

9

Letting April 25, 2025

Notice to Bidders, Specifications and Proposal



**Contract No. 61G79
DUPAGE County
Section 06-00133-00-BR (Naperville)
Route FAU 1509 (North Aurora Road)
Project XUXZ-984 ()
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. April 25, 2025 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. 61G79
DUPAGE County
Section 06-00133-00-BR (Naperville)
Project XUXZ-984 ()
Route FAU 1509 (North Aurora Road)
District 1 Construction Funds**

Widening the North Aurora road underpass and construction of railroad Bridges to carry WCL and BNSF Railways over North Aurora Road in Naperville.

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

Gia Biagi,
Acting Secretary

CONTRACT 61G79

INDEX FOR SUPPLEMENTAL SPECIFICATIONS AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2025

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 1-1-25)

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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	616	<input checked="" type="checkbox"/>	Accessible Pedestrian Signals (APS)	April 1, 2003	Jan. 1, 2022
80274	618	<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	621	<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		<input type="checkbox"/>	Building Removal with Asbestos Abatement	Sept. 1, 1990	Aug. 1, 2022
80460	623	<input checked="" type="checkbox"/>	Cement, Finely Divided Minerals, Admixtures, Concrete, and Mortar	Jan. 1, 2025	
80384	634	<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	
80461		<input type="checkbox"/>	Concrete Barrier	Jan. 1, 2025	
80453		<input type="checkbox"/>	Concrete Sealer	Nov. 1, 2023	
80261	638	<input checked="" type="checkbox"/>	Construction Air Quality – Diesel Retrofit	June 1, 2010	Jan. 1, 2025
* 80029	640	<input checked="" type="checkbox"/>	Disadvantaged Business Enterprise Participation	Sept. 1, 2000	Jan. 2, 2025
80229	643	<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
80456		<input type="checkbox"/>	Hot-Mix Asphalt	Jan. 1, 2024	Jan. 1, 2025
80446	646	<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
80450		<input type="checkbox"/>	Mechanically Stabilized Earth Retaining Walls	Aug. 1, 2023	
* 80464	648	<input checked="" type="checkbox"/>	Pavement Marking Inspection	April 1, 2025	
80441	649	<input checked="" type="checkbox"/>	Performance Graded Asphalt Binder	Jan 1, 2023	
80459		<input type="checkbox"/>	Preformed Plastic Pavement Marking	June 2, 2024	
34261	654	<input checked="" type="checkbox"/>	Railroad Protective Liability Insurance	Dec. 1, 1986	Jan. 1, 2022
80455	655	<input checked="" type="checkbox"/>	Removal and Disposal of Regulated Substances	Jan. 1, 2024	April 1, 2024
80445	657	<input checked="" type="checkbox"/>	Seeding	Nov. 1, 2022	
80457	663	<input checked="" type="checkbox"/>	Short Term and Temporary Pavement Markings	April 1, 2024	April 2, 2024
* 80462	667	<input checked="" type="checkbox"/>	Sign Panels and Appurtenances	Jan. 1, 2025	April 1, 2025
80448	668	<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	669	<input checked="" type="checkbox"/>	Steel Cost Adjustment	April 2, 2004	Jan. 1, 2022
80397	672	<input checked="" type="checkbox"/>	Subcontractor and DBE Payment Reporting	April 2, 2018	
80391	673	<input checked="" type="checkbox"/>	Subcontractor Mobilization Payments	Nov. 2, 2017	April 1, 2019
* 80463	674	<input checked="" type="checkbox"/>	Submission of Bidders List Information	Jan. 2, 2025	Mar. 2, 2025
80437	675	<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
* 80465	677	<input checked="" type="checkbox"/>	Surveying Services	April 1, 2025	
* 80466		<input type="checkbox"/>	Temporary Rumble Strips	April 1, 2025	
20338	678	<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	681	<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	682	<input checked="" type="checkbox"/>	Weekly DBE Trucking Reports	June 2, 2012	Jan. 2, 2025
80454		<input type="checkbox"/>	Wood Sign Support	Nov. 1, 2023	
80427	683	<input checked="" type="checkbox"/>	Work Zone Traffic Control Devices	Mar. 2, 2020	Jan. 1, 2025
80071	685	<input checked="" 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
686	<input checked="" 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
697	<input checked="" type="checkbox"/>	GBSP 81	Membrane Waterproofing for Buried Structures	Oct 4, 2016	March 1, 2019
	<input 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
	<input 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
699	<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	
700	<input checked="" type="checkbox"/>	GBSP 100	Bar Splicers, Headed Reinforcement	Sept 2, 2022	Oct 27, 2023
	<input 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 "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways" in effect on the date of invitation for bids; and the "Manual of Test Procedures for Materials" in effect on the date of invitation for bids; and the Supplemental Specifications, adopted January 1, 2025, and Recurring Special Provisions indicated on the Check Sheet included herein which apply to and govern the construction of FAU Route 1509 (North Aurora Road) from Pennsbury Lane to Frontenac Road Reconstruction, Section: 06-00133-00-BR, Project No. XUXZ(984) in DuPage County, City of Naperville, City of Aurora and Naperville Township and in case of conflict with any part or parts of said specifications, the said Special Provisions shall take precedence and shall govern.

CONTRACT NO. 61G79

LOCATION OF PROJECT

The project is located along North Aurora Road, beginning at station 98+00.00, a point on the centerline of North Aurora Road approximately 340 feet east of the centerline of Pennsbury Lane within the City of Aurora, DuPage County and extends in an easterly direction for a gross/net length of 1,985.00 feet (0.38 miles) to station 117+85.00, a point on the centerline of North Aurora Road approximately 86 feet west of the centerline of Frontenac Road within the City of Naperville, DuPage County.

DESCRIPTION OF PROJECT

This project involves widening the North Aurora Road underpass under the Wisconsin Central Ltd. (WCL) and Burlington Northern and Santa Fe (BNSF) Railways. The work consists of pavement removal; curb and gutter removal and replacement; roadway reconstruction, including pavement widening, channelization, sidewalk and multiuse path; grading; storm sewer and drainage structure adjustments and installation; stormwater detention culverts; pump station; maintenance of traffic; erosion control; landscaping; pavement markings; retaining wall; railroad shoofly; railroad bridge; utility coordination, relocation and adjustments; and all incidental and collateral work as necessary to complete the improvement shown herein and as described in the specifications.

AVAILABLE REPORTS

☐ 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 (Local PSI)
- ☒ Preliminary Environmental Site Assessment (Local PESA)
- ☒ Soils/Geotechnical Report
- ☒ Boring Logs
- ☒ Pavement Cores
- ☐ Location Drainage Study (LDS)
- ☐ Hydraulic Report
- ☒ Noise Analysis
- ☒ Wetland and Water Investigation Report
- ☒ Other: ComEd Environmental Contractor of Choice (ECOC)
- ☒ Other: ComEd Insurance Requirements

Those seeking these reports should request access from:

Andy Hynes, P.E., P.T.O.E. – Deputy City Engineer
City of Naperville – Transportation, Engineering and Development
Phone: (630) 548-2958
Email: hynesa@naperville.il.us

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 (D1)

Effective: June 1, 2016

Revised: April 1, 2025

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
Sta. 110+66 to Sta. 117+50, Lt and Sta. 106+81 to Sta. 110+23, Rt	Aerial cables	Aerial fiber optic cables on ComEd owned poles. Will be relocated following ComEd's pole relocations.	Adesta	Contractor for Adesta to relocate aerial cables to relocated power poles. 5 Days Total
Sta. 107+00, Lt and Sta. 107+00, Rt	Buried cable	Buried cable is in conflict with proposed storm sewer and drainage structures.	Adesta	Contractor for Adesta to relocate buried cable. 5 Days Total

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	DURATION OF TIME
Sta. 102+41, Lt,	Buried telephone cable	Buried cable is in conflict with proposed storm sewer.	AT&T	Contractor for AT&T to relocate buried cable.
Sta. 101+08 to Sta. 104+22, Rt,	Buried telephone cable/Splice boxes	Splice boxes are in conflict with proposed storm sewers at Sta. 102+41 and Sta. 105+13. Buried cable is in conflict with proposed storm sewer and drainage structures.		Contractor for AT&T to relocate splice box.
Sta. 105+04 to Sta. 107+00 Rt				Contractor for AT&T to relocate buried cable.
Sta. 117+22, Lt,	Splice box	Splice box is in conflict with proposed roadway widening.		
Sta. 108+00, Rt	Splice box	Splice box is in conflict with proposed shared-use path.		
Sta. 117+80, Lt	Buried telephone cable	Buried cable is in conflict with proposed storm sewer.		10 Days Total
Sta. 110+66 to Sta. 117+50, Lt and Sta. 98+01 to Sta. 105+05, Rt	Cable TV Overhead Wires	Overhead wires will be impacted due to relocation of the power poles.	Comcast	Contractor for Comcast to relocate overhead wires. 5 Days Total

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	DURATION OF TIME
Sta. 95+17, Rt Sta. 96+92, Rt Sta. 98+01, Rt Sta. 98+68, Rt Sta. 100+30, Rt Sta. 101+71, Rt Sta. 102+17, Rt Sta. 103+94, Rt Sta. 105+05, Rt Sta. 105+96, Rt Sta. 106+81, Rt Sta. 107+91, Rt Sta. 108+40, Rt Sta. 109+23, Rt Sta. 110+23, Rt Sta. 110+66, Lt Sta. 112+37, Lt Sta. 114+05, Lt Sta. 115+78, Lt Sta. 117+50, Lt	Electric Power Poles	The power poles are in conflict with the proposed roadway widening, sidewalk, and water main. The power poles are in conflict with the proposed multi-use path, storm sewers, retaining walls, and temporary light poles.	ComEd (Distribution)	Contractor for ComEd to relocate power poles and aerial cables. 25 Days Total
Sta. 109+23	Underground cable	Underground cable crossing roadway is in conflict with proposed retaining wall and storm sewer.	ComEd (Distribution)	Contractor for ComEd to relocate underground cable. 5 Days Total
Sta. 106+83, 38' Lt	Transmission Pole	Transmission pole is in conflict with the proposed westbound pavement.	ComEd (Transmission)	Contractor for ComEd to relocate transmission poles and aerial cables. This work is anticipated to begin in September 2025. 60 Days Total

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	DURATION OF TIME
Sta. 109+50 to Sta. 116+50, Lt	Underground duct package	Underground duct package is in conflict with proposed temporary storm sewer, drainage structures, proposed water main, proposed storm sewer and drainage structures, and proposed sanitary sewer.	Crown Castle	Contractor for Crown Castle to relocate underground duct package. 15 Days Total
Sta. 107+67 (crossing)	Oil Pipeline (34")	Oil pipeline and valve is in conflict with proposed roadway, storm sewer and sidewalk.	Enbridge Department	Contractor for Enbridge to relocate/lower 34" oil pipeline and retire valve. This work is anticipated to begin in March 2026. 60 Days Total Contractor shall implement detour for Enbridge work.
Sta. 100+50, Sta. 100+77, and Sta. 101+00	Natural gas pipelines (36", 36" and 20" dia.)	Above-ground pipeline markers and cathodic protection test leads in conflict with sidewalk and grading on the north side.	Kinder Morgan Department	Contractor for Kinder Morgan to relocation markers and test leads. 15 Days Total Contractor shall provide excavation support for Kinder Morgan work, if requested.

Stage 1

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	DURATION OF TIME
Sta. 106+88	Oil pipeline (8")	Roadway widening extends beyond pipelines existing casing on north side.	ONEOK Department	Contractor for ONEOK to replace existing pipeline entire width of ROW. Work must occur after ComEd Transmission pole relocation. 15 Days Total Contractor shall implement detour for ONEOK work.
Sta. 98+15, Lt Sta. 117+89, Lt	Gas main	Gas main is in conflict with proposed storm sewer/storm sewer removal, proposed roadway, proposed water main, proposed light pole foundations and handholes.	Nicor	Contractor for Nicor to relocate gas main. Work must occur after ComEd Transmission pole relocation. 30 Days Total

Stage 2 – No conflicts to be resolved.

Stage 3 – No conflicts to be resolved.

Stage 4 – No conflicts to be resolved.

Stage 5 – No conflicts to be resolved.

Stage 6 – No conflicts to be resolved.

Stage 7 – No conflicts to be resolved.

Stage 8 – No conflicts to be resolved.

Stage 9 – No conflicts to be resolved.

