Department each week from the start to the completion of their respective work, except that full social security numbers shall not be included on weekly submittals. Instead, the payrolls shall include an identification number for each employee (e.g., the last four digits of the employee’s social security number). In addition, starting and ending times of work each day may be omitted from the payroll records submitted. The submittals shall be made using LCPTracker Pro software. The software is web-based and can be accessed at <https://lcptracker.com/>.

When there has been no activity during a work week, a payroll record shall still be submitted with the appropriate option (“No Work”, “Suspended”, or “Complete”) selected.”

80437

TRAINING SPECIAL PROVISIONS (BDE)

Effective: October 15, 1975

Revised: September 2, 2021

This Training Special Provision supersedes Section 7b of the Special Provision entitled "Specific Equal Employment Opportunity Responsibilities," and is in implementation of 23 U.S.C. 140(a).

As part of the Contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training aimed at developing full journeyman in the type of trade or job classification involved. The number of trainees to be trained under this contract will be 4. In the event the Contractor subcontracts a portion of the contract work, it shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also ensure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within the reasonable area of recruitment. Prior to commencing construction, the Contractor shall submit to the Illinois Department of Transportation for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee it employs on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority trainees and women (e.g. by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps it has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he or she has successfully completed a training course leading to journeyman status or in which he or she has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used, the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by the Illinois Department of Transportation and the Federal Highway Administration. The Illinois Department of Transportation and the Federal Highway Administration shall approve a program, if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved by not necessarily sponsored by the U.S. Department of Labor Employment Training Administration shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Illinois Department of Transportation and the Federal Highway Administration. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirement of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program.

It is not required that all trainees be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The Contractor shall furnish the trainee a copy of the program he will follow in providing the training. The Contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The Contractor shall provide for the maintenance of records and furnish periodic reports documenting its performance under this Training Special Provision.

For contracts with an awarded contract value of \$500,000 or more, the Contractor is required to comply with the Illinois Works Apprenticeship Initiative (30 ILCS 559/20-20 to 20-25) and all applicable administrative rules to the extent permitted by Section 20-20(g). For federally funded projects, the number of trainees to be trained under this contract, as stated in the Training Special Provisions, will be the established goal for the Illinois Works Apprenticeship Initiative 30 ILCS 559/20-20(g). The Contractor shall make a good faith effort to meet this goal. For federally funded projects, the Illinois Works Apprenticeship Initiative will be implemented using the FHWA approved OJT procedures. The Contractor must comply with the recordkeeping and reporting obligations of the Illinois Works Apprenticeship Initiative for the life of the project, including the certification as to whether the trainee/apprentice labor hour goals were met.

Method of Measurement. The unit of measurement is in hours.

Basis of Payment. This work will be paid for at the contract unit price of 80 cents per hour for TRAINEES. The estimated total number of hours, unit price, and total price have been included in the schedule of prices.

20338

VEHICLE AND EQUIPMENT WARNING LIGHTS (BDE)

Effective: November 1, 2021

Revised: November 1, 2022

Add the following paragraph after the first paragraph of Article 701.08 of the Standard Specifications:

“The Contractor shall equip all vehicles and equipment with high-intensity oscillating, rotating, or flashing, amber or amber-and-white, warning lights which are visible from all directions. In accordance with 625 ILCS 5/12-215, the lights may only be in operation while the vehicle or equipment is engaged in construction operations.”

80439

WEEKLY DBE TRUCKING REPORTS (BDE)

Effective: June 2, 2012

Revised: November 1, 2021

The Contractor shall submit a weekly report of Disadvantaged Business Enterprise (DBE) trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) that are used for DBE goal credit.

The report shall be submitted to the Engineer on Department form "SBE 723" within ten business days following the reporting period. The reporting period shall be Sunday through Saturday for each week reportable trucking activities occur.

Any costs associated with providing weekly DBE trucking reports shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

80302

WOOD SIGN SUPPORT (BDE)

Effective: November 1, 2023

Add the following to Article 730.02 of the Standard Specifications:

“(c) Preservative Treatment1007.12”

Revise the first paragraph of Article 730.03 of the Standard Specifications to read:

“**730.03 General.** Wood sign supports shall be treated. When the 4 x 6 in. (100 x 150 mm) posts are used, they shall be modified to satisfy the breakaway requirements by drilling 1 1/2 in. (38 mm) diameter holes centered at 4 and 18 in. (100 and 450 mm) above the groundline and perpendicular to the centerline of the roadway.”

80454

WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

Effective: March 2, 2020

Add the following to Article 701.03 of the Standard Specifications:

“(q) Temporary Sign Supports 1106.02”

Revise the third paragraph of Article 701.14 of the Standard Specifications to read:

“For temporary sign supports, the Contractor shall provide a FHWA eligibility letter for each device used on the contract. The letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device. The signs shall be supported within 20 degrees of vertical. Weights used to stabilize signs shall be attached to the sign support per the manufacturer’s specifications.”

Revise the first paragraph of Article 701.15 of the Standard Specifications to read:

“**701.15 Traffic Control Devices.** For devices that must meet crashworthiness standards, the Contractor shall provide a manufacturer’s self-certification or a FHWA eligibility letter for each Category 1 device and a FHWA eligibility letter for each Category 2 and Category 3 device used on the contract. The self-certification or letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device.”

Revise the first six paragraphs of Article 1106.02 of the Standard Specifications to read:

“**1106.02 Devices.** Work zone traffic control devices and combinations of devices shall meet crashworthiness standards for their respective categories. The categories are as follows.

Category 1 includes small, lightweight, channelizing and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, plastic drums, and delineators, with no attachments (e.g. lights). Category 1 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 1 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2024.

Category 2 includes devices that are not expected to produce significant vehicular velocity change but may otherwise be hazardous. These include vertical panels with lights, barricades, temporary sign supports, and Category 1 devices with attachments (e.g. drums with lights). Category 2 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 2 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2024.

Category 3 includes devices that are expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. These include crash cushions (impact

attenuators), truck mounted attenuators, and other devices not meeting the definitions of Category 1 or 2. Category 3 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 3 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2029. Category 3 devices shall be crash tested for Test Level 3 or the test level specified.

Category 4 includes portable or trailer-mounted devices such as arrow boards, changeable message signs, temporary traffic signals, and area lighting supports. It is preferable for Category 4 devices manufactured after December 31, 2019 to be MASH-16 compliant; however, there are currently no crash tested devices in this category, so it remains exempt from the NCHRP 350 or MASH compliance requirement.

For each type of device, when no more than one MASH-16 compliant is available, an NCHRP 350 or MASH-2009 compliant device may be used, even if manufactured after December 31, 2019.”

Revise Articles 1106.02(g), 1106.02(k), and 1106.02(l) to read:

“(g) Truck Mounted/Trailer Mounted Attenuators. The attenuator shall be approved for use at Test Level 3. Test Level 2 may be used for normal posted speeds less than or equal to 45 mph.

(k) Temporary Water Filled Barrier. The water filled barrier shall be a lightweight plastic shell designed to accept water ballast and be on the Department’s qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings.

(l) Movable Traffic Barrier. The movable traffic barrier shall be on the Department’s qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings. The barrier shall be capable of being moved on and off the roadway on a daily basis.”

80427

MEMBRANE WATERPROOFING SYSTEM FOR BURIED STRUCTURES

Effective: October 4, 2016

Revised: March 1, 2019

Description. This work shall consist of furnishing and placing a membrane waterproofing system on the top slab and sidewalls, or portions thereof, for buried structures as detailed on the contract plans.

All membrane waterproofing systems shall be supplied by qualified producers. The Department will maintain a list of qualified producers.

Materials. The materials used in the waterproofing system shall consist of the following.

- (a) Cold-applied, self-adhering rubberized asphalt/polyethylene membrane sheet with the following properties:

Physical Properties	
Thickness ASTM D 1777 or D 3767	60 mils (1.500 mm) min.
Width	36 inches (914 mm) min.
Tensile Strength, Film ASTM D 882	5000 lb./in ² (34.5 MPa) min.
Pliability [180° bend over 1" inch (25 mm) mandrel @ -20 °F (-29 °C)] ASTM D 146 (Modified) or D1970	No Effect
Puncture Resistance-Membrane ASTM E 154	40 lb. (178 N) min.
Permeability (Perms) ASTM E 96, Method B	0.1 max.
Water Absorption (% by Weight) ASTM D 570	0.2 max.
Peel Strength ASTM D 903	9 lb./in (1576 N/m) min.

- (b) Ancillary Materials: Adhesives, Conditioners, Primers, Mastic, Two-Part Liquid Membranes, and Sealing Tapes as required by the manufacturer of the membrane and film for use with the respective membrane waterproofing system.

Construction. The areas requiring waterproofing shall be prepared and the waterproofing shall be installed in accordance with the manufacturer's instructions. The Contractor shall not install any part of a membrane waterproofing system in wet conditions, or if the ambient or concrete surface temperature is below 40° (4° C), unless allowed by the Engineer.

Surfaces to be waterproofed shall be smooth and free from projections which might damage the membrane sheet. Projections or depressions on the surface that may cause damage to the membrane shall be removed or filled as directed by the Engineer. The surface shall be power washed and cleaned of dust, dirt, grease, and loose particles, and shall be dry before the waterproofing is applied.

The Contractor shall uniformly apply primer to the entire area to be waterproofed, at the rate stated in the manufacturer's instructions, by brush, or roller. The Contractor shall brush out primer that tends to puddle in low spots to allow complete drying. The primer shall be cured according to the manufacturer's instructions. Primed areas shall not stand uncovered overnight. If membrane sheets are not placed over primer within the time recommended by the manufacturer, the Contractor shall recoat the surfaces at no additional cost to the Department.

The installation of the membrane sheet to primed surfaces shall be such that all joints are shingled to shed water by commencing from the lowest elevation of the buried structure's top slab and progress towards the highest elevation. The membrane sheets shall be overlapped as required by the manufacturer. The Contractor shall seal with mastic any laps that were not thoroughly sealed. The membrane shall be smooth and free of wrinkles and there shall be no depressions in horizontal surfaces of the finished waterproofing. After placement, exposed edges of membrane sheets shall be sealed with a troweled bead of a manufacturer's recommended mastic, or two-part liquid membrane, or with sealing tape.

Sealing bands at joints between precast segments shall be installed prior to the waterproofing system being applied. Where the waterproofing system and sealing band overlap, the installation shall be planned such that water will not be trapped or directed underneath the membrane or sealing band.

Care shall be taken to protect and to prevent damage to the waterproofing system prior to and during backfilling operations. The waterproofing system shall be removed as required for the installation of slab mounted guardrails and other appurtenances. After the installation is complete, the system shall be repaired and sealed against water intrusion according to the manufacturer's instructions and to the satisfaction of the Engineer.

Replace the last paragraph of Article 540.06 Precast Concrete Box Culverts and replace with:

Handling holes shall be filled with a polyethylene plug. The plug shall not project beyond the inside surface after installation nor project above the outside surface to the extent that may cause damage to the membrane. When metal lifting inserts are used, their sockets shall be filled with mastic or mortar compatible with the membrane.

Method of Measurement. The waterproofing system will be measured in place, in square yards (square meters) of the concrete surface to be waterproofed.

Basis of Payment. This work will be paid for at the contract unit price, per square yard (square meter) for MEMBRANE WATERPROOFING SYSTEM FOR BURIED STRUCTURES.

METALLIZING OF STRUCTURAL STEEL

Effective: October 4, 2016

Revised: October 20, 2017

Description: This work consists of furnishing all materials, equipment, labor, and other essentials necessary to accomplish the surface preparation and application of thermal spray metallizing to all new structural steel, or portions thereof as detailed in the plans, in the shop. Also included in this work, when specified on the Contract plans, is the application of a paint system over the metallizing in the shop and/or in the field.

Materials: Materials shall be according to the following.

Metallizing Wire: All thermal spray feedstock (metallizing wire) shall be the products of a single manufacturer, meet the requirements below, and meet the thermal spray equipment manufacturer's specifications.

- a. The metallizing wire shall consist of 99.9% zinc or 85/15 zinc/aluminum complying with ASTM B-833 and ANSI/AWS C2.25/C2.25M
- b. The Contractor shall provide a certificate of chemical composition of the proposed metallizing wire from the metallizing wire manufacturer.

Paint: All materials to be used on an individual structure shall be produced by the same manufacturer.

The Bureau of Materials and Physical Research has established a list of all paint products that have met preliminary requirements. Each batch of material, except for the clear aliphatic urethane and the penetrating sealer shall be tested and approved for use. The specified colors shall be produced in the coating manufacturer's facility. Tinting of coating after it leaves the manufacturing facility is not allowed.