Pre-Stage: 235 Days Total Installation
Stage 1: 45 Days Total Installation
Stage 2: No conflicts
Stage 3: No conflicts
Stage 4: No conflicts
Stage 5: No conflicts
Stage 6: No conflicts
Stage 7: No conflicts
Stage 8: No conflicts
Stage 9: No conflicts

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
Adesta	Aaron Rydell	630-962-7139	Aaron.Rydell@aus.com
AT&T	Daniel Bluhm	630-573-5705	db3492@att.com
Comcast	Martha Gieras	773-851-8613	Martha_gieras@comcast.com
ComEd (Distribution)	Cassie Evans	773-241-0741	Cassie.evans@comed.com
ComEd (Transmission)	John Mishevski	630-437-2215	John.Mishevski@comed.com
Crown Castle	Mike Kyriazakos	630-480-5203	Mike.Kyriazakos@crowncastle.com
City of Naperville – DPU Electric	Ron Ritter	630-420-4183	RitterR@naperville.il.us
City of Naperville – DPU Water	Joshua Strait	630-305-5373	StraitJ@naperville.il.us
Enbridge	Kelly Khuu	403-718-3423	kelly.khuu@enbridge.com
Kinder Morgan	Mark Cavazos	713-420-4363	Mark_Cavazos@kindermorgan.com
Nicor	Charles “Chip” Parrott	630-388-3319	cparrot@southernco.com
ONEOK	Kalli Ritterbush	405-638-5692	kalli.ritterbush@oneok.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
Sta. 94+20 to Sta. 95+30, Rt Sta. 108+00 to Sta. 119+10, Lt	12kV overhead electric	Watch and protect during installation of temporary signals.	ComEd

Stage 1

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
Sta. 107+67	Oil pipeline	Contractor to be aware of utility and shall protect against any damage during construction of temporary roadway.	Enbridge
Sta. 106+90, Lt	8" natural gas pipeline	Contractor to be aware of utility and shall protect against any damage during construction of roadway and storm sewers.	ONEOK

Stage 2 – No utilities to watch and protect

Stage 3 – No utilities to watch and protect

Stage 4 – No utilities to watch and protect

Stage 5 – No utilities to watch and protect

Stage 6 – No utilities to watch and protect

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
Sta. 100+50, Sta. 100+77, and Sta. 101+00	Natural gas pipelines (36", 36" and 20" dia.)	Contractor to be aware of utility and shall protect against any damage during construction of roadway and water main.	Kinder Morgan
Sta. 107+67	Oil pipeline	Contractor to be aware of utility and shall protect against any damage during construction of roadway and storm sewers.	Enbridge
Sta. 106+90, Lt	8" natural gas pipeline	Contractor to be aware of utility and shall protect against any damage during construction of roadway and storm sewers.	ONEOK

Stage 7 – No utilities to watch and protect

Stage 8

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
Sta. 100+50, Sta. 100+77, and Sta. 101+00	Natural gas pipelines (36", 36" and 20" dia.)	Contractor to be aware of utility and shall protect against any damage during construction of roadway and water main.	Kinder Morgan
Sta. 107+67	Oil pipeline	Contractor to be aware of utility and shall protect against any damage during construction of roadway.	Enbridge
Sta. 106+90, Lt	8" natural gas pipeline	Contractor to be aware of utility and shall protect against any damage during construction of roadway and storm sewers.	ONEOK

Stage 9 – No utilities to watch and protect

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
Adesta	Aaron Rydell	630-962-7139	Aaron.Rydell@aus.com
AT&T	Daniel Bluhm	630-573-5705	db3492@att.com
Comcast	Martha Gieras	773-851-8613	Martha_gieras@comcast.com
ComEd	Cassie Evans	773-241-0741	Cassie.evans@comed.com
ComEd (Transmission)	John Mishevski	630-437-2215	John.Mishevski@comed.com
Crown Castle	Mike Kyriazakos	630-480-5203	Mike.Kyriazakos@crowncastle.com
City of Naperville – DPU Electric	Ron Ritter	630-420-4183	RitterR@naperville.il.us
City of Naperville – DPU Water	Joshua Strait	630-305-5373	StraitJ@naperville.il.us
Enbridge	Kelly Khuu	403-718-3423	kelly.khuu@enbridge.com
Kinder Morgan	Mark Cavazos	713-420-4363	Mark_Cavazos@kindermorgan.com
Nicor	Charles “Chip” Parrott	630-388-3319	cparrot@southernco.com
ONEOK	Kalli Ritterbush	405-638-5692	kalli.ritterbush@oneok.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.

The contractor is responsible for contacting JULIE (or DIGGER within the City of Chicago) prior to any excavation work. Please note that IDOT electrical facilities are not part of the one-call locating services, such as JULIE or DIGGER.

If the contract requires the services of an electrical contractor, it is the contractor's responsibility, at their own expense, to locate existing IDOT electrical facilities before commencing work. For contracts that do not require an electrical contractor, the contractor may request one free locate of IDOT electrical facilities by contacting the Department's Electrical Maintenance Contractor. Additional locate requests will be at the contractor's expense.

The Department's Electrical Maintenance Contractor must be notified at least 72 hours in advance of the work by calling 773-287-7600 or emailing dispatch@meade100.com to arrange for the locating of underground electrical facilities.

Please note, the marking of underground facilities does not absolve the contractor of their responsibility to repair or replace any facilities damaged during construction at their expense.

COOPERATION WITH OTHER CONTRACTORS

The Contractor must coordinate his/her operations with other Contractors who will be performing utility adjustment and railroad work related to the project. Contractors include, but is not limited to:

Enbridge, Inc for the adjustment of the 34" pipeline near Station 107+45. The pipeline will be adjusted by Contractors for Enbridge, Inc. in April 2026.

ComEd Transmission for the relocation of the transmission pole on the north side of North Aurora Road at Station 106+83. The transmission pole is anticipated to be replaced by Contractors for ComEd Transmission in September 2025.

ONEOK for the replacement of the 8" pipeline near Station 106+88. It is anticipated that the pipeline will be adjusted by Contractors for ONEOK after the above ComEd Transmission pole relocation work is completed.

Kinder Morgan for the relocation or adjustment of their above ground markers, sacrificial anodes and test leads. The Contractor shall assist Kinder Morgan, if requested, by providing excavation support for this relocation, which will be paid for under Article 109.04 of the Standard Specifications.

WCL and BNSF forces and their Contractors to perform trackwork, railroad signal equipment, and other items of work included by railroad force account.

PUBLIC CONVENIENCE AND SAFETY (D1)

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, and 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.”

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, 701006-05, 701011-04, 701101-05, 701206-05, 701301-04, 701311-03, 701427-05, 701501-06, 701502-09, 701601-09, 701602-10, 701701-10, 701801-06, 701901-10

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

SPECIAL PROVISIONS:

Traffic Control Plan (D1)
Maintenance of Roadways (D1)
Public Convenience and Safety (D1)
Temporary Information Signing
Traffic Control and Protection (Arterials) (D1)
Pavement and Shoulder Resurfacing (Recurring CS #13)
Temporary Pavement (D1)
Temporary Traffic Signal Timing (D1)
Vehicle and Equipment Warning Lights (BDE)
Work Zone Traffic Control Devices (BDE)
Work Zone Traffic Control Surveillance (LRS 3)

WATER FOR CONSTRUCTION PURPOSES

City water for construction purposes will be available at the Contractor's cost according to the rate in effect at the time of usage. The Contractor will use water only from a location as agreed to by the Water and Waste Water Department. If approved, the procedure for securing the city meter is:

In Naperville, the Contractor shall go to:

Water and Waste Water Department
North Operating Center
(N.O.C.) 420-6137
1200 W. Ogden Ave.
Naperville, IL 60566-7020

The Contractor shall apply to Water and Waste Water Department for usage of a water meter in accordance with Department regulations. The contractor shall pay all required deposits, fees, and rentals as determined by the Water Department.

In Aurora, the Contractor shall secure a city water meter by presenting a deposit for \$1,600.00 in the form of a certified check made out to The City of Aurora to the Water Billing Department on the First Floor of 44 E. Downer Place, Aurora, Illinois. The name of the Contractor and their Tax ID number will be required. The Contractor will take the resulting forms to the Water & Sewer Maintenance Division located at 649 S. River Street where the city water meter shall be provided. The Contractor and/or sub-contractor will be fined, according to ordinance, which will be deducted from moneys due, for each unauthorized use of City water regardless of the amount of water used or the reason for unauthorized use.

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 October 1 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.

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.

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.

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.

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 coarse 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:

Upon construction of the temporary access, sixty percent of the contract unit price per each, of the type constructed, will be paid.

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.”

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.

EMBANKMENT I (D1)

Effective: March 1, 2011

Revised: November 1, 2013

Description. This work shall be according to Section 205 of the Standard Specifications except for the following.

Material. All material shall be approved by the District Geotechnical Engineer. The proposed material must meet the following requirements.

- a) The laboratory Standard Dry Density shall be a minimum of 90 lb/cu ft (1450 kg/cu m) when determined according to AASHTO T 99 (Method C).
- b) The organic content shall be less than ten percent determined according to AASHTO T 194 (Wet Combustion).
- c) Soils which demonstrate the following properties shall be restricted to the interior of the embankment and shall be covered on both the sides and top of the embankment by a minimum of 3 ft (900 mm) of soil not considered detrimental in terms of erosion potential or excess volume change.
 - 1) A grain size distribution with less than 35 percent passing the number 75 um (#200) sieve.
 - 2) A plasticity index (PI) of less than 12.
 - 3) A liquid limit (LL) in excess of 50.
- d) Reclaimed asphalt shall not be used within the ground water table or as a fill if ground water is present.
- e) The RAP used shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications". Gradation deleterious count shall not exceed 10% of total RAP and 5% of other by total weight.

CONSTRUCTION REQUIREMENTS

Samples. Embankment material shall be sampled, tested, and approved before use. The contractor shall identify embankment sources, and provide equipment as the Engineer requires, for the collection of samples from those sources. Samples will be furnished to the Geotechnical Engineer a minimum of three weeks prior to use in order that laboratory tests for approval and compaction can be performed. Embankment material placement cannot begin until tests are completed and approval given.

Placing Material. In addition to Article 202.03, broken concrete, reclaimed asphalt with no expansive aggregate, or uncontaminated dirt and sand generated from construction or

demolition activities shall be placed in 6 inches (150 mm) lifts and disked with the underlying lift until a uniform homogenous material is formed. This process also applies to the overlaying lifts. The disk must have a minimum blade diameter of 24 inches (600 mm).

When embankments are to be constructed on hillsides or existing slopes that are steeper than 3H:1V, steps shall be keyed into the existing slope by stepping and benching as shown in the plans or as directed by the engineer.

Compaction. Soils classification for moisture content control will be determined by the Soils Inspector using visual field examination techniques and the IDH Textural Classification Chart.

When tested for density in place each lift shall have a maximum moisture content as follows.

- a) A maximum of 110 percent of the optimum moisture for all forms of clay soils.
- b) A maximum of 105 percent of the optimum moisture for all forms of clay loam soils.

Stability. The requirement for embankment stability in Article 205.04 will be measured with a Dynamic Cone Penetrometer (DCP) according to the test method in the IDOT Geotechnical Manual. The penetration rate must be equal or less than 1.5 inches (38 mm) per blow.

Basis of Payment. This work will not be paid separately but will be considered as included in the various items of excavation.

FRICITION 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>	
		<u>Up to...</u>	<u>With...</u>
		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."

HOT-MIX ASPHALT BINDER AND SURFACE COURSE (D1)

Effective: November 1, 2019

Revised: January 1, 2025

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 Standard 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 N_{design} = 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.”

Revise the first and second paragraphs of Articles 1030.06(c)(2) of the Standard Specifications to read:

- “(2) Personnel. The Contractor shall provide a QC Manager who shall have overall responsibility and authority for quality control. This individual shall maintain active certification as a Hot-Mix Asphalt Level II technician.

In addition to the QC Manager, the Contractor shall provide sufficient personnel to perform the required visual inspections, sampling, testing, and documentation in a timely manner. Mix designs shall be developed by personnel with an active certification as a Hot-Mix Asphalt Level III technician. Technicians performing mix design testing and plant sampling/testing shall maintain active certification as a Hot-Mix Asphalt Level I technician. The Contractor may provide a technician trainee who has successfully completed the Department's "Hot-Mix Asphalt Trainee Course" to assist in the activities completed by a Hot-Mix Asphalt Level I technician for a period of one year after the course completion date. The Contractor may also provide a Gradation Technician who has successfully completed the Department's "Gradation Technician Course" to run gradation tests only under the supervision of a Hot-Mix Asphalt Level II Technician. The Contractor shall provide a Hot-Mix Asphalt Density Tester who has successfully completed the Department's "Nuclear Density Testing" course to run all nuclear density tests on the job site.”