The paint materials shall meet the following requirements of the Standard Specification and as noted below:

<u>Item</u>	<u>Article</u>
(a) Waterborne Acrylic	1008.04
(b) Aluminum Epoxy Mastic (Note 1)	1008.03
(c) Epoxy/ Aliphatic Urethane (Note 1)	1008.05
(d) Penetrating Sealer (Note 2)	
(e) Clear Aliphatic Urethane (Note 3)	

Note 1: If the finish coats are being applied in the field over a shop applied epoxy, select an epoxy intermediate for shop application with a recoat window that is long enough to support the construction schedule.

Note 2: The Epoxy Penetrating Sealer shall be a cross-linked multi component sealer. The sealer shall have the following properties:

- (a) The volume solids shall be 98 percent (plus or minus 2 percent).
- (b) Shall be clear or slightly tinted color.

Note 3: The Clear Aliphatic Urethane material shall be one of the following products:

- (a) Carbothane Clear Coat by Carboline Company
- (b) Pitthane Ultra Clear 95-8000 by Pittsburgh Paints (PPG)
- (c) ArmorSeal Rextthane I MCU by Sherwin-Williams

Shop Prequalification: The Contractor performing the shop work shall have either an SSPC-QP 3 Certification or an AISC Sophisticated Paint Endorsement certification. The certification(s) shall remain current throughout the duration of the contract.

The Contractor performing the shop work shall have satisfactorily performed a minimum of three (3) previous projects involving abrasive blast cleaning, metallizing, and paint application. At least one project within the past two (2) years shall have involved a bridge or similar industrial type application. The suitability of the Contractor's qualifications and prior experience will be considered by the Department before granting approval to proceed.

Submittals: The Contractor performing the shop work shall submit the following plans and information for Engineer review and acceptance within 30 days of contract execution (unless written permission from the Engineer states otherwise). When full coats are being applied in the field, the field painting contractor shall comply with the submittal requirements of Article 506.03. Work in the shop or field shall not proceed until submittals are accepted by the Engineer.

- (a) **Contractor Personnel Qualifications:** Evidence of experience and the names and qualifications/experience/training of the personnel managing and implementing the Quality Control program, and for those performing the quality control tests. QC personnel qualification requirements are found under "Quality Control (QC) Inspection."

All metallizing applicators shall be qualified in accordance with AWS C2.16/C2.16M.

- (b) **Quality Control (QC) Plan:** A Quality Control Plan that identifies: test instruments to be used, a schedule of required measurements and observations, procedures for correcting unacceptable work, and procedures for improving surface preparation and metallizing/painting quality as a result of quality control findings. The program shall incorporate the IDOT Quality Control Daily Report Forms as supplied by the Engineer, or equivalent information on Engineer-approved Shop Contractor-designed forms.
- (c) **Surface Preparation Plan:** The surface preparation plan shall include the methods of surface preparation and types of equipment that will be used to prepare the surfaces as specified herein. Also any solvents proposed for solvent cleaning shall be identified and MSDS provided.

- (d) Abrasives: Identify the type and brand name of the abrasive proposed for use, provide MSDS and manufacturer's data indicating that the abrasive meets requirements of the SSPC-AB 1 or AB 3 standards as specified herein.
- (e) Metallizing Plan: Written procedures for the shop application of metallizing, including the brand name and type of metallizing wire and application equipment to be used. Proof that the metallizing wire complies with ASTM B-833 and ANSI/AWS C2.25/C2.25M shall also be provided. Provide written documentation verifying that all metallizing applicators are qualified in accordance with ANSI/AWS C2.16/C2.16M.
- (f) Painting Plan: If shop painting is specified to be applied over the metallizing or if galvanizing is used in lieu of metallizing on minor bridge members, procedures for the application of the coating system shall be provided along with MSDS and product data sheets. A description of the application equipment to be used shall be included. The plan shall include the requirements to be followed by the field contractor for field touch up.
- (g) Shipping and Handling Plan: A written plan outlining the precautions that shall be taken for the protection of the finished surface during shipping and handling. The plan shall address the steps to be taken, such as insulating padding, wood dunnage, load securing strapping, binding apparatus, etc.
- (h) Galvanizing Option: At the Contractor's option, hot dip galvanizing may be proposed as a substitute for shop metallizing of bearings, typical cross frames, or diaphragms on non-curved structures; expansion joint assemblies; and other elements not carrying calculated stress. Submittal requirements are found under "Hot Dip Galvanizing Option." Include the proposed cleaning and painting plan.

The Engineer will provide written notification to the Contractor when submittals are complete and acceptable. No surface preparation work shall begin until that notification is received. This acceptance shall not be construed to imply approval of any particular method or sequence for conducting the work, or for addressing health and safety concerns. Acceptance does not relieve the Contractor from the responsibility to conduct the work according to the requirements of Federal, State, or Local regulations and this specification, or to adequately protect the health and safety of all workers involved in the project and any members of the public who may be affected by the project. The Contractor remains solely responsible for the adequacy and completeness of the programs and work practices, and adherence to them.

Quality Control (QC) Inspections: The Contractor performing the shop work shall perform first line, in process QC inspections. The Contractor shall implement the accepted QC Program to insure that the work complies with these specifications. The designated Quality Control inspector shall be onsite full time during any operations that affect the quality of the system (e.g., surface preparation, metallizing application, paint application, and final inspection at project completion). The Contractor shall use the IDOT Contractor Daily (QC) Metallizing & Painting Report form (supplied by the Engineer, or Engineer-approved Contractor-designed

forms that contain the same information, to record the results of quality control tests and inspections. The completed reports shall be given to the Engineer before work resumes the following day.

QC inspections shall include, but are not limited to the following:

- Ambient conditions.
- Surface preparation (solvent cleaning, abrasive blast cleanliness, surface profile depth, etc.).
- Metallizing application (specified materials used, bend test, continuity and coverage, adhesion, dry film thickness).
- Verification that the MISTIC test ID number for the paint system has been issued when painting is specified.
- Paint Application (when specified)(specified materials used, continuity and coverage, dry film thickness, freedom from overspray, dry spray, pinholes, skips, misses, etc.).

The personnel managing the QC Program shall possess a minimum classification as a NACE CIP Level 2, or shall provide evidence of successful inspection of three projects of similar or greater complexity and scope completed in the last two years. References shall include the name, address, and telephone number of a contact person employed by the facility owner.

The personnel performing the QC tests shall be trained in all tests, inspections, and instrument use required for the inspection of surface preparation, metallizing and paint application. Documentation of training shall be provided. The QC personnel shall be solely dedicated to quality control activities and shall not perform any production work. QC personnel shall take the lead in all inspections, but applicators shall perform wet film thickness measurements during application of the coatings, with QC personnel conducting random spot checks. The Contractor shall not replace the QC personnel assigned to the project without advance notice to the Engineer, and acceptance of the replacement(s), by the Engineer.

The Contractor performing the shop work shall supply all necessary equipment to perform the QC tests and inspections as specified. Equipment shall include the following at a minimum:

- Psychrometer or comparable equipment for measurement of dew point and relative humidity, including weather bureau tables or psychrometric charts
- Surface temperature thermometer
- SSPC Visual Standard VIS 1
- Surface profile replica tape and spring micrometer or electronic micrometer designed for use with replica tape; or electronic profilometer designed for measuring blast profile.
- Blotter paper for compressed air cleanliness checks
- Type 2 Electronic Dry Film Thickness Gage

- Calibration standards for dry film thickness gage
- Bend test coupons and bend test mandrel
- Adhesion testing instrument
- Companion panels for adhesion testing (if that option is selected)
- All applicable ASTM, ANSI, AWS, and SSPC Standards used for the work (reference list attached)

The instruments shall be verified for accuracy and adjusted by the Contractor's personnel in accordance with the equipment manufacturer's recommendations and the Contractor's QC Program. All inspection equipment shall be made available to the Engineer for QA observations as needed.

Hold Point Notification: Specific inspection and testing requirements within this specification are designated as Hold Points. Unless other arrangements are made, the Contractor shall provide the Engineer with a minimum four-hour notification in advance of the Hold Point. If four-hour notification is provided and the work is ready for inspection at that time, the Engineer will conduct the necessary observations. If the work is not ready at the appointed time, unless other arrangements are made, an additional four-hour notification is required. Permission to proceed beyond a Hold Point without a QA inspection will be at the sole discretion of the Engineer and will only be granted on a case-by-case basis.

Quality Assurance (QA) Observations: The Engineer will conduct QA observations of any or all phases of the work. The presence or activity of Engineer observations in no way relieves the Contractor of the responsibility to perform all necessary daily QC inspections of their own and to comply with all requirements of this Specification.

The Engineer has the right to reject any work that was performed without adequate provision for QA observations.

CONSTRUCTION REQUIREMENTS

The surface preparation and metallizing shall be according to the SSPC Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc and their Alloys and Composites for the Corrosion Protection of Steel, SSPC-CS 23.00/AWS C2.23M/NACE No. 12 except as modified herein. In the event of a conflict, the requirements of this specification shall prevail.

Hot Dip Galvanizing Option: At the Contractor's option, hot dip galvanizing may be substituted for shop metallizing of bearings, typical cross frames, or diaphragms on non-curved structures; expansion joint assemblies; and other elements not carrying calculated stress. Galvanized surfaces which shall have concrete poured against them shall be chemically passivated or otherwise protected by a method approved by the Engineer. Galvanized bearings for exterior members and elements readily visible after erection shall be prepared for field painting, but galvanized items obscured from public view will not require field painting. The

Contractor shall submit a proposal for substituting galvanizing to the Engineer, showing items to be field painted, applicable provisions of AASHTO M 111 (ASTM A 123), drain/vent holes and any other necessary modifications.

Notification: The Contractor shall notify the Engineer 24-hours in advance of beginning surface preparation operations.

Surface Preparation, Metallizing and Painting Equipment: The Contractor shall provide surface preparation, metallizing, and painting equipment as needed to perform the work as specified herein.

Metallizing application equipment shall be portable electric arc thermal spray units that are set-up, adjusted and operated in accordance with the manufacturer's written instructions.

All cleaning and painting equipment shall include gages capable of accurately measuring fluid and air pressures and shall have valves capable of regulating the flow of air, water or paint as recommended by the equipment manufacturer. The equipment shall be maintained in proper working order.

Diesel or gasoline powered equipment shall be positioned or vented in a manner to prevent deposition of combustion contaminants on any part of the structure.

Hand tools, power tools, pressure washing, water jetting, abrasive blast cleaning equipment, brushes, rollers, and spray equipment shall be of suitable size and capacity to perform the work required by this specification. Appropriate filters, traps and dryers shall be provided for the compressed air used for abrasive blast cleaning and conventional spray application. Paint pots shall be equipped with air operated continuous mixing devices unless prohibited by the coating manufacturer.

Test Areas (Sections): Prior to proceeding with production work on the project, the Contractor shall prepare test sections of at least 10 square feet (0.93 sq. m). More than one test section may be needed to represent the various design configurations of the structure. The test section(s) shall be blast cleaned, metallized and painted (if specified) in accordance with the requirements specified herein using the same equipment, materials and procedures that will be used for the production.

During the blast cleaning, metallizing, and painting of the test section(s), in the presence of the Engineer, the Contractor shall perform all quality control tests and inspections required by this specification including complete documentation. In addition, the Contractor shall allow sufficient time for the Engineer to perform any or all quality assurance tests and inspections desired.

Production work shall not proceed until the Engineer agrees that the blast cleaning, metallizing, and painting work, along with the quality control testing, inspection, and documentation are acceptable.

No additional compensation will be paid for the preparation of the test section(s).

Protective Coverings and Damage: The Contractor shall apply protective coverings to all surfaces of the structural steel that are not scheduled for surface preparation, metallizing, and painting. The coverings shall be maintained and remain in place until the work is completed and then shall be removed prior to shipping.

Metallized or painted surfaces damaged by any Contractor's operation shall be repaired, and re-metallized and/or re-painted, as directed by the Engineer, at no additional cost to the Department.

Ambient Conditions: Surfaces prepared for metallizing or painting shall be free of moisture and other contaminants. The Contractor shall control operations to insure that dust, dirt, or moisture do not come in contact with surfaces on which work will take place. The surface temperature shall be at least 5°F (3°C) above the dew point during final surface preparation operations, and the application of metallizing. Metallizing shall only be applied when the surface and air temperatures are above 32°F (0°C). The manufacturers' published literature shall be followed for specific temperature, dew point, and humidity restrictions during the application of each paint coat. Metallizing or paint shall not be applied in rain, wind, snow, fog or mist. Ambient conditions shall be maintained during the drying period specified by the manufacturer.

Compressed Air Cleanliness: Prior to using compressed air for abrasive blast cleaning, blowing down surfaces, and metallizing or painting application, the Contractor shall verify that the compressed air is free of moisture and oil contamination according to the requirements of ASTM D 4285. The tests shall be conducted at least one time per shift for each compressor system in operation. If air contamination is evident, the Contractor shall change filters, clean traps, add moisture separators or filters, or make other adjustments as necessary to achieve clean, dry air. The Contractor shall also examine the work performed since the last acceptable test for evidence of defects or contamination caused by the contaminated compressed air. Contaminated work shall be repaired at no additional cost to the Department.