Add Article 1030.06(d)(3) to the Standard Specifications to read:

- “(3) The Contractor shall take possession of any Department unused backup or dispute resolution HMA mixture samples or density specimens upon notification by the Engineer. The Contractor shall collect the HMA mixture samples or density specimens from the location designated by the Engineer. The HMA mixture samples or density specimens may be added to RAP stockpiles according to Section 1031.”

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 (Gmm) will be based on the running average of four available Department test results for that project. If less than four Gmm test results are available, an average of all available Department test results for that project will be used. The initial Gmm 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 Gmm.”

Revise the following table and notes in Article 1030.09 (c) of the Standard Specifications to read:

CONTROL LIMITS						
Parameter	IL-19.0, IL-9.5, IL-9.5FG, IL-19.0L, IL-9.5L		SMA-12.5, SMA-9.5		IL-4.75	
	Individual Test	Moving Avg. of 4	Individual Test	Moving Avg. of 4	Individual Test	Moving Avg. of 4
% Passing: ^{1/}						
1/2 in. (12.5 mm)	± 6 %	± 4 %	± 6 %	± 4 %		
3/8 in. (9.5mm)			± 4 %	± 3 %		
# 4 (4.75 mm)	± 5 %	± 4 %	± 5 %	± 4 %		
# 8 (2.36 mm)	± 5 %	± 3 %	± 4 %	± 2 %		
# 16 (1.18 mm)			± 4 %	± 2 %	± 4 %	± 3 %
# 30 (600 µm)	± 4 %	± 2.5 %	± 4 %	± 2.5 %		
Total Dust Content # 200 (75 µm)	± 1.5 %	± 1.0 %			± 1.5 %	± 1.0 %
Asphalt Binder Content	± 0.3 %	± 0.2 %	± 0.2 %	± 0.1 %	± 0.3 %	± 0.2 %
Air Voids ^{2/}	± 1.2 %	± 1.0 %	± 1.2 %	± 1.0 %	± 1.2 %	± 1.0 %
Field VMA ^{3/}	-0.7 %	-0.5 %	-0.7 %	-0.5 %	-0.7 %	-0.5 %

1/ Based on washed ignition oven or solvent extraction gradation.

2/ The air voids target shall be a value equal to or between 3.2 % and 4.8 %.

3/ Allowable limit below minimum design VMA requirement.

Revise Article 1030.09(g)(2) of the Standard Specifications to read:

“(2)The Contractor shall complete split verification sample tests listed in the Limits of Precision table in Article 1030.09(h)(1).”

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 (Gmm) will be the Department mix design verification test result.”

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 fourth 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.”

HOT-MIX-ASPHALT – ECHELON PAVING

This work shall consist of placing hot-mix-asphalt (HMA) surface course by means of an echelon paving operation (also known as the “Concurrent Double-Lane Paving Method”), in which the HMA surface course is placed from the outside edge of pavement to the centerline of pavement (or to the inside edge of pavement where a flush or raised median is present). Work shall be according to Section 406 of the Standard Specifications and relevant project Special Provisions, except as modified herein.

The Contractor shall use Echelon Paving for paving the surface course for the two thru lanes in each direction so that there is a hot joint. If the Contractor would like to use rapid cure tack coat as an option due to the time restrictions with Echelon Paving to meet the contract requirements, it can be used but will be included in the cost of the regular tack coat.

Equipment. The Contractor shall supply two (2) spreading and finishing machines, and two (2) complete sets of rollers. The Contractor shall utilize a sufficient quantity of trucks to deliver HMA material so that the echelon paving operation is not impeded.

Placing. The HMA shall be placed with two (2) spreading and finishing machines, operating concurrently in echelon (side-by-side with one paver slightly leading the other), to the typical section and grade shown on the plans or as established by the engineer. The Contractor is required to use a paver ski when placing bituminous lifts.

In no case shall the distance between the two (2) spreading and finishing machines exceed two hundred feet (200') as measured from the rear of the lead paver to the rear of the trailing paver, so as not to permit cooling of the longitudinal joint between the two lanes.

The HMA shall be placed first in the lane nearest the outside curb by the lead paver. HMA shall then be placed by the trailing paver between the unconfined edge of the first mat to the edge of the flush median.

Construction Joints. The trailing paver shall use a joint matching shoe to match the undisturbed mat laid by the lead paver, when placing the mixture in the adjacent lane. The distance that the screed and end gate of the trailing paver shall extend over the adjacent uncompacted mixture shall be one to two inches (1"-2"). The inside end gate of the trailing paver shall be set at the same level as the bottom of the screed plate on the lead paver. No raking of the joint shall occur. The paving width shall be such that the final pavement markings will be offset from the paving joint at the lane line and/or centerline by a minimum of six inches (6").

The unconfined longitudinal joint at the edge of flush median shall be according to the project special provision, SECTION 406 HOT-MIX ASPHALT BINDER AND SURFACE COURSE.

Traffic Control. Traffic control for this work shall be according to the project special provision, TRAFFIC CONTROL PLAN and also meet the following requirements. Flaggers shall be placed at all signalized intersections at which traffic is crossed over to the opposite side of the road. Changeable Message Signs shall be erected one week prior to echelon paving operations.

Basis of Payment. This work will not be paid for separately but shall be included in the contract unit price for HMA SURFACE COURSE, of the type and thickness specified.

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.

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.

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES (CONTRACT 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 1: North Aurora Road

- Station 110+23 to Station 110+61, from 60 feet LT to 60 feet RT. Based on IDOT requirements, the Engineer has preliminarily determined this material meets the criteria of and shall be managed in accordance with Article 669.05(b)(1): *“Based on the pH levels that exceeded the MAC in the soil at SB-102 (3-5) an exclusion zone has been established around these boring. The soil generated from these areas are **NOT** certified for CCDD and are considered to be 669.05 (b)(1) soils, which may be utilized within the construction limits or managed and disposed of off-site as “uncontaminated soil” according to Article 202.03. However, the excavated soil cannot be taken to a CCDD facility or uncontaminated soil fill operation.”*

Site 2: North Aurora Road

- Station 108+65 to Station 109+01, from centerline to 60 feet RT. Based on IDOT requirements, the Engineer has preliminarily determined this material meets the criteria of and shall be managed in accordance with Article 669.09(a)(5): *“Soils within the areas characterized by SB-103 (3-5) are considered to be (a)(5) soils per Article 669.05 of IDOT Standard Specifications for Road and Bridge Construction, which must be managed and disposed of off-site as non-special waste or special waste.*

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:

None

Additional information on the above sites is available through the City of Naperville. Soil samples or analysis without the approval of the Engineer will be at no additional cost to the Department.

PROTECTION OF EXISTING TREES

The Contractor shall be responsible for taking measures to minimize damage to the tree limbs, tree trunks, and tree roots at each work site. All such measures shall be included in the contract price for other work except that payment will be made for TEMPORARY FENCE, TREE ROOT PRUNING, and TREE PRUNING.

All work, materials and equipment shall conform to Section 201 and 1081 of the Standard Specifications except as modified herein.

A. Earth Saw Cut of Tree Roots (Root Pruning):

1. Whenever proposed excavation falls within a drip-line of a tree, the Contractor shall:
 - a. Root prune 6-inches behind and parallel to the proposed edge of trench a neat, clean vertical cut to a minimum depth directed by the Engineer through all affected tree roots.
 - b. Root prune to a maximum width of 4-inches using a "Vermeer" wheel, or other similar machine. Trenching machines will not be permitted.
 - c. Exercise care not to cut any existing utilities.
 - d. If during construction it becomes necessary to expose tree roots which have not been pre-cut, the Engineer shall be notified and the Contractor shall provide a clean, vertical cut at the proper root location, nearer the tree trunk, as necessary, by means of hand-digging and trimming with chain saw or hand saw. Ripping, shredding, shearing, chopping or tearing will not be permitted.
 - e. Top Pruning: When thirty percent (30%) or more of the root zone is pruned, an equivalent amount of the top vegetative growth or the plant material shall be pruned off within one (1) week following root pruning.

2. Whenever curb and gutter is removed for replacement, or excavation for removal of or construction of a structure is within the drip line/root zone of a tree, the Contractor shall:
 - a. Root prune 6-inches behind the curbing so as to neatly cut the tree roots.
 - b. Depth of cut shall be 12 inches for curb removal and replacement and 24 inches for structural work. Any roots encountered at a greater depth shall be neatly saw cut at no additional cost.
 - c. Locations where earth saw cutting of tree roots is required will be marked in the field by the Engineer.
3. All root pruning work is to be performed through the services of a licensed arborist to be approved by the Engineer.

Root pruning will be paid for at the contract unit price each for TREE ROOT PRUNING, which price shall be payment for all labor, materials and equipment.

Tree limb pruning will be paid for at the contract unit price per each for TREE PRUNING (1 TO 10 INCH DIAMETER) and/or TREE PRUNING (OVER 10 INCH DIAMETER), which price shall included labor, materials, and equipment.

B. Temporary Fence:

1. The Contractor shall erect a temporary fence around all trees within the construction area to establish a "tree protection zone" before any work begins or any material is delivered to the jobsite. No work is to be performed (other than root pruning), materials stored or vehicles driven or parked within the "tree protection zone".
2. The exact location and establishment of the "tree protection zone" fence shall be approved by the Engineer prior to setting the fence.
3. The fence shall be erected on three sides of the tree at the drip-line of the tree or as determined by the Engineer.
4. All work within the "tree protection zone" shall have the Engineer's prior approval. All slopes and other areas not regarded should be avoided so that unnecessary damage is not done to the existing turf, tree root system ground cover.
5. The grade within the "tree protection zone" shall not be changed unless approved by the Engineer prior to making said changes or performing the work.

The fence shall be similar to wood lath snow fence (48 inches high), plastic poly-type or and other type of highly visible barrier approved by the Engineer. This fence shall be properly maintained and shall remain up until final restoration, unless the Engineer directs removal

otherwise. Tree fence shall be supported using T-Post style fence posts. Utilizing re-bar as a fence post will not be permitted.

Temporary fence will be paid for at the contract unit price per foot for TEMPORARY FENCE, which price shall include furnishing, installing, maintaining, and removing.

C. Tree Limb Pruning:

1. The Contractor shall inspect the work site in advance and arrange with the Roadside Development Unit (847.705.4171) to have any tree limbs pruned that might be damaged by equipment operations at least one week prior to the start of construction. Any tree limbs that are broken by construction equipment after the initial pruning must be pruned correctly within 72 hours.
2. Top Pruning: When thirty percent (30%) or more of the root zone of a tree is pruned, an equivalent amount of the top vegetative growth or the plant material shall be pruned off within one (1) week following root pruning.

Tree limb pruning will be paid for at the contract unit price per each for TREE PRUNING (1 TO 10 INCH DIAMETER) and/or TREE PRUNING (OVER 10 INCH DIAMETER), which price shall include labor, materials, and equipment.

D. Removal of Driveway Pavement and Sidewalk:

1. In order to minimize the potential damage to the tree root system(s), the Contractor will not be allowed to operate any construction equipment or machinery within the "tree protection zone" located between the curb or edge of pavement and the right-of-way property line.
2. Sidewalk to be removed in the areas adjacent to the "tree protection zones" shall be removed with equipment operated from the street pavement. Removal equipment shall be Gradall (or similar method), or by hand or a combination of these methods. The method of removal shall be approved by the Engineer prior to commencing any work.
3. Any pavement or pavement related work that is removed shall be immediately disposed of from the area and shall not be stockpiled or stored within the parkway area under any circumstances.

E. Backfilling:

1. Prior to placing the topsoil and/or sod, in areas outside the protection zone, the existing ground shall be disked to a depth no greater than one (1"), unless otherwise directed by the Engineer. No grading will be allowed within the drip-line of any tree unless directed by the Engineer.

F. Damages:

1. In the event that a tree not scheduled for removal is injured such that potential irreparable damage may ensue, as determined by the Roadside Development

Unit, the Contractor shall be required to remove the damage tree and replace it on a three to one (3:1) basis, at his own expense. The Roadside Development Unit will select replacement trees from the pay items already established in the contract.