Solvent Cleaning (HOLD POINT): All traces of oil, grease, and other detrimental contaminants on the steel surfaces to be metallized shall be removed by solvent cleaning in accordance with SSPC-SP 1. The brand name of proposed cleaning solvent(s) and/or proprietary chemical cleaners including manufacturers' product data sheet and MSDS shall be submitted for Engineer acceptance prior to use.

Under no circumstances shall blast cleaning be performed in areas containing surface contaminants or in areas where the Engineer has not accepted the solvent cleaning. Rejected surfaces shall be re-cleaned to the specified requirements at no additional cost to the Department.

Abrasives: Abrasive blast cleaning shall be performed using either expendable abrasives or recyclable steel grit abrasives. Expendable abrasives shall be used one time and discarded. The abrasive shall be angular in shape. Acceptable angular shaped abrasives include, but are not limited to, aluminum oxide, steel grit, and crushed slag. Silica sand shall not be used. Steel

shot and other abrasives producing a rounded surface profile are not acceptable, even if mixed with angular grit abrasives.

Abrasive suppliers shall provide written certification that expendable abrasives and recyclable steel grit abrasives meet the requirements of SSPC-AB 1 and AB 3, respectively. Abrasive suppliers shall certify that abrasives are not oil contaminated and shall have a water extract pH value within the range of 6 to 8. On a daily basis, the Contractor shall verify that recycled abrasives are free of oil and contamination by performing a vial test in accordance with SSPC-AB 2.

All surfaces that are found to have been prepared using abrasives not meeting the SSPC-AB 1, AB 2, or AB 3 requirements, as applicable, are oil contaminated, or have a pH outside the specified range, shall be solvent cleaned or low pressure water cleaned, and re-blast cleaned at no cost to the Department.

Surface Preparation (HOLD POINT): The following method of surface preparation shall be used:

- (a) **Flame Cut Steel:** Prior to blast cleaning, all flame cut edges shall be ground to remove hardened steel and any sharp or irregular shapes.
- (b) **Near-White Metal Blast Cleaning:** All steel surfaces to be metallized shall be near white metal blast cleaned in accordance with SSPC-SP 10 using dry abrasive blast cleaning methods.
- (c) **Galvanized Minor Bridge Members:** If galvanizing of minor bridge members is selected in lieu of metallizing, prepare all galvanized surfaces for painting by brush-off blast cleaning in accordance with SSPC-SP 16 or by using proprietary solutions that are specifically designed to clean and etch (superficially roughed) galvanized steel for painting. If cleaning and etching solutions are selected, submit manufacturer's technical product literature and MSDS for Engineer's review and written acceptance prior to use.
- (d) **Base Metal Irregularities:** If hackles, burrs, or slivers in the base metal are visible on the steel surface after cleaning, the Contractor shall remove them by grinding followed by re-blast cleaning.

Surface Profile (HOLD POINT): Blast cleaning abrasives shall be of the size and grade that will produce a uniform angular surface profile depth of 3.5 to 4.5 mils (89 to 114 microns). If the metallizing wire manufacturer's profile requirements are more restrictive, the Contractor shall advise the Engineer and comply with those requirements. For recycled abrasives, an appropriate operating mix shall be maintained in order to control the profile within these limits.

The average surface profile shall be determined each work day with a minimum frequency of one location per every 200 sq ft (18.6 sq m) per piece of equipment. All surfaces, including flame cut edges, shall be tested in accordance with SSPC-PA 17. Surface profile replica tape or electronic profilometer shall be used. The tape shall be retained and included with the daily

QC report. Single measurements less than 3.5 mils (89 microns) are unacceptable. In that event, additional testing shall be done to determine the limits of the deficient area and, if it is not isolated, work will be suspended. The Contractor shall submit a plan for making the necessary adjustments to insure that the specified surface profile is achieved on all surfaces. Work shall not resume until the Engineer provides written acceptance.

Surface Condition Prior to Metallizing (HOLD POINT): Prepared surfaces shall meet the requirements of SSPC-SP 10 immediately prior to metallizing, and shall be metallized within six hours of blast cleaning. If rust appears or bare steel has been exposed for more than six hours, the affected area shall be re-blasted at no additional cost to the Department.

All dust and surface preparation residue on steel surfaces shall be removed prior to metallizing.

The quality of surface preparation and cleaning of surface dust and debris shall be accepted by the Engineer prior to metallizing.

The Engineer has the right to reject any work that was performed without adequate provision for QA observations to accept the degree of cleaning. Rejected metallizing work shall be removed and replaced at no additional cost to the Department.

Daily Metallizing Operator-Equipment Qualification – Bend Tests: Unless directed otherwise by the Engineer, each day that metallizing will be applied, the Contractor shall perform bend testing prior to beginning production work. For each metallizing applicator, five carbon steel coupons measuring 2 inch wide x 8 inch long x 0.05 inch (50mm x400 mm x 1.3 mm) thick shall be blast cleaned using the same equipment and abrasive used for the production work. Each applicator shall apply the metallizing to five coupons in accordance with the requirements of this Specification to a dry film thickness of 8.0 to 12.0 mils (200 to 300µm). 180 degree bend testing shall be performed on all five coupons using a 13mm (1/2") mandrel in accordance with the requirements and acceptance criteria of SSPC-CS 23/AWS C2.23M/NACE 12. Minor cracks that cannot be lifted from the substrate with knife blade are acceptable. If lifting occurs on any coupon, the surface preparation and/or metallizing process shall be modified until acceptable results are achieved before proceeding with production work.

Application of Metallizing: Application shall be done in overlapping passes in a cross-hatch pattern (i.e., a second set of overlapping passes shall be applied at right angles to the first set of overlapping passes) to ensure uniform coverage. The gun shall be held at such a distance from the work surfaces that the metal is still molten on impact. The metallizing shall be applied as a continuous film of uniform thickness, firmly adherent, and free from thin spots, misses, lumps or blisters, and have a fine sprayed texture. Thin spots and misses shall be re-metallized. If touch up metallizing or the application of additional metallizing to previously applied metallizing does not occur within 24 hours, the surface of the metallizing shall be brush off blast cleaned according to SSPC-SP7 to remove oxidation and surface contaminants prior to the application of additional metallizing. The final appearance of the metallizing when left un-top coated or top coated with System 1 shall be uniform without excessive blotchiness or contrast in color. If the surface does not have a uniform appearance, remove and replace the metallizing at no cost to

the Department. If the configuration of the surface being metallized does not allow for a proper gun-to-work piece standoff distance, the Contractor shall notify the Engineer.

Unless required by the contract plans, the top of the top flanges shall not be metallized or painted. If the contract plans indicate that the top flange is to be metallized, only the first coat of the paint system shall be applied to the top flange.

Metallizing Thickness: The thickness of the metallizing shall be 8.0 to 12.0 mils (200-300 microns). Thickness shall be measured as specified by SSPC-PA 2 (use a Type 2 Electronic Gauge only).

Metallizing Adhesion: Adhesion testing of metallizing applied each day shall be determined with a self-adjusting adhesion tester in accordance with ASTM D 4541. Unless otherwise directed by the Engineer, a minimum of one test shall be conducted for every 500 sq ft (46sq m) of metallized surface. The tests shall be conducted prior to application of any coating. If any of the tests exhibit less than 700 psi (4.83 MPa) for 85/15 or less than 500 psi (3.45 MPa) for zinc, additional tests shall be conducted to determine the extent of the deficient material. All deficient metallizing shall be removed by blast cleaning and re-applied at no additional cost to the Department.

At the discretion of the Engineer, a representative blast cleaned test panel (or steel companion panel approximately 12 inch x 12 inch x ¼ inch thick) can be metallized at the same time each 500 sq ft (46sq m) of surface area, or portion thereof, is metallized. Adhesion testing can be performed on the companion panel rather than on the structure. If the adhesion tests on the panels are acceptable, the metallizing on the structure is considered acceptable and testing on the structure is not required. If adhesion testing of the panels fails, testing shall be conducted on the structure. If adhesion testing on the structure is acceptable, the metallizing on the structure is considered to be acceptable. If tests on the structure are unacceptable, complete removal of the failing metallizing and re-metallizing in accordance with this Specification shall be performed at no additional cost to the Department.

Application of Paint Systems Over Metallizing:

When painting over the metallizing is specified, three painting system options exist for application over the metallizing as shown below. Systems, or components of systems, specified to be shop applied shall not be applied to the faying surfaces of bolted connections. The system to be applied shall be as designated on the plans.

- (a) **System 1** is a single coat system consisting of a full clear aliphatic urethane coat shop applied to all metallized surfaces except as noted above.

The thickness of the clear coat to be applied is dependent on the product selected and shall be as follows:

TABLE 1

CLEAR URETHANE COAT (SINGLE COAT SYSTEM)

MANUFACTURER	SEALER COAT ONLY (DFT)
Carboline Company	Carbothane Clear Coat (3.0 to 5.0 mils) (75 to 125 microns)
Pittsburgh Paints (PPG)	Pitthane Ultra Clear 95-8000 (2.0 to 3.0 mils) (50 to 75 microns)
Sherwin-Williams	AarmorSeal Rexthane I MCU (3.0 to 5.0 mils) (75 to 125 microns)

The clear urethane shall be applied in a 2 step process. The first step shall be to apply a “mist coat” that is thinned at the maximum allowable thinning rate as listed on the manufacturer’s product data sheet that is compliant with VOC regulations. The intent of the mist coat is to saturate the porous metallizing surface and displace entrapped air within the porosity of the metallizing. After allowing the mist coat to flash off for 20 minutes, the full coat of clear urethane shall be applied to achieve the manufacturer’s recommended dry film thickness.

- (b) **System 2** is a four coat system consisting of a full shop coat of epoxy penetrating sealer coat, a full shop coat of an extended recoat epoxy and two full field applied coats of waterborne acrylic.

The epoxy penetrating sealer shall be applied in accordance with the coating manufacturer’s instructions at a coverage rate designed to achieve a theoretical dry film thickness of 1.5 mils (38 microns). The intent of the epoxy penetrating sealer coat is to saturate the metallizing and cover the surface rather than to build a film thickness; therefore, dry film thickness measurement of the epoxy penetrating sealer coat is not required. The top of top flanges that are specified to be metallized and embedded in concrete shall receive the epoxy penetrating sealer only.

The thicknesses of the epoxy and waterborne acrylic coats shall be according to Article 506.09(f)(1).

- (c) **System 3** is a three coat system consisting of a full epoxy penetrating sealer coat, a full epoxy intermediate coat, and a full urethane finish coat. All coats shall be shop-applied unless specified otherwise. If the urethane is field-applied, an extended recoat epoxy shall be applied in the shop.

The epoxy penetrating sealer shall be applied in accordance with the coating manufacturer's instructions at a coverage rate designed to achieve a theoretical dry film thickness of 1.5 mils (38 microns). The intent of the epoxy penetrating sealer coat is to saturate the metallizing and cover the surface rather than to build a film thickness; therefore, dry film thickness measurement of the epoxy penetrating sealer coat is not required. The top of top flanges that are specified to be metallized and embedded in concrete shall receive the epoxy penetrating sealer only.

The thicknesses of the epoxy and urethane coats shall be according to Article 506.09(f)(2).

The single clear urethane coat or the epoxy penetrating sealer coat shall be applied within 24 hours of metallizing providing that the immediate work environment is controlled. If temperature and humidity cannot be controlled, that time frame shall be reduced to within 8 hours. The metallizing shall be dry and free of any visible debris or oxidation (zinc oxide) at the time of application. Visible oxidation shall be removed by mechanical methods such as stiff bristle or wire brushing. Contact surfaces for bolted connections shall consist of bare, uncoated metallizing only and shall be masked off prior to the application of any shop applied coatings.

The clear urethane coat or the epoxy penetrating sealer shall be applied in accordance with the manufacturer's instructions and in such a manner to assure thorough wetting and sealing of the metallizing.

For systems 2 and 3, prior to application of any subsequent coat, the surface of the previous coat shall be dry in accordance with the manufacturer's instructions and free of any visible contamination. If the manufacturer's specified recoat times are exceeded, the effected coat(s) shall be completely roughened or removed and replaced, according to the manufacturer's instructions, at no cost to the Department. The same restrictions regarding film appearance and continuity for the seal coat apply to the intermediate coat and topcoat.

All coats shall be applied to achieve a smooth, uniform appearance that is free of dryspray, overspray, and orange peel. Shadow-through, pinholes, bubbles, skips, misses, lap marks between applications, runs, sags, or other visible discontinuities are unacceptable.

Masked off areas around field connections shall be coated in the field after the steel is fully erected according to the touch-up procedure for the completed system.

When the application of field coat(s) is required, the existing shop applied coats shall be prepared and field painting performed according to the applicable provisions of Article 506.10. If any coat has exceeded its recoat time, the surface shall be completely roughened or removed and replaced according to the manufacturer's instructions, prior to the application of the topcoat.

All coatings shall be applied by spray, supplemented with brushing or rolling, if needed. Special attention shall be given to obtaining complete coverage and proper coating thickness in crevices, on welds and edges, and in hard to reach areas.

Application of Paint System over Galvanizing: If galvanizing is used in lieu of metallizing and Paint System 1, no further painting is required. If galvanizing is used in lieu of metallizing and Paint System 2, apply a two-coat system consisting of a full waterborne acrylic intermediate coat and a full waterborne acrylic finish coat from System 2. If galvanizing is used in lieu of metallizing and Paint System 3, apply a full epoxy intermediate coat and a full urethane coat from System 3. To minimize handling and erection damage the acrylic coats of System 2 shall be applied in the field. Except as noted on the plans, the epoxy and urethane coats of System 3 can be applied in the shop or field.

Touch-Up of Completed Coating System: The Contractor shall repair all damaged and/or unacceptable areas of the completed coating system (all metallizing, galvanizing, and paint layers) prior to shipment as defined below. The same process shall be followed for the repair of shipping, handling, and erection damage.

Damage to the metallizing, galvanizing, and/or paint that does not expose the substrate shall be prepared by solvent cleaning in accordance with SSPC-SP 1 followed by power tool cleaning in accordance with SSPC-SP 3 to remove loose material. For the repair of damaged metallizing or galvanizing that exposes the substrate, the surface shall be spot blast cleaned in accordance with SSPC-SP 10. If blast cleaning cannot be performed, as authorized by the Engineer, the damage shall be spot power tool cleaned to SSPC-SP11.

The metallizing, galvanizing and/or paint surrounding each repair area shall be feathered for a distance of 1 to 2 inches (25 to 50 mm) to provide a smooth, tapered transition into the existing intact material. The surrounding intact paint shall be roughened to promote adhesion of the repair coats.

Damage to metallizing or galvanizing extends to the substrate shall be repaired. For metallizing it is critical that all remnants of sealer or paint have been removed from the porosity of the metallizing before applying new metallizing or an adhesion failure can occur. If it is no longer feasible to apply metallizing, spot-apply an organic zinc primer meeting the requirements of Section 1008. For galvanizing, spot apply organic zinc. After priming, for both the metallizing and galvanizing, apply the same intermediate and finish coats used on the surrounding steel. If the damage does not expose the substrate, only the effected paint coat(s) shall be applied.

Surface Preparation and Painting of Galvanized Fasteners: All ASTM A 325 or ASTM F 3125 high strength steel bolts, nuts and washers shall be hot dip galvanized according to AASHTO M232, except in areas where the metallized surfaces are to be top coated, in which case they shall be mechanically galvanized according to Article 1006.08(a) of the Standard Specifications.

The Contractor shall prepare all fasteners (i.e., galvanized nuts, bolts, etc.) by power tool cleaning in accordance with SSPC-SP 3. Following power tool cleaning and prior to painting, the surfaces shall be solvent cleaned according to SSPC-SP 1. Slight stains of torqueing compound dye may remain after cleaning provided the dye is not transferred to a cloth after vigorous rubbing. If any dye is transferred to a cloth after vigorous rubbing, additional cleaning is required.

Spot paint the fasteners with one coat of an aluminum epoxy mastic coating meeting the requirements of Article 1008.03 of the Standard Specifications.

Shipping and Handling: The Contractor shall take special care in handling the steel in the shop and when loading for shipment. Painted, metallized, or galvanized steel shall not be moved or handled until sufficient cure time has elapsed to prevent handling damage. During shipping, the steel shall be insulated from the moving apparatus (i.e., chains, cables, hooks, clamps, etc.) by softeners approved by the Engineer. Apparatus used to hoist the steel shall be padded. Steel shall be placed on wood dunnage and spaced in such a manner that no rubbing will occur during shipment that could damage the paint, metallizing or galvanizing.

Special Instructions: At the completion of the work, the Contractor shall stencil on the bridge, using a contrasting colored paint, the date of metallizing and painting. The letters shall be capitals, not less than 2 inches (50 mm) and not more than 3 inches (75 mm) in height. The information defined below shall be stenciled on the exterior face of the first girders at the bridge abutments (approximately 1 or 2 feet outward from the abutment end of the girders). The Engineer will identify the bridge member(s) to be stenciled.

When all coats are applied in the shop with the exception of touch-up, the shop Contractor shall do the stenciling. The stencil shall contain the following words on four lines: "METALLIZED BY" on the first line; name of the Contractor on the second line; and the month and year in which the coating was completed on the third line; and the applicable system Code on the fourth line.

When the finish coat is applied in the field, the Contractor shall do the stenciling as described above, but insert "PAINTED BY" and the Contractor's name after the fourth line.

Basis of Payment: This work shall not be paid for separately but shall be included in the unit price bid for furnishing and/or erecting structural steel according to Article 505.13.

Appendix 1 – Reference List

The Shop and Field Contractor(s) shall maintain the following regulations and references on site for the duration of the project:

Illinois Environmental Protection Act

American Society of Testing Material

- ASTM D 4285, Standard Test Method for Indicating Oil or Water in Compressed Air
- ASTM B833, Standard Specifications for Zinc Wire for Thermal Spraying (Metallizing)
- ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

Society of Protective Coatings

- SSPC-AB 1, Mineral and Slag Abrasives
- SSPC-AB 2, Specification for Cleanliness of Recycled Ferrous Metallic Abrasives
- SSPC-AB 3, Newly Manufactured or Re-Manufactured Steel Abrasives
- SSPC-PA 2, Measurement of Dry Coating Thickness with Magnetic Gages
- SSPC-QP 1, Standard Procedure for Evaluating Painting Shop Contractors (Field Application to Complex Structures)
- SSPC-QP 2, Standard Procedure for Evaluating the Qualifications of Painting Shop Contractors to Remove Hazardous Paint
- SSPC-SP 1, Solvent Cleaning
- SSPC-SP 5/NACE No. 1, White Metal Blast Cleaning
- SSPC-SP 11, Power Tool Cleaning to Bare Metal
- SSPC-SP 12/NACE No. 5, Surface Preparation and Cleaning of Metals by Water Jetting Prior to Recoating
- SSPC-SP 16, Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals
- SSPC-PA 17, Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements.

- SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
- SSPC-VIS 5, Guide and Reference Photographs for Steel Prepared by Wet Abrasive Blast Cleaning
- SSPC-Guide 15, Field Methods for Retrieval and Analysis of Soluble Salts on Steel and Other Nonporous Surfaces
- SSPC-CS 23.00/AWS C2.23M/NACE No. 12, Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel

American National Standards Institute/American Welding Society

- ANSI/AWS C2.25/C2.25M, Specification for Solid and Composite Wires, and Ceramic Rods for Thermal Spraying
- AWS C2.6/C2.6M, Guide for Thermal-Spray Operator Qualification

Metallizing wire and coating manufacturer's application instructions, MSDS and product data sheets

DRILLED SHAFTS

Effective: October 5, 2015

Revised: October 27, 2023

Revise Section 516 of the Standard Specifications to read:

“SECTION 516. DRILLED SHAFTS

516.01 Description. This work shall consist of constructing drilled shaft foundations.

516.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement Concrete (Note 1)	1020
(b) Reinforcement Bars	1006.10
(c) Grout (Note 2).....	1024.01
(d) Permanent Steel Casing.....	1006.05(d)
(e) Slurry (Note 3)	

Note 1. When the soil contains sulfate contaminates, ASTM C 1580 testing will be performed to assess the severity of sulfate exposure to the concrete. If the sulfate contaminate is >0.10 to < 0.20 percent by mass, a Type II (MH) cement shall be used. If the sulfate contaminate is >0.20 to < 2.0 percent by mass, a Type V cement shall be used. If the sulfate contaminate is ≥ 2.0 percent by mass, refer to ACI 201.2R for guidance.

Note 2. The sand-cement grout mix shall be according to Section 1020 and shall be two to five parts sand and one part Type I or II cement. The maximum water cement ratio shall be sufficient to provide a flowable mixture with a typical slump of 10 in. (250 mm).

Note 3. Slurry shall be bentonite, emulsified polymer, or dry polymer, and shall be approved by the Engineer.

516.03 Equipment. Equipment shall be according to the following.

Item	Article/Section
(a) Concrete Equipment	1020.03
(b) Drilling Equipment (Note 1)	
(c) Hand Vibrator	1103.17(a)
(d) Underwater Concrete Placement Equipment	1103.18

Note 1. The drilling equipment shall have adequate capacity, including power, torque and down thrust, to create a shaft excavation of the maximum diameter specified to a depth of 20 percent beyond the depths shown on the plans.

516.04 Submittals. The following information shall be submitted on form BBS 133.

(a) Qualifications. At the time of the preconstruction conference, the Contractor shall provide the following documentation.

(1) References. A list containing at least three projects completed within the three years prior to this project's bid date which the Contractor performing this work has installed drilled shafts of similar diameter, length, and site conditions to those shown in the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects.

(2) Experience. Name and experience record of the drilled shaft supervisor, responsible for all facets of the shaft installation, and the drill operator(s) who will be assigned to this project. The supervisor and operator(s) shall each have a minimum of three years experience in the construction of drilled shafts.

(b) Installation Procedure. A detailed installation procedure shall be submitted to the Engineer for acceptance at least 28 days prior to drilled shaft construction and shall address each of the following items unless otherwise directed by the Engineer in writing.

(1) Equipment List. List of proposed equipment to be used including cranes, drill rigs, augers, boring tools, casing, vibratory hammers, core barrels, bailing buckets, final cleaning equipment, slurry equipment, tremies, or concrete pumps, etc.

(2) General Sequence. Details of the overall construction operation sequence, equipment access, and the sequence of individual shaft construction within each substructure bent or footing group. The submittal shall address the Contractor's proposed time delay and/or the minimum concrete strength necessary before initiating a shaft excavation adjacent to a recently installed drilled shaft.

(3) Shaft Excavation. A site specific step by step description of how the Contractor anticipates the shaft excavation to be advanced based on their evaluation of the subsurface data and conditions expected to be encountered. This sequence shall note the method of casing advancement, anticipated casing lengths, tip elevations and diameters, the excavation tools used and drilled diameters created. The Contractor shall indicate whether wet or dry drilling conditions are expected and if groundwater will be sealed from the excavation.

- (4) Slurry. When the use of slurry is proposed, details on the types of additives to be used and their manufacturers shall be provided. In addition, details covering the measurement and control of the hardness of the mixing water, agitation, circulation, de-sanding, sampling, testing, and chemical properties of the slurry shall be submitted.
- (5) Shaft Cleaning. Method(s) and sequence proposed for the shaft cleaning operation.
- (6) Reinforcement Cage and Permanent Casing. Details of reinforcement placement including rolling spacers to be used and method to maintain proper elevation and location of the reinforcement cage within the shaft excavation during concrete placement. The method(s) of adjusting the reinforcement cage length and permanent casing if rock is encountered at an elevation other than as shown on the plans. As an option, the Contractor may perform soil borings and rock cores at the drilled shaft locations to determine the required reinforcement cage and permanent casing lengths.
- (7) Concrete Placement. Details of concrete placement including proposed operational procedures for free fall, tremie or pumping methods. The sequence and method of casing removal shall also be stated along with the top of pour elevation, and method of forming through water above streambed.
- (8) Mix Design. The proposed concrete mix design(s).
- (9) Disposal Plan. Containment and disposal plan for slurry and displaced water. Containment and disposal plan for contaminated concrete pushed out of the top of the shaft by uncontaminated concrete during concrete placement.
- (10) Access and Site Protection Plan. Details of access to the drilled shafts and safety measures proposed. This shall include a list of casing, scaffolding, work platforms, temporary walkways, railings, and other items needed to provide safe access to the drilled shafts. Provisions to protect open excavations during non- working hours shall be included.

The Engineer will evaluate the drilled shaft installation procedure and notify the Contractor of acceptance, need for additional information, or concerns with the installation's effect on the existing or proposed structure(s).

CONSTRUCTION REQUIREMENTS

516.05 General. Excavation for drilled shaft(s) shall not proceed until written authorization is received from the Engineer. The Contractor shall be responsible for verification of the dimensions and alignment of each shaft excavation as directed by the Engineer.

Unless otherwise approved in the Contractor's installation procedure, no shaft excavation, casing installation, or casing removal with a vibratory hammer shall be made within four shaft diameters center to center of a shaft with concrete that has a compressive strength less than 1500 psi (10,300 kPa). The site-specific soil strengths and installation methods selected will determine the actual required minimum spacing, if any, to address vibration and blow out concerns.