2. The Contractor shall place extreme importance upon the protection and care of trees and shrubs which are to remain during all times of this improvement. It is of paramount importance that the trees and shrubs which are to remain are adequately protected by the Contractor and made safe from harm and potential damage from the operations and construction of this improvement. If the Contractor is found to be in violation of storage or operations within the "tree protection zone" or construction activities not approved by the Engineer, a penalty shall be levied against the Contractor with the monies being deducted from the contract. The amount of the penalty shall be two hundred fifty dollars (\$250.00) per occurrence per day.

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.

SEEDING, CLASS 4A (MODIFIED) – LOW PROFILE NATIVE GRASS

This work shall consist of seeding Class 4A (Modified) in areas as shown in the plans or as directed by the Engineer.

All work, materials, and equipment shall conform to Sections 250 and 1081 of the Standard Specifications except as modified herein.

The Class 4A (Modified) seed mixture shall be supplied in separate bags of the two mixture components: Temporary Cover and Permanent Grasses. All native species will be local genotype and verified that original seed collection source will be from a radius of 150 miles from the project site. Fertilizer is not required.

Article 250.07 Seeding Mixtures – Delete sentence 4. Delete the following from Table 1 – Seeding Mixtures:

Perennial Ryegrass

Article 250.09 – Add Seeding, Class 4A (Modified)

Article 250.10 – Add Seeding, Class 4A (Modified)

PLANTING WOODY PLANTS

This work shall consist of planting woody plants as specified in Section 253 of the Standard Specifications with the following revisions:

Delete Article 253.03 Planting Time and substitute the following:

Spring Planting. This work shall be performed between March 15th and May 31st except that evergreen planting shall be performed between March 15th and April 30th in the northern zone.

Add the following to Article 253.03 (a) (2) and (b):

All plants shall be obtained from Illinois Nurserymen's Association or appropriate state chapter nurseries. All trees and shrubs shall be dug prior to leafing out (bud break) in the spring or when plants have gone dormant in the fall, except for the following species which are only to be dug prior to leafing out in the spring:

- Maple (*Acer* spp.)
- Buckeye (*Aesculus* spp.)
- Serviceberry (*Amelanchier* spp.)
- Birch (*Betulus* spp.)
- American Hornbeam (*Carpinus caroliniana*)
- Hickory (*Carya* spp.)
- Hackberry (*Celtis occidentalis*)
- Eastern Redbud (*Cercis canadensis*)
- Hawthorn (*Crataegus* spp.)
- Walnut (*Juglans* spp.)
- Tuliptree (*Liriodendron* spp.)
- Crabapple (*Malus* spp.)
- Black Tupelo (*Nyssa sylvatica*)
- American Hophornbeam (*Ostrya virginiana*)
- Oak (*Quercus* spp.)
- Sassafras (*Sassafras albidum*)
- Baldcypress (*Taxodium distichum*)
- American Linden (*Tilia americana*)

Fall Planting. This work shall be performed between October 1 and November 30 except that evergreen planting shall be performed between August 15 and October 15.

Planting dates are dependent on species of plant material and weather. Planting might begin or end prior or after above dates as approved by the Engineer. Do not plant when soil is muddy or during frost.

Add the following to Article 253.05 Transportation:

Cover plants during transport to prevent desiccation. Plant material transported without cover shall be automatically rejected. During loading and unloading, plants shall be handled such that stems are not stressed, scraped or broken and that root balls are kept intact.

Delete the third sentence of Article 253.07 and substitute the following:

Trees must be installed first to establish proper layout and to avoid damage to other plantings such as shrubs and perennials.

The Contractor shall be responsible for all plant layout. The layout must be performed by qualified personnel. The planting locations must be laid out as shown in the landscape plan. This will require the use of an engineer's scale to determine some dimensions. Tree locations within each planting area shall be marked with a different color stake/flag and labeled to denote the different tree species. Shrub beds limits must be painted.

All utilities shall have been marked prior to contacting the Roadside Development Unit. The Engineer will contact the Roadside Development Unit at (847) 705-4171 to approve the layout prior to installation. Allow a minimum of seven (7) working days prior to installation for approval.

Delete the first paragraph to Article 253.08 Excavation of Plant Holes and substitute with the following:

Protect structures, utilities, sidewalks, bicycle paths, knee walls, fences, pavements, utility boxes, other facilities, lawns and existing plants from damage caused by planting operations. Excavation of the planting hole may be performed by hand, machine excavator, or auger.

The excavated material shall not be stockpiled on turf, in ditches, or used to create enormous water saucer berms around newly installed trees or shrubs. Remove all excess excavated subsoil from the site and dispose as specified in Article 202.03.

Delete the second sentence of Article 253.08 Excavation of Plant Holes (a) and the third paragraph of Article 253.08(b) and substitute with the following:

Excavation of planting hole width. Planting holes for trees, shrubs, and vines shall be three times the diameter of the root mass and with 45-degree sides sloping down to the base of the root mass to encourage rapid root growth. Roots can become deformed by the edge of the hole if the hole is too small and will hinder root growth.

Planting holes dug with an auger shall have the sides cut down with a shovel to eliminate the glazed, smooth sides and create sloping sides.

Excavation of planting hole depth. The root flare shall be visible at the top of the root mass. If the trunk flare is not visible, carefully remove soil from around the trunk until the root flare is

visible without damaging the roots. Remove excess soil until the top of the root mass exposes the root collar.

The root flare shall always be slightly above the surface of the surrounding soil. The depth of the hole shall be equal to the depth of the root mass minus 1 inch allowing the tree or shrub to sit 1 inch higher than the surrounding soil surface for trees that have a 1-inch caliper or smaller. The depth of the hole shall be equal to the depth of the root mass minus 2 inches allowing the tree or shrub to sit 2 inches higher than the surrounding soil surface for trees that have a 2-inch caliper or larger.

For stability, the root mass shall sit on existing undisturbed soil. If the hole was inadvertently dug too deep, backfill and recompact the soil to the correct depth.

Excavation of planting hole on slopes. Excavate away the slope above the planting hole to create a flattened area uphill of the planting hole to prevent the uphill roots from being buried too deep. Place the excess soil on the downslope of the planting hole to extend the planting shelf to ensure roots on the downhill side of the tree remain buried. The planting hole shall be three times the diameter of the root mass and saucer shaped. The hole may be a bit elongated to fit the contour of the slope as opposed to the typical round hole on flat ground.

Add backfill to create a small berm on the downhill portion of the planting shelf to trap water and encourage movement into the soil to increase water filtration around the tree. Smooth out the slope above the plant where you have cut into the soil so the old slope and the new slope transition together smoothly.

Add the following to Article 253.08 Excavation of Plant Holes (b):

When planting shrubs in shrub beds as shown on the plans or as directed by the Engineer, spade a planting bed edge at approximately a 45-degree angle and to a depth of approximately 3-inches around the perimeter of the shrub bed prior to placement of the mulch. Remove any debris created in the spade edging process and dispose of as specified in Article 202.03.

Delete Article 253.09 (b) Pruning and substitute with the following:

Deciduous Shrubs. Shrubs shall be pruned to remove dead, conflicting, or broken branches and shall preserve the natural form of the shrub.

Delete the third and fourth paragraphs of Article 253.10 Planting Procedures and Article 253.10 (a) and substitute the following:

Approved watering equipment shall be at the site of the work and in operational condition PRIOR TO STARTING the planting operation and DURING all planting operations OR PLANTING WILL NOT BE ALLOWED.

All plants shall be placed in a plumb position and avoid the appearance of leaning. Confirm the tree is straight from two directions prior to backfilling.

Before the plant is placed in the hole, any paper or cardboard trunk wrap shall be removed. Check that the trunk is not damaged. Any soil covering the tree's root flare shall be removed to expose the crown prior to planting.

Check the depth of the root ball in the planting hole. With the root flare exposed, one-inch caliper trees shall be set one inch higher than the surrounding soil and two-inch and larger caliper trees shall be set two inches higher than the surrounding soil. The root flare shall always be slightly above the surface of the surrounding soil. For stability, the root ball shall sit on existing undisturbed soil. If the hole was inadvertently dug too deep, backfill and recompact the soil to the correct depth.

After the plant is placed in the hole, all cords and burlap shall be removed from the trunk. Remove the wire basket from the top three quarters (3/4) of the root ball. The remaining burlap shall be loosened and scored to provide the root system quick contact with the soil. All ropes or twine shall be removed from the root ball and tree trunk. All materials shall be disposed of properly.

The plant hole shall be backfilled with the same soil that was removed from the hole. Clay soil clumps shall be broken up as much as possible. Where rocks, gravel, heavy clay or other debris are encountered, clean top soil shall be used. Do not backfill excavation with subsoil.

The hole shall be 1/3 filled with soil and firmly packed to assure the plant remains in plumb, then saturated with water. After the water has soaked in, complete the remaining backfill in 8" lifts, tamping the topsoil to eliminate voids, and then the hole shall be saturated again. Maintain plumb during backfilling. Backfill to the edge of the root mass and do not place any soil on top of the root mass. Visible root flare shall be left exposed, uncovered by the addition of soil.

Add the following to Article 253.10 (b):

After removal of the container, inspect the root system for circling, matted or crowded roots at the container sides and bottom. Using a sharp knife or hand pruners, prune, cut, and loosen any parts of the root system requiring corrective action.

Delete the first sentence of Article 253.10(e) and substitute with the following:

Water Saucer. All plants placed individually and not specified to be bedded with other plants, shall have a water saucer constructed of soil by mounding up the soil 4-inches high x 8-inches wide outside the edge of the planting hole.

Delete Article 253.11 and substitute the following:

Individual trees, shrubs, shrub beds, and vines shall be mulched within 48 hours after being planted. No weed barrier fabric will be required for tree and shrub plantings. Pre-emergent Herbicide will be used instead of weed barrier fabric. The Pre-emergent Herbicide shall be applied prior to mulching. See specification for Weed Control, Pre-Emergent Granular Herbicide.

The mulch shall consist of wood chips or shredded tree bark not to exceed two (2) inches in its largest dimension, free of foreign matter, sticks, stones, and clods. Mulch shall be aged in stockpiles for a minimum of four (4) months where interior temperatures reach a minimum of 140-degrees. The mulch shall be free from inorganic materials, contaminants, fuels, invasive weed seeds, disease, harmful insects such as emerald ash borer or any other type of material detrimental to plant growth. A sample must be supplied to the Roadside Development Unit for

approval prior to performing any work. Allow a minimum of seven (7) working days prior to installation for approval.

Mulch shall be applied at a depth of 4-inches around all plants within the entire mulched bed area or around each individual tree forming a minimum 6-foot diameter mulch ring around each tree. An excess of 4-inches of mulch is unacceptable and excess shall be removed. Mulch shall not be tapered so that no mulch shall be placed within 6-inches of the shrub base or trunk to allow the root flare to be exposed and shall be free of mulch contact.

Care shall be taken not to bury leaves, stems, or vines under mulch material. All finished mulch areas shall be left smooth and level to maintain uniform surface and appearance. After the mulch placement, any debris or piles of material shall be immediately removed from the right of way, including raking excess mulch out of turf areas in accordance with Article 202.03.

Delete Article 253.12 Wrapping and substitute the following:

Within 48 hours after planting, screen mesh shall be wrapped around the trunk of all deciduous trees with a caliper of 1-inch or greater. Multi-stem or clump form trees, with individual stems having a caliper of 1-inch or greater, shall have each stem wrapped separately. The screen mesh shall be secured to itself with staples or single wire strands tied to the mesh. Trees shall be wrapped at time of planting, before the installation of mulch. The lower edge of the screen wire shall be in continuous contact with the ground and shall extend up to a minimum of 36-inches or to the lowest major branch, whichever is less. Replacement plantings shall not be wrapped.

Delete Article 253.13 Bracing and substitute with the following:

Unless otherwise specified by the Engineer, within 48 hours after planting all deciduous and evergreen trees, with the exception of multi-stem or clump form specimens, over 8-feet in height shall require three 6-foot long steel posts so placed that they are equidistant from each other and adjacent to the outside of the ball. The posts shall be driven vertically to a depth of 18-inches below the bottom of the hole. The anchor plate shall be aligned perpendicular to a line between the tree and the post. The tree shall be firmly attached to each post with a double guy of 14-gauge steel wire. The portion of the wire in contact with the tree shall be encased in a hose of a type and length approved by the Engineer.