Lost tools shall not remain in the shaft excavation without the approval of the Engineer.

Blasting shall not be used as a method of shaft excavation.

516.06 Shaft Excavation Protection Methods. The construction of drilled shafts may involve the use of one or more of the following methods to support the excavation during the various phases of shaft excavation, cleaning, and concrete placement dependent on the site conditions encountered. Surface water shall not flow uncontrolled into the shaft excavation, however water may be placed into the shaft excavation in order to meet head pressure requirements according to Articles 516.06(c) and 516.13.

The following are general descriptions indicating the conditions when these methods may be used.

- (a) Dry Method. The dry construction method shall only be used at sites where the groundwater and soil conditions are suitable to permit the drilling and dewatering of the excavation without causing subsidence of adjacent ground, boiling of the base soils, squeezing, or caving of the shaft side walls. The dry method shall consist of drilling the shaft excavation, removing accumulated water, cleaning the shaft base, and placing the reinforcement cage and concrete in a predominately dry excavation.
- (b) Slurry Method. The slurry construction method may be used at sites where dewatering the excavation would cause collapse of the shaft sidewalls or when the volume and head of water flowing into the shaft is likely to contaminate the concrete during placement resulting in a shaft defect. This method uses slurry, or in rare cases water, to maintain stability of the shaft sidewall while advancing the shaft excavation. After the shaft excavation is completed, the slurry level in the shaft shall be kept at an elevation to

maintain stability of the shaft sidewall, maintain stability of the shaft base, and prevent additional groundwater from entering the shaft. The shaft base shall be cleaned, the reinforcement cage shall be set, and the concrete shall be discharged at the bottom of the shaft excavation, displacing the slurry upwards.

- (c) Temporary Casing Method. Temporary casing shall be used when either the dry or slurry methods provide inadequate support to prevent sidewall caving or excessive deformation of the shaft excavation. Temporary casing may be used with slurry or be used to reduce the flow of water into the excavation to allow dewatering and concrete placement in a dry shaft excavation. Temporary casing shall not be allowed to remain permanently without the approval of the Engineer.

During removal of the temporary casing, the level of concrete in the casing shall be maintained at a level such that the head pressure inside the casing is a minimum of 1.25 times the head pressure outside the casing, but in no case is less than 5 ft (1.5 m) above the bottom of the casing. Casing removal shall be at a slow, uniform rate with the pull in line with the shaft axis. Excessive rotation of the casing shall be avoided to limit deformation of the reinforcement cage. In addition, the slump requirements during casing removal shall be according to Article 516.12.

When called for on the plans, the Contractor shall install a permanent casing as specified. Permanent casing may be used as a shaft excavation support method or may be installed after shaft excavation is completed using one of the above methods. After construction, if voids are present between the permanent casing and the drilled excavation, the voids shall be filled with grout by means of tremie(s) or concrete pump which shall be lowered to the bottom of the excavation. The contractor's means and methods for grout placement shall fill the annular void(s) between the permanent casing and the surrounding earth material to restore and provide lateral earth resistance to the shaft. Grout yield checks shall be performed by the contractor for submittal to the Engineer. Permanent casing shall not remain in place beyond the limits shown on the plans without the specific approval of the Engineer.

When the shaft extends above the streambed through a body of water and permanent casing is not shown, the portion above the streambed shall be formed with removable casings, column forms, or other forming systems as approved by the Engineer. The forming system shall not scar or spall the finished concrete or leave in place any forms or casing within the removable form limits as shown on the plans unless approved as part of the installation procedure. The forming system shall not be removed until the concrete has attained a minimum compressive strength of 2500 psi (17,200 kPa) and cured for a minimum of 72 hours. For shafts extending through water, the concrete shall be protected from water action after placement for a minimum of seven days.

516.07 Slurry. When slurry is used, the Contractor shall provide a technical representative of the slurry additive manufacturer at the site prior to introduction of the slurry into the first shaft where slurry will be used, and during drilling and completion of a minimum of one shaft to adjust the slurry mix to the specific site conditions. During construction, the level of the slurry shall be maintained a minimum of 5 feet (1.5 m) above the height required to prevent

caving of the shaft excavation. In the event of a sudden or significant loss of slurry in the shaft excavation, the construction of that foundation shall be stopped and the shaft excavation backfilled or supported by temporary casing, until a method to stop slurry loss, or an alternate construction procedure, has been approved by the Engineer.

- (a) General Properties. The material used to make the slurry shall not be detrimental to the concrete or surrounding ground. Mineral slurries shall have both a mineral grain size that remains in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Polymer slurries shall have sufficient viscosity and gel characteristics to transport excavated material to suitable screening systems or settling tanks. The percentage and specific gravity of the material used to make the slurry shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement.

If approved by the Engineer, the Contractor may use water and excavated soils as drilling slurry. In this case, the range of acceptable values for density, viscosity and pH, as shown in the following table for bentonite slurry shall be met.

When water is used as the slurry to construct rock sockets in limestone, dolomite, sandstone or other formations that are not erodible, the requirements for slurry testing shall not apply if the entire fluid column is replaced with fresh water after drilling. To do so, fresh water shall be introduced at the top of the shaft excavation and existing water used during drilling shall be pumped out of the shaft excavation from the bottom of the shaft excavation until the entire volume of fluid has been replaced.

- (b) Preparation. Prior to introduction into the shaft excavation, the manufactured slurry admixture shall be pre-mixed thoroughly with clean, fresh water and for adequate time in accordance with the slurry admixture manufacturer's recommendations. Slurry tanks of adequate capacity shall be used for slurry mixing, circulation, storage and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without approval from the Engineer. Adequate desanding equipment shall be provided to control slurry properties during the drilled shaft excavation in accordance with the values provided in Table 1.
- (c) Quality Control. Quality control tests shall be performed on the slurry to determine density, viscosity, sand content and pH of freshly mixed slurry, recycled slurry and slurry in the shaft excavation. Tests of slurry samples from within two feet of the bottom and at mid-height of the shaft excavation shall be conducted in each shaft excavation during the excavation process to measure the consistency of the slurry. A minimum of four sets of tests shall be conducted during the first eight hours of slurry use on the project. When a series of four test results do not change more than 1% from the initial test, the testing frequency may be decreased to one set every four hours of slurry use. Reports of all tests, signed by an authorized representative of the Contractor, shall be furnished to the

Engineer upon completion of each drilled shaft. The physical properties of the slurry shall be as shown in Table 1.

The slurry shall be sampled and tested less than 1 hour before concrete placement. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be removed. The contractor shall perform final shaft bottom cleaning after suspended solids have settled from the slurry. Concrete shall not be placed if the slurry does not have the required physical properties.

Table 1 – SLURRY PROPERTIES				
	Bentonite	Emulsified Polymer	Dry Polymer	Test Method
Density, lb/cu ft (kg/cu m) (at introduction)	65.2 ± 1.6^1 (1043.5 \pm 25.6)	63 (1009.0) max.	63 (1009.0) max.	ASTM D 4380
Density, lb/cu ft (kg/cu m) (prior to concrete placement)	67.0 ± 3.5^1 (1073.0 \pm 56.0)	63 (1009.0) max.	63 (1009.0) max.	ASTM D 4380
Viscosity ² , sec/qt (sec/L)	46 \pm 14 (48 \pm 14)	38 \pm 5 (40 \pm 5)	65 \pm 15 (69 \pm 16)	ASTM D 6910
pH	9.0 \pm 1.0	9.5 \pm 1.5	9.0 \pm 2.0	ASTM D 4972
Sand Content, percent by volume (at introduction)	4 max.	1 max.	1 max.	ASTM D 4381
Sand Content, percent by volume (prior to concrete placement)	10 max.	1 max.	1 max.	ASTM D 4381
Contact Time ³ , hours	4 max.	72 max.	72 max.	

Note 1. When the slurry consists of only water and excavated soils, the density shall not exceed 70 lb/cu ft (1121 kg/cu m).

Note 2. Higher viscosities may be required in loose or gravelly sand deposits.

Note 3. Contact time is the time without agitation and sidewall cleaning.

516.08 Obstructions. An obstruction is an unknown isolated object that causes the shaft excavation method to experience a significant decrease in the actual production rate and requires the Contractor to core, break up, push aside, or use other means to mitigate the obstruction. Subsurface conditions such as boulders, cobbles, or logs and buried infrastructure such as footings, piling, or abandoned utilities, when shown on the plans, shall not constitute an obstruction. When an obstruction is encountered, the Contractor shall notify the Engineer immediately and upon concurrence of the Engineer, the Contractor shall mitigate the obstruction with an approved method.

516.09 Top of Rock. The top of rock will be considered as the point where rock, defined as bedded deposits and conglomerate deposits exhibiting the physical characteristics and difficulty of rock removal as determined by the Engineer, is encountered which cannot be drilled with augers and/or underreaming tools configured to be effective in the soils indicated in the contract documents.

516.10 Design Modifications. If the top of rock elevation differs from that shown on the plans by more than 10 percent of the length of the drilled shaft above the rock, the Engineer shall be contacted to determine if any drilled shaft design changes may be required. In addition, if the type of soil or rock encountered is not similar to that shown in the subsurface exploration data, the Contractor may be required to extend the drilled shaft length(s) beyond those specified in the plans. In either case, the Engineer will determine if revisions are necessary and the extent of the modifications required.

516.11 Excavation Cleaning and Inspection. Materials removed or generated from the shaft excavations shall be disposed of according to Article 202.03.

After excavation, each shaft shall be cleaned. For a drilled shaft terminating in soil, the depth of sediment or debris shall be a maximum of 1 1/2 in. (38 mm). For a drilled shaft terminating in rock, the depth of sediment or debris shall be a maximum of 1/2 in. (13 mm).

A shaft excavation shall be overreamed when, in the opinion of the Engineer, the sidewall has softened, swelled, or has a buildup of slurry cake. Overreaming may also be required to correct a shaft excavation which has been drilled out of tolerance. Overreaming may be accomplished with a grooving tool, overreaming bucket, or other approved equipment. Overreaming thickness shall be a minimum of 1/2 in. (13 mm) and a maximum of 3 in. (75 mm).

516.12 Reinforcement. This work shall be according to Section 508 and the following.

The shaft excavation shall be cleaned and inspected prior to placing the reinforcement cage. The reinforcement cage shall be completely assembled prior to drilling and be ready for adjustment in length as required by the conditions encountered. The reinforcement cage shall be lifted using multiple point sling straps or other approved methods to avoid reinforcement

cage distortion or stress. Cross frame stiffeners may be required for lifting or to keep the reinforcement cage in proper position during lifting and concrete placement.

The Contractor shall attach rolling spacers to keep the reinforcement cage centered within the shaft excavation during concrete placement and to ensure that at no point will the finished shaft have less than the minimum concrete cover(s) shown on the plans. The rolling spacers or other approved non-corrosive spacing devices shall be installed within 2 ft (0.6 m) of both the top and bottom of the drilled shaft and at intervals not exceeding 10 ft (3 m) throughout the length of the shaft to ensure proper reinforcement cage alignment and clearance for the entire shaft. The number of rolling spacers at each level shall be one for each 1.0 ft (300 mm) of shaft diameter, with a minimum of four rolling spacers at each level. For shafts with different shaft diameters throughout the length of the excavation, different sized rolling spacers shall be provided to ensure the reinforcement cage is properly positioned throughout the entire length of the shaft.

When a specific concrete cover between the base of the drilled shaft and the reinforcement cage is shown on the plans, the bottom of the reinforcement cage shall be supported so that the proper concrete cover is maintained.

If the conditions differ such that the length of the shaft is increased, additional longitudinal bars shall be either mechanically spliced or lap spliced to the lower end of the reinforcement cage and confined with either hoop ties or spirals. The Contractor shall have additional reinforcement available or fabricate the reinforcement cages with additional length as necessary to make the required adjustments in a timely manner as dictated by the encountered conditions. The additional reinforcement may be non-epoxy coated.

516.13 Concrete Placement. Concrete work shall be performed according to the following.

Throughout concrete placement the head pressure inside the drilled shaft shall be at least 1.1 times the head pressure outside the drilled shaft.

Concrete placement shall begin within 1 hour of shaft cleaning and inspection. The pour shall be made in a continuous manner from the bottom to the top elevation of the shaft as shown on the contract plan or as approved in the Contractor's installation procedure. Concrete placement shall continue after the shaft excavation is full and until 18 in. (450 mm) of good quality, uncontaminated concrete is expelled at the top of shaft. Vibration of the concrete will not be allowed when the concrete is displacing slurry or water. In dry excavations, the concrete in the top 10 ft (3 m) of the shaft shall be vibrated.

When using temporary casing or placing concrete under water or slurry, a minimum of seven days prior to concrete placement, a 4 cu yd (3 cu m) trial batch of the concrete mixture shall be

performed to evaluate slump retention. Temporary casing shall be withdrawn before the slump of the concrete drops below 6 in. (150 mm). For concrete placed using the slurry method of construction, the slump of all concrete placed shall be a minimum of 6 in. (150 mm) at the end of concrete placement.

Devices used to place concrete shall have no aluminum parts in contact with concrete.

When the top of the shaft is at the finished elevation and no further concrete placement above the finished elevation is specified, the top of the shaft shall be level and finished according to Article 503.15(a).

Concrete shall be placed by free fall, tremie, or concrete pump subject to the following conditions.

- (a) Free Fall Placement. Concrete shall only be placed by free fall when the rate of water infiltration into the shaft excavation is less than 12 in. (300 mm) per hour and the depth of water in the shaft excavation is less than 3 in. (75 mm) at the time of concrete placement.

Concrete placed by free fall shall fall directly to the base without contacting the reinforcement cage, cross frame stiffeners, or shaft sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

Drop chutes used to direct placement of free fall concrete shall consist of a smooth tube. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. The drop chute shall be supported so that free fall does not exceed 60 ft (18.3 m) for conventional concrete or 30 ft (9.1 m) for self-consolidating concrete. If placement cannot be satisfactorily accomplished by free fall in the opinion of the Engineer, either a tremie or pump shall be used to accomplish the pour.

- (b) Tremie and Concrete Pump Placement. Concrete placement shall be according to Article 503.08, except the discharge end of the steel pipe shall remain embedded in the concrete a minimum of 10 ft (3.0 m) throughout concrete placement when displacing slurry or water.

516.14 Construction Tolerances. The following construction tolerances shall apply to all drilled shafts.

- (a) Center of Shaft. The center of the drilled shaft shall be within 3 in. (75 mm) of the plan station and offset at the top of the shaft.

- (b) Center of Reinforcement Cage. The center of the reinforcement cage shall be within 1 1/2 in. (40 mm) of plan station and offset at the top of the shaft.
- (c) Vertical Plumbness of Shaft. The out of vertical plumbness of the shaft shall not exceed 1.5 percent.
- (d) Vertical Plumbness of Reinforcement Cage. The out of vertical plumbness of the shaft reinforcement cage shall not exceed 0.83 percent.
- (e) Top of Shaft. The top of the shaft shall be no more than 1 in. (25 mm) above and no more than 3 in. (75 mm) below the plan elevation.
- (f) Top of Reinforcement Cage. The top of the reinforcement cage shall be no more than 1 in. (25 mm) above and no more than 3 in. (75 mm) below the plan elevation.
- (g) Bottom of shaft. Excavation equipment and methods used to complete the shaft excavation shall have a nearly planar bottom. The cutting edges of excavation equipment used to create the bottom of shafts in rock shall be normal to the vertical axis of the shaft within a tolerance of 6.25 percent.

516.15 Method of Measurement. This work will be measured for payment in place and the volume computed in cubic yards (cubic meters). The volume will be computed using the plan diameter of the shaft multiplied by the measured length of the shaft. The length of shaft in soil will be computed as the difference in elevation between the top of the drilled shaft shown on the plans, or as installed as part of the Contractor's installation procedure, and the bottom of the shaft or the top of rock (when present) whichever is higher. The length of shaft in rock will be computed as the difference in elevation between the measured top of rock and the bottom of the shaft.

When permanent casing is specified, it will be measured for payment in place, in feet (meters). Permanent casing installed at the Contractor's option will not be measured for payment.

Reinforcement furnished and installed will be measured for payment according to Article 508.07.

516.16 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for DRILLED SHAFT IN SOIL, and/or DRILLED SHAFT IN ROCK.

Permanent casing will be paid for at the contract unit price per foot (meter) for PERMANENT CASING.

Reinforcement furnished and installed will be paid for according to Article 508.08.

Obstruction mitigation will be paid for according to Article 109.04.”

ERECTION OF BRIDGE GIRDERS OVER OR ADJACENT TO RAILROADS

Effective: August 9, 2019

Description: In addition to the requirements of Article 504.06(d) and 505.08(e), the following shall apply.

The Contractor or sub-Contractor performing the erection of steel or concrete beams or girders over, or adjacent to (within 25 ft. of), active railroad tracks shall submit an erection plan to the Engineer for approval prior to starting the work.

Erection Plan: The Erection Contractor shall retain the services of an Illinois Licensed Structural Engineer for the completion of a project-specific erection plan. The structural engineer, herein referred to as the Erection Engineer, shall sign and seal the erection plan, drawings, and calculations for the proposed erection of the structural beams or girders.

The erection plan shall be complete in detail for all phases, stages, and conditions anticipated during erection. The erection plan shall include structural calculations and supporting documentation necessary to completely describe and document the means, methods, temporary support positions, and loads necessary to safely erect the structural members in conformance with the contract documents and as outlined herein. The erection plans shall address and account for all items pertinent to the erection including such items as sequencing, falsework, temporary shoring and/or bracing, girder stability, crane positioning and movement, means of access, pick points, girder shape, permissible deformations and roll, interim/final plumbness, cross frame/diaphragm placement and connections, bolting and anchor bolt installation sequences and procedures, and blocking and anchoring of bearings. The Erection Contractor shall be responsible for the stability of the partially erected structure during all phases of erection.

The erection plans and procedures shall be submitted to the Engineer for review and acceptance prior to starting the work. Review, acceptance and/or comments by the Department shall not be construed to guarantee the safety or final acceptability of the work or compliance with all applicable specifications, codes, or contract requirements, and shall neither relieve the Contractor of the responsibility and liability to comply with these requirements, nor create liability for the Department. Significant changes to the erection plan in the field must be approved by the Erection Engineer and accepted by the Engineer for the Department.

Basis of Payment: This work shall not be paid for separately but shall be included in the applicable pay items according to Article 504.08 or 505.13 of the Standard Specifications.

BAR SPLICERS, HEADED REINFORCEMENT

Effective: September 2, 2022

Revised: October 27, 2023

Add the following to Article 508.08(b):

When bar splicers are epoxy-coated, all damaged or uncoated areas near the threaded ends shall be coated with a two-part epoxy according to ASTM D 3963 (D 3963M). All threaded ends of Stage II construction threaded splicer bars shall be coated according to ASTM D 3963 or dipped in an epoxy-mastic primer prior to joining the Stage II construction threaded splicer bar to the threaded coupler.

Add the following Article 508.02 (d)

Bar Terminators1006.10(a)(1)h

Add the following paragraph after Article 508.08 (c):

Bar terminators are threaded, headed attachments to reinforcement to form headed reinforcement. When specified on the plans, a bar terminator shall be attached to the designated reinforcement for development.

Add the following 4th paragraph to Article 508.11:

Bar Terminators will be paid for at the contract unit price per each for BAR TERMINATORS.

Add the following to Article 1006.10(a)(1)g:

For bar splicers with welded connections between the threaded coupler and threaded rod, the Stage I construction threaded splicer bar shall be welded to the threaded coupler using an all-around fillet weld.

Add the following Article 1006.10(a)(1)h:

Bar Terminators. Designated bars shall use a bar terminator to form headed reinforcement. Headed reinforcement shall conform to ASTM A970 with threaded attachment; Class HA; and reinforcement bars conforming to ASTM A706, except the connection strength of the bar terminator to the reinforcement bar shall meet, in tension, at least 125 percent of the specified yield strength of the reinforcement bar. The bar terminator shall be on the Department's qualified product list.

When the reinforcement bar to receive the bar terminator is epoxy coated, the bar terminator shall also be epoxy coated according to ASTM A 775 (A 775M)

NOISE ABATEMENT WALL, GROUND MOUNTED

Effective: December 9, 2022

Revised: June 28, 2024

General. This work shall consist of furnishing the design, shop drawings, materials, post anchorage, and construction of ground mounted concrete noise abatement walls (noise walls) according to this Special Provision, the Contract Plans and/or as directed by the Engineer.

The noise abatement wall shall consist of precast concrete panels spanning between vertical posts supported by concrete drilled shaft foundations (ground mounted) as shown on the plans. Driven piles will not be allowed. The posts shall be steel or concrete, unless otherwise specified on the Contract Plans. The design, material, fabrication and construction shall comply with this Special Provision and the requirements specified by the noise wall supplier selected by the Contractor for use on this project. The walls shall have no omissions or gap except as detailed in the Contract Plans.

The Contractor shall verify the locations for the proposed ground mounted wall for conflicts and inform the Engineer in writing of any conflicts before realigning or redesigning the wall. The Contractor shall realign or redesign the wall to avoid any conflicts.

Post spacing shall avoid existing and proposed underground utilities and storm sewers.

Wall components shall be fabricated and erected to produce a precast concrete reflective noise wall system and/or an absorptive noise reduction system at the locations shown in the Contract Plans. The noise reduction system shall satisfy the acoustical requirements as specified on the Contract Plans. An absorptive noise reduction system may be used as an alternate to a reflective noise wall system. Substitution of alternate materials in lieu of precast concrete panels will not be allowed.

All appurtenances behind, in front of, under, over, mounted upon, or passing through the noise wall, such as drainage structures, fire hydrant access, highway signage, emergency access, utilities, and storm sewers shall be accounted for in design of the wall.

The noise walls shall be designed and constructed to extend to the minimum lines, grades and dimensions of the wall envelope, with no omissions or gaps, as shown on the Contract Plans and as directed by the Engineer.

Submittals. A complete wall and foundation design submittal, including design calculations for wall panels, posts, foundations, and all connections and shop drawings shall be submitted to the Department for review and approval no later than 90 days prior to beginning construction of the wall. The time required for the preparation and review of these submittals shall be charged to the allowable contract time. Delays caused by untimely submittals or insufficient data will not be considered justifications for any time extensions. No additional compensation will be made for any additional material, equipment or other items found necessary to comply with the project specifications as a result of the Engineer's review. The Contractor will be required to submit the

necessary shop drawings. All submittals shall be prepared and sealed by an Illinois Licensed Structural Engineer.

Submittals shall include all structural calculations, details, dimensions, quantities and cross sections necessary for the construction of the noise abatement walls including but not be limited to:

- (1) Structural design calculations for all structural members, foundations, and connections prepared and sealed by an Illinois Licensed Structural Engineer, and prints of shop drawings on reduced size 11 x 17 in. (275 x 425 mm) sheets in accordance with Article 503.05 and 1042.03(b) of the Standard Specifications.
- (2) A plan view of the wall indicating the stations and offsets required to locate the drilled shaft foundations. The proposed foundation diameter(s) and spacing(s) shall be indicated with all changes to the horizontal alignment shown. Each panel and post shall be numbered and any changes in type or size shall be noted. The centerline of any utilities passing under the wall and locations of expansion joints, access doors, lighting, signing, curb cuts, and drainage structures shall also be shown.
- (3) An elevation view of the wall, indicating the elevations of the top of the posts and panels as well as the elevations of the bottom of the panels, tops of the shaft foundations, all steps in wall system, the finished grade line, and vertical clearances to existing utilities and storm sewers. Each post size and length, panel type and size, and foundation depth shall be designated.
- (4) A typical cross section(s) that shows the panel, post, foundation, and the elevation relationship between existing ground conditions and the finished grade as well as slopes adjacent to the wall.
- (5) All general notes required for constructing the wall.
- (6) All details for the steps in the bottom of panels shall be shown. The bottom of the panels shall be located at or below the theoretical bottom of panel line shown on the Contract Plans. The theoretical bottom of panel line is assumed to be 8 in (200 mm) below the finished grade line at front face of the wall for ground mounted noise walls, unless otherwise shown on the Contract Plans.
- (7) Tops of the panels and posts shall extend to or above the theoretical top of wall line shown on the Contract Plans. All panel tops shall be cast and placed horizontally with any changes in elevation accomplished by stepping adjacent panel sections at posts. Steps shall not exceed 2 ft (300 mm) in height.
- (8) All panel types shall be detailed. The details shall show panel weight, orientation, all dimensions necessary to cast and/or fabricate each type of panel, the reinforcing steel, and location of post or foundation connection hardware as well as lifting devices embedded in

the panels. The Noise Reduction Coefficient (NRC) of each panel of the absorptive face shall be noted.