During the life of the contract, within 72 hours the Contractor shall straighten any tree that deviates from a plumb position. The Contractor shall adjust backfill compaction and install or adjust bracing on the tree as necessary to maintain a plumb position. Replacement trees shall not be braced.

Delete the second sentence of the first paragraph of Article 253.14 Period of Establishment and substitute the following:

This period shall begin in April and end in November of the same year.

Delete the first paragraph of Article 253.15 Plant Care and substitute the following:

From planting until final acceptance of planting, the Contractor shall properly care for all plants including watering, weeding, adjusting braces, repairing water saucers, spraying insect infected plants, or other work which is necessary to maintain the health, vigor and satisfactory appearance of the plantings. The Contractor shall provide plant care a minimum of every two weeks, or within three days following notification by the Engineer. Water shall be applied at a reasonable velocity and distance such as to cause no harm to the plant or displacement of mulch or soil. All requirements for plant care shall be considered as included in the cost of the contract.

Delete the first paragraph of Article 253.15 Plant Care (a) and substitute with the following:

During plant care watering shall be performed at least every two weeks during the months of April through November. The Contractor shall apply a minimum of 35 gallons of water per tree, 25 gallons per large shrub, 15 gallons per small shrub, and 4 gallons per vine. The Engineer may direct the Contractor to adjust the watering rate and frequency depending upon weather conditions.

Add the following to Article 253.15 Plant Care (c):

The contractor shall correct any vine growing across the ground plane that should be growing up desired vertical element (noise wall, retaining wall, fence, knee wall, etc.). Work may include but is not limited to carefully weaving vines through fence and/or taping vines to vertical elements.

Add the following to Article 253.15 Plant Care (d):

The contractor shall inspect all trees, shrubs, and vines for pests and diseases at least every two weeks during the months of initial planting through final acceptance. Contractor must identify and monitor pest and diseases and determine action required to maintain the good appearance, health and, top performance of all plant material. Contractor shall notify the Engineer with their inspection findings and recommendations within twenty-four hours of findings. The recommendations for action by the Contractor must be reviewed and by the Engineer for approval/rejection. All approved corrective activities will be considered as included in the cost of the contract and shall be performed within 48 hours following notification by the Engineer.

Delete Article 253.16 Method of Measurement and substitute with the following:

Trees, shrubs, evergreens, vines, and seedlings will be measured as each individual plant.

- (a) This work will be measured for initial payment, in place, for plant material found to be in live and healthy condition by June 1.
- (b) This work will be measured for final payment, in place, for plant material found to be in live and healthy condition upon final acceptance by the department.
- (c) Pre-emergent Herbicide will be measured for payment as specified in Weed Control, Pre-emergent Granular Herbicide.

Delete Article 253.17 Basis of Payment and substitute the following:

This work will be paid for at the contract unit price per each for TREES, SHRUBS, EVERGREENS, or VINES, of the species, root type, and plant size specified; and per unit for SEEDLINGS. The unit price shall include the cost of all materials, equipment, labor, plant care, and disposal required to complete the work as specified herein and to the satisfaction of the Engineer. Payment will be made according to the following schedule.

- (a) Initial Payment. Upon completion of planting, mulch covering, wrapping, and bracing, 75 percent of the pay item(s) will be paid.
- (b) Final Payment. After the successful completion of all required replacement plantings, clean-up work and receipt of the "Final Acceptance of Landscape Work" memorandum from the Bureau of Maintenance, or upon execution of a third-party bond, the remaining 25 percent of the pay item(s) will be paid.
- (a) The placement of Pre-emergent Herbicide shall be paid for at the contract unit price for WEED CONTROL, PRE-EMERGENT GRANULAR HERBICIDE.

WEED CONTROL, PRE-EMERGENT GRANULAR HERBICIDE

Description: This work shall consist of spreading a pre-emergent granular herbicide in areas as shown on the plans or as directed by the Engineer. This item will be used in mulched plant beds and mulch rings.

Materials: The pre-emergent granular herbicide shall contain the chemicals Trifluralin 2% active ingredient and Isoxaben with 0.5% active ingredient. The herbicide label shall be submitted to the Engineer for approval at least seventy-two (72) hours prior to application.

Method: The pre-emergent granular herbicide shall be used in accordance with the manufacturer's directions on the package. The granules are to be applied prior to mulching.

Apply the granular herbicide using a drop or rotary-type designed to apply granular herbicide or insecticides. Calibrate application equipment to use according to manufacturer's directions. Check frequently to be sure equipment is working properly and distributing granules uniformly. Do not use spreaders that apply material in narrow concentrated bands. Avoid skips or overlaps as poor weed control or crop injury may occur. More uniform application may be achieved by spreading half of the required amount of product over the area and then applying the remaining half in swaths at right angles to the first. Apply the granular herbicide at the rate of 100 lbs/acre (112 kg/ha) or 2.3 lbs/1000 sq. ft. (11.2 kg/1000 sq. meters).

Method of Measurement: Pre-emergent granular herbicide will be measured in place in Pounds (Kilograms) of Pre-emergent Granular Herbicide applied. Areas treated after mulch placement shall not be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per pound (kilogram) of WEED CONTROL, PRE-EMERGENT GRANULAR HERBICIDE which price shall include all materials, equipment, and labor necessary to complete the work as specified.

GENERAL REQUIREMENTS FOR WEED CONTROL SPRAYING

Experience

The Contractor shall have previous experience with the use of weed control chemicals. He/she shall have had at least three (3) season's experience in ecological restoration and the ability to identify and differentiate between targeted weeds and vegetation to remain. The Contractor shall observe and comply with all sections of the Illinois Custom Spray Law, including licensing. Contractor personnel applying herbicides shall have a valid pesticide applicator license issued by the Illinois Department of Agriculture.

The licensed pesticide applicator shall attend the preconstruction meeting and submit their current license to the Engineer. The licensed pesticide applicator shall be qualified at a minimum in Right-of-Way and Aquatics. The licensed applicator shall work on-site.

Equipment

The equipment used shall consist of a vehicle-mounted tank, pump, spray bar and handgun, plus any other accessories needed to complete the specified work. Spraying shall be done through multiple low-pressure flooding or broad jet nozzles mounted on spray bars operated not more than 36" above the ground. If different sizes or types of nozzles are used to make up the spray pattern, the pressure, sizes and capacities shall be adjusted to provide a uniform rate of application for each segment of the spray pattern. Hand spray guns may be used for spraying areas around traffic control devices, lighting standard and similar inaccessible areas. Maximum speed of the spray vehicle during application of chemical shall be ten (10) miles per hour.

Pumps used shall have a volume and pressure capacity range sufficient to deliver the mixture at a pressure to provide the required coverage and to keep the spray pattern full and steady without pulsation or excessive pressure as to cause fogging. Maximum pressure for application shall be 15 PSI. Quick acting shut-off valves and spring-loaded ball check valves shall be provided to stop the spray pattern with a minimum of nozzle drip. In areas where the spray vehicle must traverse the right-of-way, a four-wheel drive vehicle with flotation tires will be required to minimize damage to the ground surface.

Additional equipment used shall consist of swiping gloves, wicks, wands, hand spray guns and/or backpack sprayers, plus any other accessories needed to complete the specified work as directed by the Engineer. Wick applicators, swiping gloves, or other such devices may be required to ensure herbicides are applied only to target species. If hand spray guns used are attached to spray vehicle, maximum speed of the spray vehicle during application of chemical shall be five (5) miles per hour. In areas where a vehicle is needed to traverse the right-of-way, a four-wheel drive vehicle with flotation tires will be required to minimize damage to the ground surface.

Prior to beginning work, the Contractor shall obtain approval from the Engineer of the spraying equipment proposed for completing this work. The proposed equipment shall be in an operational condition and available for inspection by the Engineer at least two (2) weeks prior to the proposed starting time. If requested by the Engineer, the Contractor shall demonstrate the calibration of the equipment.

The equipment must provide consistently uniform coverage and keep the spray mixture sufficiently agitated or the work will be suspended until the equipment is repaired or replaced.

Spraying Areas

This work includes roadsides and other types of right-of-way of various widths and gradients. Spray areas often extend more than thirty (30) feet from the edge of the roadway, requiring both spray bar and hand gun applications.

When the description of work requires weed control of a stated species, such as teasel, the chemical shall be applied only to locations where the stated species is present. When the description of work requires general weed control within a bed or area, such as broadleaf weed control in turf, then the chemical shall be applied to the entire bed or area.

Exclusion of Spraying Areas

Areas where weed control spraying is inappropriate or detrimental to the environment, desirable planting, or private property shall be excluded from the spray area.

Spraying will not be permitted over any drainage swales or waterways, or other areas where the chemical label prohibits application. Spraying within 150 feet of a natural area or site where endangered or threatened species occur.

Responsibility for Prevention of Damage to Private Property

The Contractor shall, at all times, exercise extreme caution to prevent damage to residential plantings, flower or vegetable gardens, vegetable crops, farm crops, orchard or desirable plants adjacent to the roadside.

The Contractor or Department receives a complaint; the Contractor shall contact a complaint within ten (10) days after receiving a claim for damages, either in person or by letter. The Contractor, or his authorized representative, shall make a personal contact with the complainant within twenty (20) days. The Engineer shall also be notified by the Contractor of all claims for damage he received and shall keep the Engineer informed as to the progress in arriving at a settlement for such claims.

Communication with the Engineer

The Contractor is required to communicate with the Engineer to receive all required approvals in a timely way and to assure that the Engineer can accurately document the work performed.

All herbicide application shall be directly supervised by the Engineer for quality assurance and for payment purposes. If the Contractor performs work without the Engineer's supervision, work will not be paid for.

It shall be the Contractor's responsibility to assure that all chemical containers are opened and added to the spray mixture in the presence of the Engineer.

The Contractor shall obtain approval from the Engineer to proceed with spraying at each location 24 hours prior to the proposed spray operations.

The Contractor's superintendent shall closely coordinate work with the Engineer at all times in accordance with Article 105.06. The superintendent shall attend weekly progress meetings with the Engineer at the Engineer's office or other mutually agreed upon location. The superintendent shall communicate with the Engineer in the field during weed control activities to facilitate accurate completion of work while it is occurring. At the request of the Engineer, the Contractor shall provide a cell phone number where the superintendent can be reached during working hours. The Contractor shall notify the Engineer at least twenty-four (24) hours in advance of either discontinuing or resuming operations.

Pesticide Application Daily Spray Record

The Contractor will be required to properly track pesticide applications as required by the ILG87 Permit. Reported data from this form will be collected and compiled annually and reported to the IEPA as required.

Within 48 hours of the application of pesticides, including but not limited to herbicides, insecticides, algaecides, and fungicides, the Contractor shall complete and return to the Engineer, Operations form "OPER 2720". OPER 2720 may be found at the following link:

<http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/OPER/OPER%202720.docx>

REQUIRED INSPECTION OF WOODY PLANT MATERIAL

Delete Article 1081.01(a)(5) and substitute the following:

The place of growth for all material, and subsequent inspection, must be located within 200 miles of the project.

Delete Article 1081.01(c)(1) and substitute the following:

Inspection of plant material will be made at the nursery by the Engineer, or a duly authorized representative of the Department; all plant material must be in the ground of the nursery supplying the material.

The Contractor shall provide the Engineer a minimum of 50 calendar days advance notice of the plant material to be inspected. Written certification by the Nursery will be required certifying that the plants are true to their species and/or cultivar specified in the plans.

The Department reserves the right to place identification seals on any or all plants selected. No trees shall be delivered without IDOT seal. Plant material not installed within 60 days of initial inspection will be required to be re-inspected.

FAILURE TO COMPLETE PLANT CARE AND ESTABLISHMENT WORK ON TIME

Should the Contractor fail to complete the plant care and/or supplemental watering work within the scheduled time frame as specified in the Special Provision for "Tree Planting" and "Supplemental Watering", or within 24 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 and \$40.00 per shrub/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.

STORM SEWER RELATED WORK

If during construction, the Contractor encounters or otherwise becomes aware of any sewers or underdrains within the right-of-way other than those shown on the plans, he/she shall inform the Engineer who shall direct the work necessary to maintain or replace the facilities in service and to protect them from damage during construction if maintained. Existing facilities to be maintained that are damaged because of non-compliance with this provision shall be replaced at the Contractor's expense. Should the engineer direct the replacement of a facility, the necessary work and payment shall be according to sections 550 and 601, and article 104.02 of the Standard Specifications.