- (9) All post types shall be detailed. The details shall show post weight, orientation, all dimensions necessary to cast and/or fabricate each type of post, the reinforcing steel, connecting plates, and anchorage details as well as lifting devices embedded in or attached to the posts. Post spacing for walls shall be limited to a distance that does not over stress the supporting structure.
- (10) Details of wall panels with appurtenances attached to or passing through the wall, as shown on the contract plans, such as utilities, emergency access doors, framed openings, drainage structures, signs, etc. shall be shown. Any modifications to the design or location of these appurtenances to accommodate a particular system shall also be submitted.
- (11) All architectural panel treatment, including color, texture and form liner patterns shall be shown. All joints shall be placed horizontal or vertical and shall be aligned with adjacent panels.
- (12) The details for the connection between panels and posts as well as their connection to the foundation, shall be shown. Foundation details, including details showing the dimensions, reinforcement, and post anchorage system for the drilled shaft foundations, shall be shown. The method of securing the reinforcement in the foundation prior to concrete placement shall be shown.
- (13) Testing, certifications and reports from independent laboratories documenting that the panel's sound Transmission Loss (TL) and NRC for the panel satisfy the criteria shown in the design criteria section of this specification. The testing results for the flame spread, smoke density and freeze-thaw/salt scaling requirements described in the materials section of this specification shall also be submitted. If unable to document panel and post deflections by calculations, reports of full scale testing shall be submitted to demonstrate the deflection criteria have been met.
- (14) Manufacturer recommended installation requirements, a sequence of construction and a detailed bill of materials shall be included.
- (15) The color of the wall panels and support posts identified by Federal Standard 595-B color number.

The Contractor shall deliver to the Department, a 2 ft x 2 ft (600 mm x 600 mm) precast concrete sample of the wall which contains the colors, textures and patterns proposed for use on the project for approval.

The samples shall be made at the same plant manufacturing the product for the noise walls under this contract and shall be representative of those which will be tested per this specification. Once the color sample is approved, a batch shall be designated by batch number and date and will remain the standard for the entire project.

The Contractor shall submit site access plans showing access and limits of the work areas for the installation of the wall. Any required traffic controls shall be according to the requirements in the plans or the special provision for TRAFFIC CONTROL PLAN.

The initial wall and foundation design submittal shall include three (3) sets of shop drawings and calculations. One set of drawings will be returned to the Contractor with any corrections indicated. The Contractor shall do no work or ordering of materials for the structure until the Engineer has approved the submittal.

Design Criteria. The wall system shall be designed to withstand wind pressure, applied perpendicular to the panels in either direction, according to the AASHTO LRFD Bridge Design Specifications, Chapter 15, for the Design of Sound Barriers. The noise wall design life shall be 75 years unless otherwise noted. The wall system shall be designed to withstand active earth pressure and live load surcharge at locations indicated on the plans. The contractor shall be responsible for the structural adequacy of the panels, posts, foundations and connections as well as overall wall overturning stability. Prestressed and/or post tensioned panel concepts will not be permitted.

The factored Strength III design wind loading shall be as specified on the plans but not less than 35 psf (1.7 kPa). The Service I factored design wind loading shall be as specified on the plans but not less than 15 psf. When a sound wall is also required to support earth pressures, the unfactored design active earth pressure shall be based on an equivalent fluid pressure of 55 pounds per cubic foot (880 kg/m³) and a minimum live load surcharge pressure of 2 feet (600 mm) of earth pressure. The earth pressure fill height shall be defined by the proposed grade line elevation and the theoretical bottom of panel line.

The post shall be connected to the foundation by either embedding the post inside the concrete foundation shaft or by attaching the post to the foundation shaft with base plates and anchor bolts as required by design. Embedded posts shall extend into the shaft for the full length of the shaft. For base plate and anchor bolt connections, the minimum number of anchor bolts per post shall be four 1 in. (M24) diameter bolts, with a minimum embedment depth of 18 in. (450 mm). The concrete shaft for base plate and anchor bolt type connections shall be reinforced. For embedded post type connections, the shaft need not be reinforced unless the minimum clear cover over the post exceeds 10 inches (250 mm). When reinforcement of the concrete shaft is required as specified above, the reinforcement shall consist of a minimum of eight #5 (#15) vertical bars symmetrically placed and tied with #3 (#10) ties at 6 in. (150 mm) centers. An additional tie shall be provided at the top and bottom of the foundation. As an alternative to the ties, a #3 (#10) spiral at a 6 in. (150 mm) pitch with an additional 1 1/2 turns at the top and bottom of the foundation or an equivalent 4 x 4 – W12.3 x W7.4 welded wire fabric may be substituted. Reinforcement bars inside the concrete foundations do not require epoxy coating.

Posts shall be oversized by 0.0625 in. in each direction to account for corrosion.

The material and construction of the foundations (drilled shafts) shall be according to Section 516 of the Standard Specifications.

The shaft foundation dimensions shall be determined according to AASHTO LRFD Bridge Design Specifications. Soil borings from prior soil investigations when available are shown in the plans and may be used to generate foundation design parameters. The design shall utilize load and resistance factors as specified in the AASHTO LRFD Bridge Design Specifications and shall account for the effects of a sloping ground surface and water table indicated on the plans. In the event that insufficient data is shown on the plans, the following parameters should be assumed for the foundation design:

Effective unit weight	70 pcf (1120 kg/m ³)
Internal friction angle	30 degrees
Cohesion intercept	0 ksf (0 kg/m ³)

The maximum post spacing shall be as specified in the Contractor's approved design, but not greater than 20 ft.

The maximum allowable panel deflection shall be no more than the panel length (L) divided by 240 (L/240). The maximum post deflection due to post curvature shall be $H/180$, where H is the height of the post above the foundation. The maximum total post deflection due to post curvature, foundation curvature, and top-of-foundation rotation shall be $H/90$. A method utilizing P-y springs for different soil layers shall be used to calculate the total post deflection. When meeting the deflection limits cannot be demonstrated by calculations, a lateral load test and report shall be submitted to the Engineer indicating that the above noted design lateral loads can be applied to the panels and/or posts without exceeding noted deflection tolerance. The test shall apply lateral loads to the panel simulating uniform wind pressure, and earth pressure when present.

The design shall account for the presence of all appurtenances mounted on or passing through the wall such as drainage structures, existing or proposed utilities, emergency access doors and other items.

Corrugations, ribs or battens on the panel shall be oriented vertically when erected. The panels shall be designed to prevent entrapment and ponding of water. The walls shall not have openings allowing the perching or nesting of birds or the collection of dirt, debris or water.

The walls shall not have handholds or grips promoting climbing of the walls. Any bolts or fasteners used to connect material to the supporting panel, posts, or foundations shall be recessed or embedded in concrete, hidden from view and weather exposure. No external mechanical fastening devices such as frames or clips shall be used for these connections.

The noise abatement material shall be designed to achieve a sound TL equal to or greater than 20 dB in all one-third octave bands from 100 hertz to 5000 hertz, inclusive, when tested according to ASTM E-90. The sound absorptive material shall have a minimum NRC as indicated on the plans. For the side of the walls specified as reflective, no minimum NRC is required.

The NRC shall be determined per ASTM E795, tested according to ASTM C423 (mounting type A). The ratio of noise absorptive material on the panel surface to total wall area (including posts)

shall be greater than 90 percent. NRC testing shall be performed on coated samples, utilizing the stain that will be applied for color.

Access Doors. All access doors shall be designed to fit within the design of the noise wall as shown on the plans. Doors shall be complete with hardware and locking devices. Each door shall provide a 3 ft (0.9 m) wide by 7 ft (2.1 m) high minimum clear access opening. Both door jambs shall be securely fastened to anchored posts. Front and back face of the installed door shall be flush with the faces of the noise wall.

The door, jambs, head, hinges, door appurtenances, and adjacent ground mounted posts shall be designed to withstand the wind pressure of 30 psf (1.4 kPa) with the door in fully open and fully closed positions and support the weight of the door and a 300 lb (136 kg) vertical load on the non-hinged side of the door. Provide steel bracing as required. Door bottom shall be equipped with drainage holes to avoid accumulation of trapped moisture.

Door jambs and head section shall be hot dip galvanized steel. Door hinges shall be barrel type, edge mount, extra heavy-duty, hot dip galvanized steel or stainless steel. The hinges shall be designed to support the weight of door assembly, wind loads on the open door, and a 300 lb (136 kg) vertical load on the non-hinged side of the door.

Door pulls shall be provided on both sides of access door(s). Door locking hardware shall be hasp-type to be used with a padlock and shall be located according to local fire department or other requirements as applicable. A solid steel emergency access lock box system shall be provided and mounted near the hasp location at the steel post on the locking hardware side of door. The lock box for emergency access doors shall be according to local fire department requirements.

Doors shall be equipped with lifting bolts or beams as required for safe lifting of door units.

Materials. Noise wall materials shall conform to the supplier's standards, AASHTO Specifications for noise walls and the following:

- (a) Reinforcement bars shall satisfy ASTM A706 Grade 60 (400). Welded wire fabric shall be according to AASHTO M 336. All reinforcement in the wall panels shall be epoxy coated or galvanized.
- (b) Anchor bolts shall conform to ASTM F1554 Grade 55 or 105 and shall be galvanized per AASHTO M232.
- (c) The precast elements shall be according to applicable portions of Section 1042 of the Standard Specifications. The precast elements are considered to be Precast Concrete Structural Members. Coarse Aggregate shall meet the requirements of Article 1004.02(f) of the Standard Specifications. Concrete shall be Class PC with a minimum compressive strength of 4500 psi (31,000 kPa) at 28 days. Dry cast concrete element will not be permitted.
- (d) For sound absorptive panels, the manufacturer shall provide test information from an independent lab that the panels meet specified durability requirements.

All sound absorbing concrete and composite concrete components shall be tested for long-term durability according to AASHTO T 161 (ASTM C666), Procedure A or B, or ASTM C672-12. For testing according to AASHTO T 161 (ASTM C666), a minimum of three specimens shall be tested, and the maximum weight (mass) loss after 300 cycles shall be 7.0 percent with no cracks, delamination (applies to composite panels), or other excessive physical distress. For testing according to ASTM C672-12, the following modifications and requirements shall apply:

Three specimens of a full cross section of the panel at least 144 square inches in face area will be selected at random from the provided panel. Sample specimens shall be representative of the manufacturer's continuous production operation, as selected and marked by the engineer. Specimens shall be 2D-symmetric and shaped according to the testing laboratory's accommodations. Surfaces of the sample specimens shall be prepared for testing as follows. Brush the surfaces of the sample to remove any loose particles. Before testing, submerge the test specimens be submerged in water for a period of 24 hours before testing. Immediately following this, cover the specimens with the sodium chloride solution as stated below.

Test Procedure

Place samples in a 5 sided water tight container, fully submerged in a solution of sodium chloride (concentration 3% by mass). Maintain 1/4 inch of sodium chloride solution above the top surface of the fully submerged specimen within the container.

Subject the submerged specimens to continuous freeze-thaw cycles as follows:

After each five cycles, remove the salt solution and particles of deteriorated concrete from the slab and collect in a watertight container. The operation is best accomplished by tilting the slab in a funnel approximately 20 inches in diameter and washing the surface of the slab with a 3% sodium chloride solution. Continue this washing until all loose particles are removed from the sample. Strain the solution through a filter and dry the residue at 221 degrees Fahrenheit to a constant mass condition. Cumulatively weigh the residue after each five cycles. The dry residue is defined as the loss of mass. Calculate the loss of mass to the nearest 0.01 pounds per square foot, not including the exposed surface of any core material on the cast or cut edges. Visually rate the surfaces according to 10.1.5 of ASTM C672 including any delamination of the sound absorbing material from the concrete core for composite concrete materials. After each washing of each sample, re-establish the initial submerged condition with a new solution of 3% sodium chloride before continuing with freeze-thaw cycling.

Continue the test until 30 freeze-thaw cycles have been completed.

During the test position and support each specimen to allow free circulation of the test solution under, around, and over test pieces. Support the bottom of the specimens on blocks in a manner to facilitate movement of moisture through and around the test specimens.

Test Report

Submit to the engineer an independent testing laboratory test report which shows that all solid and composite concrete products meet or exceed the following criteria:

1. After 30 freeze-thaw cycles the test specimens shall not exhibit excessive deterioration in the form of cracks, spalls, aggregate disintegration, delamination or other objectionable features.
 2. Compliance with the test requirements is based upon a loss of mass of not more than 0.2 pounds per square foot from the surface after 30 cycles of freezing and thawing.
 3. The report shall include the following:
 - a. Name of manufacturer.
 - b. Location of production.
 - c. Production description.
 - d. Date product sample was cast.
 - e. Date testing began.
 - f. Specimen identification.
 - g. 5x7-inch color photographs of the test specimens before and after the 30 cycles of freeze-thaw test showing both sound absorbing faces and at least one representative side view of a cut (not cast) face, and any defects.
 - h. A graph of the cumulative mass loss of each specimen plotted against the number of freeze-thaw cycles for 5, 10, 15, 20, 25, and 30 freeze-thaw cycles.
 - i. Visual rating according to ASTM C672 Section 10.1.5, including report of any delamination of the sound absorbing material from the concrete core for composite concrete components.
- (e) The manufacturer for the noise abatement wall shall provide their quality control plan for testing the product, and test results shall be provided upon request by the Engineer. Manufacturers on the Department's Qualified Product List of Certified Precast Concrete Producers who are approved for noise abatement walls will be considered in compliance with this requirement. The panel manufacturer shall warranty the panels for aesthetic coating durability and no material delaminations or failures for a minimum of ten years.
- (f) Steel plates and posts shall conform to AASHTO M 270 (M 270 M) Grade 36 (250) or 50 (345). All portions of the post shall be galvanized according to AASHTO M111 and ASTM A385 or primed according to Section 506 of the Standard Specifications. The exposed portions of the steel posts shall be painted according to Section 506 of the Standard Specifications. The adjacent concrete panels shall be protected from over spray. The color shall closely match the color of the concrete panels, unless otherwise specified on the plans. Steel bolts, nuts, and washers shall be galvanized according to AASHTO M232.
- (g) Lifting inserts cast into the panels shall be hot dipped galvanized.
- (h) Non shrink grout shall be according to Section 1024 of the Standard Specifications.
- (i) The default color of both sides of the panels, posts and other visible elements shall be a light brown earth tone unless specified otherwise on the Contract Plans Colors shall be achieved

through the use of integral pigments or stains, which are in compliance with the environmental regulation of the State of Illinois. Components manufactured with integral pigment shall be tested and certified in conformance to ASTM C979. Stains shall be non film forming, penetrating stains. Stains shall be applied to concrete at the cured age of the manufacturer's recommendation. Surface preparation and application shall be according to manufacturer written recommendations. Coloring of concrete elements shall be accomplished using a single component water based, sound absorptive, penetrating, architectural stain that is weather resistant. Stains and/or pigments must be applied at the manufacturing plant; application in the field on site will not be allowed. The final color shall be consistent with the quality and appearance of the approved sample. The surface coating shall be tested for accelerated weathering as follows:

Submit to the engineer certification of compliance that all coatings on barrier components, with the exception of structural steel and wood components comply with the following requirements when tested according to ASTM Standard G155, G153, or G152 after 2400 hours of exposure on a cement based test specimens:

1. No checking when rated according to ASTM D660.
2. No cracking when rated according to ASTM D661.
3. No blistering when rated according to ASTM D714.
4. No difference in adhesion between the unexposed control sample and an exposed sample when tested according to ASTM D3359, Method A.
5. No chalking less than #7 rating when rated according to ASTM D4214.
6. No color change greater than 5 NBS units when measured according to ASTM D2244, using illuminant D65 and the 1964 10-degree standard observer.

- (j) The finish pattern of the precast panels shall be as specified on the Contract Plans.
- (k) With the exception of the steel and Portland cement concrete elements of the wall, all materials shall be tested for flame spread and smoke density developed according to ASTM E84. The material must exhibit a flame-spread index less than 10 and a smoke density developed value of 10 or less.

Fabrication. All precast units shall be manufactured according to Section 504 of the Standard Specifications, and the following requirements and tolerances with respect to the dimensions shown on the approved shop drawings.

- (a) The minimum reinforcement bar cover shall be 1 1/2 in (40 mm).
- (b) Panel dimensions shall be within 1/4 in (6 mm).
- (c) All hardware embedded in panels or posts shall be within 1/4 in (6 mm).
- (d) Angular distortion with regard to panel squareness, defined as the difference between the two diagonals, shall not exceed 1/2 in (13 mm).
- (e) Surface defects on formed surfaces measured on a length of 5 ft (1.5 m) shall not be more than 0.10 in (2.5 mm).
- (f) Posts shall be installed plumb to within 1/2 in (13 mm) of vertical for every 15 ft (5 m) of height and to within 1/2 in (13 mm) of the station and offset indicated on the approved shop drawings.

- (g) Drilled shaft foundations shall be placed within 2 in (50 mm) of the station and offset indicated on the approved shop drawings.
- (h) Panel reinforcement and lifting devices shall be set in place to the dimension and tolerances shown on the plans and these special provisions prior to casting.

The date of manufacture, the production lot number, and the piece-mark shall be clearly noted on each panel.

Absorptive material shall be permanently attached to their supporting elements and no external mechanical fastening systems such as frames or clips shall be used. Any bolts or fasteners used shall be recessed or embedded below the surface.

Any chipping, cracks, honeycomb, or other defects, to be allowed, shall be within acceptable standards for precast concrete products according to Section 1042 of the Standard Specifications and as determined by the Engineer.

Construction. The Contractor shall obtain technical assistance from the supplier during wall erection to demonstrate proper construction procedures and shall include any costs related to this technical assistance in the contract unit price for Noise Abatement Wall. The instructions provided by the wall supplier are guidelines and do not relieve the contractor of the responsibility to adhere to contract requirements.

It is recommended that all bottom panels be installed for a length of wall prior to placing middle or top panels. After bottom panels are in-place, finish grading can be accomplished with heavy equipment by reaching over the in-place panels.

Site excavations and/or fill construction shall be completed to plan elevations and profiles prior to the start of wall foundation construction. All underground utility or drainage structure installation shall be completed prior to foundation installation. The ground elevations as shown on the plans and the approved noise wall shop drawings shall be verified by the contractor and discrepancies corrected prior to material fabrication. Buried utilities shall be marked to verify proper clearance from the drilled foundations. The Contractor should consider overhead obstruction such as electric and telephone wires prior to wall erection.

If the soils encountered during drilling of the foundations do not satisfy the design strengths shown on the Contract Plans, the Engineer shall be notified to evaluate the required foundation modifications. The shaft foundation will normally require additional length, which may be paid separately under Article 104.03 of the Standard Specifications. All drilled shaft excavations shall be filled with concrete within 6 hours of their initiation. The concrete for the drilled shaft foundations shall be placed against undisturbed, in-place soils. The concrete at the top of the shaft shall be shaped to provide the panels on each side of the post adequate bearing area and correct elevation per the approved shop drawings.

The panels shall be delivered to the project site in full truckload quantities. They may be off-loaded individually or by forklift with a solid steel plate spanning between the forks providing uniform, fully distributed bearing support to the underside of the panels. Units shall be shipped,

handled and stored in such a manner as to minimize the danger of staining, chipping, spalling, development of cracks, fractures, and excessive bending stresses. Panels shall be stored and shipped in bundles, on edge. Any touch up and repair is at the Contractor's expense and shall be carried out according to the manufacturer's recommendations.

Method of Measurement. Noise abatement walls will be measured in square feet (square meters) from the wall envelope, defined by the theoretical top of wall line to the theoretical bottom of wall line for the length of the wall as shown on the Contract Plans.

Drilled shafts, concrete, reinforcement bars and other elements for supporting the ground mounted noise abatement walls will not be measured for payment.

Access doors shown on the Contract Plans will not be measured for payment.

Basis of Payment. This work will be paid for at the contract unit price per square foot (square meter) for NOISE ABATEMENT WALL, GROUND MOUNTED.

The costs for drilled shafts, concrete, reinforcement bars and other elements supporting the noise abatement walls will not be paid for separately but will be included in the item for NOISE ABATEMENT WALL, GROUND MOUNTED.

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Non-segregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
- XI. Certification Regarding Use of Contract Funds for Lobbying
- XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work

performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (see 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action

within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide

sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants /

Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:

The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than \$10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway

Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA- 1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. *Wage rates and fringe benefits.* All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act ([29 CFR part 3](#))), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in paragraphs (d) and (e) of 29 CFR 5.5, the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act ([40 U.S.C. 3141\(2\)\(B\)](#)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.e. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in paragraph 4. of this section. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph 1.c. of this section) and the Davis-Bacon poster (WH-1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. *Frequently recurring classifications.* (1) In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in [29 CFR part 1](#), a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to paragraph 1.c. of this section, provided that:

(i) The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

(ii) The classification is used in the area by the construction industry; and

(iii) The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

(2) The Administrator will establish wage rates for such classifications in accordance with paragraph 1.c.(1)(iii) of this section. Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

c. *Conformance.* (1) The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is used in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

(3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to DBAconformance@dol.gov. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to DBAconformance@dol.gov, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(5) The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division

under paragraphs 1.c.(3) and (4) of this section. The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 1.c.(3) or (4) of this section must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

d. *Fringe benefits not expressed as an hourly rate.*

Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

e. *Unfunded plans.* If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in § 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

f. *Interest.* In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. Withholding (29 CFR 5.5)

a. *Withholding requirements.* The contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in this section for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in paragraph 3.d. of this section, the contracting agency may on its own initiative and after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with paragraph

2.a. of this section or Section V, paragraph 3.a., or both, over claims to those funds by:

- (1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- (2) A contracting agency for its procurement costs;
- (3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- (4) A contractor's assignee(s);
- (5) A contractor's successor(s); or
- (6) A claim asserted under the Prompt Payment Act, [31 U.S.C. 3901–3907](#).

3. Records and certified payrolls (29 CFR 5.5)

a. Basic record requirements (1) Length of record retention. All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

(2) Information required. Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in [40 U.S.C. 3141\(2\)\(B\)](#) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

(3) Additional records relating to fringe benefits. Whenever the Secretary of Labor has found under paragraph 1.e. of this section that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in [40 U.S.C. 3141\(2\)\(B\)](#) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(4) Additional records relating to apprenticeship. Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

b. Certified payroll requirements (1) Frequency and method of submission. The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to the contracting

agency. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system.

(2) Information required. The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under paragraph 3.a.(2) of this section, except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (e.g., the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH-347 or in any other format desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division website at <https://www.dol.gov/sites/dolgov/files/WHDLegacy/files/wh347.pdf> or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the contracting agency.

(3) Statement of Compliance. Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

(i) That the certified payroll for the payroll period contains the information required to be provided under paragraph 3.b. of this section, the appropriate information and basic records are being maintained under paragraph 3.a. of this section, and such information and records are correct and complete;

(ii) That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in [29 CFR part 3](#); and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

(4) Use of Optional Form WH-347. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 will satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(3) of this section.

(5) *Signature.* The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

(6) *Falsification.* The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under [18 U.S.C. 1001](#) and [31 U.S.C. 3729](#).

(7) *Length of certified payroll retention.* The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

c. *Contracts, subcontracts, and related documents.* The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

d. *Required disclosures and access (1) Required record disclosures and access to workers.* The contractor or subcontractor must make the records required under paragraphs 3.a. through 3.c. of this section, and any other documents that the contracting agency, the State DOT, the FHWA, or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by § 5.1, available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

(2) *Sanctions for non-compliance with records and worker access requirements.* If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to § 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under [29 CFR part 6](#) any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

(3) *Required information disclosures.* Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address

of each covered worker, and must provide them upon request to the contracting agency, the State DOT, the FHWA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity (29 CFR 5.5)

a. *Apprentices (1) Rate of pay.* Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) *Fringe benefits.* Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

(3) *Apprenticeship ratio.* The allowable ratio of apprentices to journeymen on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to paragraph 4.a.(4) of this section. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph 4.a.(1) of this section, must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(4) *Reciprocity of ratios and wage rates.* Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

b. *Equal employment opportunity.* The use of apprentices and journeymen under this part must be in conformity with

the equal employment opportunity requirements of Executive Order 11246, as amended, and [29 CFR part 30](#).

c. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeyworkers shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor must insert FHWA-1273 in any subcontracts, along with the applicable wage determination(s) and such other clauses or contract modifications as the contracting agency may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate. 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility. a. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of [40 U.S.C. 3144\(b\)](#) or § 5.12(a).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of [40 U.S.C. 3144\(b\)](#) or § 5.12(a).

c. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, [18 U.S.C. 1001](#).

11. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#);

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#);

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#); or

d. Informing any other person about their rights under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#).

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchpersons and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1. of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or

mechanic, including watchpersons and guards, employed in violation of the clause set forth in paragraph 1. of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1. of this section.

* \$31 as of January 15, 2023 (See 88 FR 88 FR 2210) as may be adjusted annually by the Department of Labor, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

3. Withholding for unpaid wages and liquidated damages

a. *Withholding process.* The FHWA or the contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in this section on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with Section IV paragraph 2.a. or paragraph 3.a. of this section, or both, over claims to those funds by:

- (1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- (2) A contracting agency for its repurchase costs;
- (3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- (4) A contractor's assignee(s);
- (5) A contractor's successor(s); or
- (6) A claim asserted under the Prompt Payment Act, [31 U.S.C. 3901](#)–3907.

4. Subcontracts. The contractor or subcontractor must insert in any subcontracts the clauses set forth in paragraphs 1. through 5. of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1. through 5. In the

event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in this part;

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or this part;

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or this part; or

d. Informing any other person about their rights under CWHSSA or this part.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

- (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
- (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and

health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of \$150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.327.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.327.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov/>). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

- a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;.

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, 2 CFR 180.800;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

- b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

* * * * *

3. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

- a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which

this transaction originated may pursue available remedies, including suspension and/or debarment.

- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contractor). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated. 2 CFR 1200.220 and 1200.332.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov>), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily

excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment. 2 CFR 180.325.

* * * * *

4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(1) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(2) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(3) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

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XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or

cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS
PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY
SYSTEM OR APPALACHIAN LOCAL ACCESS**

ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B)

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.