Temporary sheeting or bracing for sewer trenches that may be required shall be the responsibility of the Contractor. At locations where the proposed storm sewer crosses over utilities, a 4" Styrofoam cushion shall be placed under the storm sewer when directed to do so by the Engineer. This work shall be included in the cost of the associated drainage structure or storm sewer of the type, size and class required. No additional compensation will be allowed.

PROPOSED STORM SEWER CONNECTION TO EXISTING MANHOLE

Description. Work shall include the proper proposed storm sewer connection to existing manhole where indicated on the plans. Pipe connections shall follow IDOT District 1 standard BD-7 and include sand bedding, mastic joint sealant, concrete collars, metal binding, or approved method. This pay item shall include all time, materials, and labor to facilitate a watertight connection to the satisfaction of the Engineer.

Method of Measurement. This work will be measured for payment in place as EACH for PROPOSED STORM SEWER CONNECTION TO EXISTING MANHOLE.

Basis of Payment. This work will be paid for as EACH for PROPOSED STORM SEWER CONNECTION TO EXISTING MANHOLE. All materials and labor to make the connection regardless of size of sewer pipe to be connected shall be included in the cost of the item.

MULCH PLACEMENT FOR EXISTING WOODY PLANTS

This work shall be done in accordance with the applicable portion of Section 253.02 (c) and Section 1081.06 (b) of the Standard Specifications for Road and Bridge Construction.

Description: This work shall consist of furnishing, transporting, and spreading an approved shredded hardwood bark mulch to the depth specified in areas as shown in the plans or as directed by the Engineer.

Material: Hardwood bark mulch shall be clean, finely shredded mixed-hardwood bark meeting the following requirements:

- Material shall be free of sticks, leaves, stones, dirt clods, and other debris.
- Individual wood chips shall not exceed 2 inches (50 mm) in the largest dimension.

A mulch sample and request for material inspection must be supplied to the Engineer for approval prior to performing any work 72 hours prior to application.

Method: The grade, depth, and condition of the area must be approved by the Engineer prior to placement.

The Contractor shall remove all weeds, litter and plant debris before mulching. Pre-emergent herbicide, if specified, shall be applied prior to the placement of shredded mulch. The Contractor shall prepare a neatly spaded edge between the landscaped bed and/or tree ring and the turf. The Contractor shall repair the grade by raking and adding topsoil as needed, before mulching.

The shredded mulch shall be placed according at the required depth as specified in the plans for planting trees, shrubs, vines and perennial plants. Care shall be taken not to bury leaves, stems, or vines under mulch material. Mulch shall not be in contact with the base of the trunk.

All finished mulch areas shall be left smooth and level to maintain uniform surface and appearance. After the mulch placement, any debris or piles of material shall be immediately removed from the right of way, including raking excess mulch out of turf areas.

Method of Measurement: Mulch placement will be measured in place to the depth specified in square yards (square meters). Areas not meeting the depth specified shall not be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per square yard (square meter) for MULCH PLACEMENT, of the thickness specified. Payment shall include all costs for materials, equipment and labor required to complete the work specified herein, including the cost of removing and disposing of any debris. Any mulch placement included as part of the work in other work items will not be measured separately for payment. Pre-emergent herbicide, if required, shall be paid for separately.

STUMP REMOVAL

Description. This work shall consist of the removal and satisfactory disposal of tree stumps. All excess chips and debris from this operation shall be removed and disposed of outside the limits of the contract. This work will be done in accordance with Section 201 of the Standard Specifications for tree removal, except that stumps are to be removed a minimum of six (6) inches below the natural surface of the ground.

Basis of Payment. This work will be measured in place and paid for at the contract unit price per Each for STUMP REMOVAL, which price shall include all labor, material, and equipment required to complete the work as specified herein..

CLEARING AND GRUBBING

Description. This work shall consist of clearing and grubbing within the right-of-way or within the limits of construction in accordance with Section 201 of the Standard Specifications and the following.

The Contractor is advised that it is the intent of the provision that each parcel within the limits of this Contract right-of-way, and as specified in the contract plans, be clear of all fences, wall, foundations, buildings, accumulations of rubbish of whatever nature and existing structures, the removal of which is not otherwise provided for in Article 501.07 of the Standard Specifications; all logs, shrubs, bushes, saplings, grass, weeds, other vegetation and stumps of a diameter less than 6in. both prior to start of earthwork, and also at the conclusion of construction activities, such that the property can be site graded, seeded, and present a neat and clean appearance on completion of this project in accordance with applicable portions of Section 201 and the requirements of this Special Provision.

Construction Requirements. The Contractor will be required to remove and dispose of materials outlined herein to the satisfaction and approval of the Engineer.

The removal of these items specified herein does not include the removal of items already measured and paid for individually per the Contract Plan Summary of Quantities and/ or per the Special Provisions.

The Contractor is advised to inspect the various items and quantities of clearing required on the parcels involved prior to bidding. Any items identified, or quantities depicted on the contract plans for removal under CLEARING AND GRUBBING is for Contractor information only. No additional compensation will be allowed for variations in removal items required to complete the CLEARING AND GRUBBING as specified in this Special Provision for the subject parcels.

Unless specifically called out in the plans, existing utilities which are still located in the ground, including (but not limited to) power poles, light poles, utility structures, fire hydrants, water main, and sewers, shall not be included in the removal items for CLEARING AND GRUBBING. The Contractor shall note any such existing utilities which conflict with items to be cleared, and request direction from the Engineer prior to clearing at these locations. Any damage to existing utilities by the Contractor shall be repaired by the Contractor at his own expense to the satisfaction of the Engineer.

The Contractor shall use caution when removing items which will cause displacement of underlying and adjacent soils. For removal operations which will cause displacement of soil, the Contractor shall use a method approved by the Engineer to minimize disturbance of the soil beneath and adjacent to the clearing items.

Materials resulting from the clearing operations as herein specified shall be disposed of according to Article 202.03 at no additional cost to the contract.

Removal of the clearing items as herein specified, and incidental site grading as directed by the Engineer, will not be paid for separately, but considered as included in the contract unit price per Square Yard for CLEARING AND GRUBBING.

The Contractor is advised that existing soil within the project limits may be considered contaminated. The Department recommends that contractor accounts for this CLEARING AND GRUBBING in the SPECIAL WASTE PLANS AND REPORTS. In instances where the CLEARING AND GRUBBING areas overlap with known NON-SPECIAL WASTE DISPOSAL areas, any earthwork shall be governed by the NON-SPECIAL WASTE requirements.

Method of Measurement. The removal and clearing items for CLEARING AND GRUBBING shall be measured for payment in feet of length and width and the area computed in Square Yard for clearing of the locations as shown in the contract plans or as directed by the Engineer.

Basis of Payment. This work will be paid for at the contract unit price per Square Yard for CLEARING AND GRUBBING.

EARTH EXCAVATION (SPECIAL)

Description: This project requires earth and topsoil excavation within the Commonwealth Edison Permanent Easement shown on the plans. The easement areas are generally from Sta. 106+74 to 109+00 left, and Sta. 106+71 to 108+30 right.

This work item shall be completed in accordance with the applicable portions of Section 202 of the Standard Specifications with the following general additions required by ComEd's Environmental Services Department (ESD).

- Removal of soil or waste from ComEd property must be managed by a ComEd Environmental Contractor of Choice (ECOC) and disposed of in a ComEd approved landfill. Clean construction or demolition debris (CCDD) is not permitted.
- Hydrovac spoils are not permitted to be reused on ComEd property and must be disposed in accordance with the above requirement.
- Grading of excess soil is not permitted on ComEd property.
- Stratification of soil horizons is required for all excavation and backfilling activities.
- All soil and dewatering activities must be managed in accordance with Illinois Urban Manual guidelines.
- No construction debris, soil, fill material, or spoils may be stored on ComEd property during or post construction.
- Environmental sampling is not permitted on ComEd property without approval and guidance from ComEd. Any environmental sampling must be conducted by a ComEd ECOC.

Embankments:

The project will require construction of embankments and topsoil placement. The embankment and topsoil placement shall be in accordance with the applicable portions of Section 205 and 211 respectively. The soils will need to be certified "clean" fill. Certification of clean fill may be obtained through a certificate of virgin material from the source or through sampling to verify adherence to environmental objectives determined by ESD. The source of the clean fill must be approved by ESD.

Basis of Payment: Payment for this work will be paid on a Cubic Yard basis for EARTH EXCAVATION (SPECIAL), which price shall be payment in full for removal, hauling and disposal of the excavation and/or topsoil materials, all labor, material, and equipment and all incidental work and materials herein specified to complete the work as specified.

EXPLORATION TRENCH (SPECIAL)

Description. This work shall be in accordance with Section 213 of the Standard Specifications insofar as applicable and the following provisions.

This item shall consist of excavating a trench at locations as directed by the Engineer for the purpose of locating existing sewer lines, water mains, sanitary sewers and other utilities within or adjacent to the proposed project limits.

The trench shall be deep enough to expose the sewer lines, water mains, sanitary sewers or other utilities. The width of the trench shall be sufficient to allow proper investigation to determine if the existing facility needs to be adjusted.

The Contractor shall familiarize himself with the locations of all underground utilities of facilities as outlined in applicable Articles 105 of the Standard Specifications and shall save such facilities from damage.

The exploration trench shall be backfilled with trench backfill meeting the requirements of Article 208 of the Standard Specifications, the cost of which shall be included in the item Exploration Trench (Special).

Method of Measurement. This work will be measured for payment in feet. 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 shall 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. This price shall include excavation, backfill, and disposal of excess material.

PROPOSED MANHOLE/CATCH BASIN CONNECTION OVER EXISTING STORM SEWER

Description. Work shall include the removal of the necessary storm sewer in order to install the proposed manhole or catch basin where placement of a new structure over an existing storm sewer line in locations as shown on the plans. Manhole and/or catch basin requirements shall meet the requirements of IDOT Highway Standards as referenced in the plans.

Work included in this pay item shall consist of placement of a manhole base beneath the proposed pipe and the placement of a dog-house style manhole over the existing pipe and grouted or sealed according to the satisfaction of the Engineer. The existing pipe will be cut or removed such that the slope of the pipe is maintained at the invert and outfall pipe within the manhole.

Manhole bottom slab shall be reinforced per IDOT highway standards and placed with a tongue-in-groove joint or other approved sealant to ensure a watertight connection. Any new storm sewer that is needed to replace damaged existing storm sewer shall be inclusive of this item. If structure and storm sewer resides underneath proposed pavement, curb, or sidewalk, the excavation shall be filled with "TRENCH BACKFILL" in accordance of Section 208 of the Standard Specification for Road and Bridge Construction.

Method of Measurement & Basis of Payment. PROPOSED MANHOLE/CATCH BASIN CONNECTION OVER EXISTING STORM SEWER shall be measured and paid for EACH new manhole or catch basin that is installed overtop of existing storm sewer. All materials and labor to remove existing pipe, insert new structure, connect existing storm sewer to structure, and any necessary proposed storm sewer and removal of existing storm sewer pipe to make the connection and/or trench backfill shall be included in the cost of the item.

REMOVE EXISTING FLARED END SECTION

Description. This work shall consist of the removal of the existing flared end section, according to Section 501 of the Specifications, at locations shown on the plans.

Method of Measurement. This work shall be measured for payment per EACH for REMOVE EXISTING FLARED END SECTION.

Basis of Payment. This work shall be paid for at the contract unit price per EACH for REMOVE EXISTING FLARED END SECTION.

REMOVE ABANDONED GAS MAIN

Description. This work shall consist of the excavation, removal, satisfactory disposal, plugging and backfilling of the existing abandoned gas main at locations as shown on the Plans or as directed by the Engineer.

Construction Requirements. Prior to any utility removal, the Contractor shall verify with the respective utility company that the subject utility structure is no longer in service. The abandoned gas main shall be removed within the limits where it conflicts with the proposed improvements, and as directed by the Engineer. The abandoned gas main that has been

determined to not be affected by the proposed improvements may remain abandoned in-place. All pipes to be abandoned under this item shall have all openings sealed with a one (1) foot minimum length concrete plug.

Backfilling for Utility Removals. Suitable excavated material from the utility removal excavation trench shall be used as backfill for the voids created by the same excavation. Excavated material from utility removal will not be allowed as backfill or embankment at other locations on the project site. Backfilling the void left by the removal operation shall be included in the cost of the item.

Method of Measurement. This work will be measured for payment in feet along the centerline of the abandoned gas main.

Basis of Payment. This work will be paid for at the contract unit price per foot for REMOVE ABANDONED GAS MAIN, which price shall include materials, equipment and labor to complete the work as described and includes excavation, removal and proper disposal of the existing abandoned gas main, plugging the ends of the sections of pipe to remain in-place and backfilling.

TEMPORARY PATCHING

Description. This work shall consist of removal and replacement of any existing pavement disturbed during construction of the proposed storm sewer laterals outside of the construction stage being constructed in order to tie into the proposed mainline storm sewer to provide positive drainage. Any necessary excavation shall be included. The temporary patch shall be constructed of Portland Cement Concrete (PCC) or Hot-Mix Asphalt (HMA) at the Contractor's discretion, the PCC shall be a thickness of eight (8) inches and the HMA shall be a thickness of ten (10) inches, and shall match the adjacent pavement surface elevation. Removed material shall be included as part of this pay item and shall be disposed of according to Article 202.03.

Method of Measurement. This work 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 square yard for TEMPORARY PATCHING.

MANHOLES, TYPE A, 7' WITH 2 TYPE 1 FRAMES, CLOSED LID, RESTRICTOR PLATE

Description. This work shall consist of constructing a Type A manhole of the diameter specified with restrictor in accordance with Sections 602 and 1006 of the Standard Specifications and the plans and/or as directed by the Engineer.

Construction Requirements. Construction shall conform to the details shown in the plans, all applicable Standard Drawings, and all applicable portions of Sections 602 and 1006 of the Standard Specifications.

Method of Measurement. This work will be measured for payment, complete in place and accepted, in units of EACH.

Basis of Payment. This work will be paid for at the contract unit price per EACH for MANHOLES, TYPE A, 7' DIAMETER, WITH 2 TYPE 1 FRAME, CLOSED LID, RESTRICTOR PLATE installed. Price shall include but not be limited to all frames, grates, lids, sand cushion, steps, 6" concrete wall, flat slab tops, snout or debris trap, all excavation and backfilling, and all other labor, materials, and equipment needed to perform the work as specified herein.

SEDIMENT CONTROL, STABILIZED CONSTRUCTION ENTRANCE

Description. This work shall consist of constructing a stabilized construction entrance, including furnishing, installing, maintaining and removing a stabilized pad of aggregate underlain with filter fabric, as shown on the plans or directed by the Engineer.

Materials. The materials used shall meet the requirements of the following:

- Aggregate: The aggregate shall be limited to IDOT Coarse Aggregate Gradation CA-1, CA-2, CA-3 or CA-4.
- Filter Fabric: The filter fabric shall be made of synthetic polymers composed of at least 85 percent by weight polypropylene, polyesters, polyamides, polyethylene, polyolefins, or polyvinylidene-chlorides. The geotextile shall be free of any chemical treatment or coating that significantly reduces its porosity. Fibers shall contain stabilizers and/or inhibitors to enhance resistance to ultraviolet lights.

Construction Requirements. The aggregate shall be at least six inches thick. The aggregate shall not be placed until the entrance area has been inspected and approved by the Engineer.

The aggregate shall be dumped and spread into place in approximately horizontal layers. The layer(s) shall not exceed three feet in thickness. The aggregate shall be placed in such a manner as to produce a reasonably homogeneous stable fill that contains no segregated pockets of larger or smaller fragments or large unfilled space caused by bridging of larger fragments. No compaction shall be required beyond that resulting from the placing and spreading operations.

The construction entrance shall follow the dimensions shown on the plans and/or have a minimum width of 14 feet for one-way and 20 feet for two-way traffic, and a minimum length of 100 feet.

All surface water flowing or diverted toward the construction entrance shall be piped across the entrance. Any pipe used for this will be considered included in the unit price for SEDIMENT CONTROL, STABILIZED CONSTRUCTION ENTRANCE. The stabilized construction entrance shall have positive drainage away from the roadway.

The entrance shall remain in place and be maintained until the disturbed area is stabilized. Any sediment spilled onto public right-of-way(s) shall be removed immediately. All removed materials shall be disposed of outside the limits of the right-of-way according to Article 202.03 of the "Standard Specifications" and/or as directed by the Engineer.

Maintenance may include the removal of sediment clogged aggregate and replacement with fresh aggregate as directed by the Engineer.

Method of Measurement. The Stabilized Construction Entrance will be measured in place and the area computed in square yards.

Basis of Payment. This work will be paid for at the contract unit price per square yard for SEDIMENT CONTROL, STABILIZED CONSTRUCTION ENTRANCE. The unit price shall include all material, including filter fabric, labor, equipment and any other items required to install, maintain, and remove the construction entrance.

STRUCTURE TO BE ADJUSTED

Description. Work under this pay item includes all materials, labor, and equipment necessary to properly adjust existing barrel sections, catch basins, manholes, inlets, or valve vaults, and set them to the required elevation. This work will be done in accordance with the applicable portions of Sections 602 and 603 of the Standard Specifications.

Adjustments may be necessary to ensure that frames and grates match the elevation of the surrounding pavement or ground surface. Preformed adjusting rings of the proper dimensions needed to mate the frame to the precast structure shall be used. No more than 12 inches of vertical adjustment may be made using the minimum practical number of individual rings.

All rings shall be High Density Polyethylene Plastic (HDPE), Recycled Rubber, High Density Expanding Polystyrene, Expanded Polypropylene (EPP), or other material as coordinated with the City Engineer. Precast concrete rings, bricks, rocks, shims, or concrete blocks will not be allowed. Tapered adjusting rings shall be required when the frame will need to match the slope of the roadway. The Contractor is cautioned to take proper care to assure a smooth riding surface after the adjustment and paving. Sudden bumps or dips in the final surface will not be accepted.

A resilient, flexible, non-hardening, preformed bituminous mastic material, Conseal 102 B, shall be used between the cone or top barrel section of the structure and the adjusting rings. A thick bead of non-hardening elastomeric joint conforming to ASTM C-920, Type S, Grade NS, shall be applied between all individual rings, and between the adjusting rings and the frame. The sealant or mastic material shall be applied in such a manner that no surface water or ground water inflow can enter the structure.

All storm sewer structure frames without inside flanges shall be shaped with hydraulic cement or elastomeric joint sealant to form a fillet to the structure or adjusting rings and to maintain watertightness.

Basis of Payment. This item of work will be measured and paid for at the contract unit price per each for STRUCTURE TO BE ADJUSTED, of the structure type specified.

TEMPORARY SOIL RETENTION SYSTEM (SPECIAL)

Description

This work shall consist of furnishing, driving, adjusting for stage construction when required and subsequent removal of the soil retention system according to the dimensions and details shown on the plans and according to the applicable portions of Section 522 of the Standard Specifications.

This work shall also include furnishing and installing sheeting, piles, ground anchors, helical ground anchors, walers, sheet piling railing and miscellaneous steel shapes, plates, timber blocking and connecting hardware when required to attach the retention system to an existing substructure unit and/or to facilitate stage construction. It also includes removal of sheeting or piles, ground anchors, helical ground anchors, walers, sheet piling railing and miscellaneous steel shapes. It shall also include any excavation performed in conjunction with this work beyond the limits specified for Structure Excavation and/or Earth Excavation to allow for the installation of ground anchors, helical ground anchors, walers and other connecting hardware, as well as backfilling the excavated areas.

General

The Contractor may propose other means of supporting the sides of the excavation provided they are done so at no extra cost to the contract. If the Contractor elects to vary from the design requirements shown on the plans, the revised design calculations and details shall be submitted to the Engineer and WCL Railroad for approval. The Contractor is responsible to check with the Railroad to determine their review and approval time. The calculations shall be prepared and sealed by an Illinois Licensed Structural Engineer. The calculations must meet AREMA, WCL and IDOT Standards when applicable. This approval will not relieve the Contractor of responsibility for the safety of the excavation. Approval shall be contingent upon acceptance by all involved utilities and/or railroads.

Ground anchors for Temporary Soil Retention System (Special) shall follow all the requirements of the special provision for GROUND ANCHORS. Helical ground anchors for Temporary Soil Retention System (Special) shall follow all the requirements of the special provision for HELICAL GROUND ANCHORS. These are performance specifications for ground anchors and helical ground anchors, respectively. The Contractor is given the responsibility for the ground anchor and helical ground anchor design, construction, and performance. All ground anchor and helical ground anchor calculations shall be submitted to the Engineer and WCL Railroad for review and comment. The Contractor is responsible to check with the Railroad to determine their review and approval time.

All provisions and requirements required under CONSTRUCTION VIBRATION MONITORING shall apply to work performed under this item. The costs incurred finding suitable equipment and procedures shall be included in the cost of Temporary Soil Retention System (Special).

Materials

The sheet piling or piles shall be made of steel and may be new or used material, at the option of the Contractor. The sheet piling or piles shall have a section modulus equivalent to or greater than the section modulus shown on the plans. If an alternate approved Contractor design is to be used, the sheet piling or piles shall have a minimum section modulus that meets the minimum requirements of the alternate design. The sheeting or piles shall be ASTM A572, Grade 50. The sheeting or piles, used by the Contractor, shall be identifiable and in good condition free of bends and other structural defects. The Contractor shall furnish a copy of the published pile section properties to the Engineer for verification purposes. The Engineer's approval will be required prior to driving any sheeting or piles. All driven sheeting or piles not approved by the Engineer shall be removed at the Contractor's expense.

Construction

The Contractor shall verify locations of all underground utilities before installing the retention system. Any disturbance or damage to existing structures, utilities, or other property, caused by the Contractor's operations, shall be repaired by the Contractor in a manner satisfactory to the Engineer at no additional cost to the contract.

The soil retention system shall be installed at the locations shown in the plans or according to the Contractor's approved alternate design prior to commencing any related excavation. If unable to install the temporary soil retention system as specified in the approved design, the Contractor shall re-evaluate the adequacy of the design. Any re-evaluation shall be submitted to the Engineer and WCL Railroad for approval prior to commencing the excavation adjacent to the area in question. The Contractor shall not excavate below the maximum excavation line shown in the approved design without the prior approval of the Engineer.

Temporary retention systems utilized for multiple stages of construction shall include any adjusting required to transition from one stage to the next as required. The retention system shall remain in place until the Engineer determines it is no longer required and shall be removed. When allowed, the Contractor may elect to cut off a portion of the retention system leaving the remainder in place. The remaining temporary retention system shall be removed to a depth which will not interfere with the new construction, and at a minimum, to a depth of 12 in. below the finished grade. Removed retention system elements shall become the property of the Contractor.

Excavation

Any excavation performed in conjunction with this work shall be according to Section 502 of the Standard Specifications. Subsequent backfilling shall be according to Article 502.10 of the Standard Specifications.

Method of Measurement

Temporary soil retention systems furnished and installed will be measured for payment in place, in square feet (square meters). The area measured shall be the minimum vertical exposed surface area envelope of the excavation supported by the temporary soil retention system. Portions of a temporary soil retention system or temporary sheet piling left in place for reuse in later stages of construction will only be measured for payment once. However, no additional payment will be made for any walers, bracing, or other supplement to the temporary soil retention system, which may be required as a result of the re-evaluation in order to ensure the original design intent was met. Portions of the temporary soil retention system left in place for reuse in later stages of construction shall only be measured for payment once.

Basis of Payment

This work will be paid for at the contract unit price per square foot for TEMPORARY SOIL RETENTION SYSTEM (SPECIAL). This includes the cost of ground anchors, helical ground anchors, walers, sheet piling, piles, railing, miscellaneous steel shapes, timber blocking and connecting hardware, as well as any excavation and subsequent backfilling and removal performed in conjunction with this work beyond the limits of Structure Excavation and Earth Excavation.

Obstruction mitigation shall be paid for according to Article 109.04 of the Standard Specifications.

TIMBER RETAINING WALL REMOVAL

Description: This work shall consist of removing an existing timber retaining wall at the location shown on the plans in accordance with the applicable portions of Sections 202 and 501 of the Standard Specifications.

Construction Requirements. The existing timber retaining wall shall be removed and all materials disposed of off the right-of-way as part of this item. If timber tie backs exist, the tie backs shall be removed or cut- off at a sufficient distance to not interfere with construction.

The Contractor shall carefully cut and remove all portions of the existing wall identified for replacement and portions of the wall that are to remain in place. A smooth joint shall be prepared so the new wall will fit tight to the portions of the existing wall that are to remain in place. If any portion of the wall that is to remain in place is damaged by the Contractor, it shall be repaired by the Contractor at no additional cost to the contract.

Measurement and Payment: This work will be measured and paid for at the contract unit price per lineal foot for TIMBER RETAINING WALL REMOVAL, which price shall be payment in full for all labor, materials and equipment necessary to remove and dispose of the timber retaining wall as shown on the plans and as described herein.

CONSTRUCTION VIBRATION MONITORING

Description

This work consists of monitoring buildings, structures, and utilities susceptible to vibration from construction activities. Additional monitoring, as determined by the Engineer, is included in the cost of this item.

The Contractor shall furnish monitoring equipment and all equipment and labor necessary to install and monitor adjacent buildings, structures, and utilities for vibration. The Contractor shall designate a minimum of two monitoring point locations for each of the structures located at the following addresses, at a minimum.

1. 740 Frontenac Road
2. 31 W 273 North Aurora Road
3. 540 Frontenac Court

The Contractor shall designate a minimum of three monitoring point locations for each of the following utilities, at a minimum:

Nicor underground gas line along North Aurora Road adjacent to the Temporary Soil Retention System (Special)

The proposed locations of vibration and displacement monitoring points are to be submitted to the Engineer for approval prior to the start of construction. The Contractor is solely responsible for determining the means, methods and sequences of construction, and may identify additional locations beyond those listed above for monitoring vibration. The cost for monitoring the additional locations identified by the Contractor is included in the lump sum contract unit price for CONSTRUCTION VIBRATION MONITORING.

The Contractor shall coordinate with the Engineer and building, structure and utility owners to ensure the proposed monitoring locations are acceptable to the owners and accessible to both the Contractor and the Engineer at all times. For the Nicor utility, the Contractor shall coordinate with Nicor Watch and Protect at the time of construction.

Vibration Monitoring

The Contractor shall employ the services of a qualified seismic monitoring consultant as approved by the Engineer. Monitoring point locations and frequency of data collection shall be as determined by the Contractor's Consultant and are subject to the approval of the Engineer. All vibration monitoring devices (seismographs) shall be attached to the floor of the buildings or structures being monitored. Vibration monitoring shall be a continuous and uninterrupted process and must be in place prior to the start of any construction activity. All vibration monitors for the project shall be programmed to actuate an alarm when the Threshold Value or Limiting Value is reached. The alarm notification protocol shall consist of the immediate dialing of mobile telephone numbers of the Engineer (or his/her authorized representative) and the Contractor.

Response Values

The Contractor shall establish the response values, including both the Threshold Value and the Limiting Value, for each building and structure.

- **Threshold Value:** A Threshold Value is a warning value. If Threshold Values are achieved, the Contractor must stop the work, determine the best course of action to reduce the vibrations and implement corrective actions to the design and/or construction methods to avoid reaching Limiting Values.
- **Limiting Value:** A Limiting Value is an alarm value. If Limiting Values are achieved, construction work shall stop immediately, the adjacent structures shall be surveyed for signs of additional distress from pre-construction surveys, and corrective action shall be taken to revise the design and/or construction methods to protect the adjacent structures from damage.

For the Nicor gas utility within the limits of the Temporary Soil Retention System, the response values shall be as follows:

- The Limiting Value shall be 1.0 in/s (inches per second) peak particle velocity using a continuous vibration piling method.
- The Limiting Value shall be 1.5 in/s (inches per second) peak particle velocity using a transient vibration piling method.

If the Threshold Value or Limiting Value is reached, all vibration inducing work shall be stopped. The Contractor shall establish the horizontal/vertical distance limit requirements between the vibration monitoring point location and the source of the vibration-inducing work to determine which construction operations must be stopped. Work may resume upon implementation of the action plan and with the approval of the Engineer.

If the work is stopped because the Threshold Value or Limiting Value is reached there will be no additional compensation nor any additional time extensions granted. Any change in construction methods to avoid reaching the Limiting Value will not be grounds for additional compensation.

Displacement Monitoring

The Contractor shall provide the exact horizontal and vertical location of the displacement monitoring points to the Engineer prior to commencement of any construction activities. The data shall be presented in a tabular format and shall include horizontal positions (stations and offsets or Northing and Easting) as well as vertical elevation to a minimum of one hundredth of a foot (0.01').

Monitoring Frequency

During the beginning phase of each stage of demolition and construction, displacement monitoring shall be performed at the beginning and end of each workday at a minimum. These surveying intervals are the minimum required, and more frequent monitoring may be required by the Engineer as field conditions warrant.

If after a period of time resulting movement that are small in magnitude, monitoring frequency can be reduced to a frequency as established by the Engineer. If resulting movements become random in nature and/or large in magnitude, the frequency shall be increased as directed by the Engineer. The frequency of readings will be dictated by the phase of current construction but must be sufficient to detect serious movements so that corrective measures can be initiated immediately.

Monitoring readings for displacement shall be dated, recorded, and reported to the Engineer the same day the readings are taken. During demolition within 100 feet of a vibration monitoring point location, the Contractor shall report the results of the largest amplitude vibration to the Engineer on the same day. At all other times the vibration report shall be submitted weekly.

Construction Requirements

Before the start of construction, the Contractor will complete a preconstruction inspection of each of the adjacent structures and utilities listed above. Readily visible conditions and distress such as unusual cracks in concrete or masonry, obvious signs of leakage, settlement, etc. will be photographically recorded and documented. The Contractor will also make a video survey to provide a more complete general record of conditions in those areas. The interior survey shall include the first floor and basement (if existing) within 30 feet of the exterior wall closest to the project site and the two adjacent walls. The survey will be performed from grade without the use of magnification devices. At the conclusion of the pre-construction field work, a report shall be prepared by the Contractor presenting the observed existing conditions and shall include written, videotaped and photographic documentation. This record shall then be used by the Contractor as a basis for comparison to distresses that may occur after the survey. The locations of the displacement monitoring points shall be included in the Report.

The Contractor will use the preconstruction report to aid in the selection of the displacement monitoring points. The Contractor must devise means and methods of construction that will not reach the established vibration response values. The Contractor is advised that particularly careful demolition/construction requirements may be required at locations where the gas utility is immediately adjacent to the area of construction.

Corrective Measures

If, at any time, resulting vibrations meet or exceed the established response values or cause damage to facilities or property, the Contractor shall stop work immediately and initiate the necessary corrective measures as approved by the Engineer. Damage to the Adjacent Structures as a result of construction activity shall be corrected by the Contractor. No additional compensation shall be due to the Contractor for repairing these facilities. The Contractor will not be entitled to any claim of damages or delay for stopping the project construction activities to make corrective measures.

Submittals

Submit the following items to allow for review and approval by the Engineer without delaying the work. Do not order materials or start work before receiving written approval from the Engineer.

- Vibration Control Plan shall include:
 - Locations of all vibration monitoring points (vibration and displacement), including property address and property contact information.
 - Procedure and outline for how the data will be provided to the Engineer.
 - Product Data: Type of vibration monitor to be used. Include construction details, material descriptions, performance properties, dimensions of individual components and profiles.
 - List of the Contractor's equipment to be used during demolition and construction operations.
 - Contact information for the Vibration Monitoring consultant and their staff.
 - Instrumentation plans, schedules, and details, including:

- An instrumentation plan showing the type, location, and installation details of all instruments to be installed.
- Monitoring and reporting frequency.
- Timetable that outlines the duration that each monitoring point will be maintained and checked.
- Reports of all monitoring (at the required frequencies listed above) including a description of the associated construction activity. The reports shall include a tabular and graphical summary of all readings to date.
- Submit at least fourteen (14) calendar days before construction begins.
- Qualification Data for the following:
 - Firm(s) installing instrumentation and collecting readings. Firms shall have experience installing and reading similar instrumentation on at least five projects over the last five years.
- Response Value Report establishing the response values for the Threshold Value and the Limiting Value for each building, structure and utility. Submit at least fourteen (14) calendar days before construction begins.
- Action Plans describing potential changes to construction activities / means and methods within 24 hours if Response Values are reached during construction.

Additional Submittals include:

- Weekly reports of all vibration monitoring locations.

Method of Measurement

The work under this item as described herein will not be measured separately. It will be paid for as lump sum.

Basis of Payment

This work will be paid at the lump sum contract unit price for CONSTRUCTION VIBRATION MONITORING which payment shall be full compensation for all work described herein and as directed and approved by the Engineer.

GROUND ANCHORS

Description

This work shall consist of designing, furnishing, installing, testing and stressing 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 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 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 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 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 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:

- (1) A ground anchor schedule giving:
 - (a) Ground anchor number
 - (b) Ground anchor design load
 - (c) Type and size of tendon
 - (d) Minimum total anchor length
 - (e) Minimum bond length
 - (f) Minimum tendon length
 - (g) Minimum unbonded length

- (2) A drawing of the ground anchor tendon and the corrosion protection system, including details for the following:
 - (a) Spacers separating elements of tendon and their location
 - (b) Centralizers and their location
 - (c) Unbonded length corrosion protection system
 - (d) Bond length corrosion protection system
 - (e) Anchorage head assembly and trumpet
 - (f) Anchorage cover corrosion protection system
 - (g) Drilled or formed hole size
 - (h) Level of each stage of grouting
 - (i) Any revisions to structure details necessary to accommodate the ground anchor system intended for use.
- (3) 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:

- 1) Uncoated, seven-wire strands, conforming to AASHTO M203 (M203M)
- 2) Indented, seven-wire strands, conforming to ASTM A886 (A886M)
- 3) Epoxy coated, seven-wire strands, conforming to ASTM A882 (A882M)
- 4) 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 filling 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:

- (1) 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.
- (2) 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.
- (3) 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).
- (4) 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:

- (1) Corrugated high density polyethylene (HDPE) tube having a minimum wall thickness of 30 mils (760 microns) and conforming to AASHTO M252 requirements.
- (2) Deformed steel tube or pipe having a minimum wall thickness of 25 mils (635 microns).
- (3) Corrugated polyvinyl chloride (PVC) tube having a minimum wall thickness of 30 mils (760 microns). (ASTM D1784) class 13464-B
- (4) 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: Non-restressable 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 two (2) anchors of each level should be installed and performance tested successfully before drilling any other anchors at that level. In the event that one or both anchors fail 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 two (2) 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 0.001 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: Five percent of the ground anchors or a minimum of three ground anchors, 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 not be measured for payment.

Basis of Payment

This work will not be paid for separately and shall be included in the contract unit price for TEMPORARY SOIL RETENTION SYSTEM (SPECIAL) and shall be compensation in full for designing, furnishing, installing and testing the ground anchors and anchorage head assemblies.

HELICAL GROUND ANCHORS

Effective: February 7, 2003

Revised: January 1, 2007

Description. This work shall consist of designing, furnishing, installing, testing and removing helical ground anchors according to the plans and these special provisions. The helical ground anchor consists of helical lead sections, helical extensions, plain extensions, coupling hardware, adapter section, thread bars, lock-off nuts and plate washers as required by this special provision.

Submittals. The Contractor shall submit the following:

- (a) Qualifications. At the time of the preconstruction conference, the Contractor shall provide the following documentation:
 - (1) A list containing at least three (3) projects completed within the three (3) years prior to this project's bid date for which the Sub-contractor performing this work has installed Helical Ground Anchors of similar design loads and in comparable subsurface 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) Name and experience record of the engineer responsible for helical anchor design and the onsite installation supervisor who will be assigned to this project. The engineer and on site installation supervisor shall each have a minimum of 3 years of experience in the design and installation of Helical Ground Anchors.
 - (3) Manufacturers shall have a minimum of three (3) years of production experience and evidence that their helical ground anchor systems have been used in similar construction projects over the last three (3) years.
- (b) Shop Drawings. The contractor shall submit complete design calculations and shop drawings for the proposed helical ground anchor system(s) to the Engineer for review and approval no later than 90 days prior to the proposed anchor installation. All submittals shall be sealed by an Illinois Licensed Structural Engineer and shall include all details, dimensions, quantities, cross sections, and construction notes necessary to order materials, install, test, and connect the helical ground anchors to the wall and shall include, but not be limited to, the following items:

- (1) A helical anchor schedule giving:
 - a. Anchor number
 - b. Anchor design load
 - c. Minimum required installation torque
 - d. Type, size, and number of helical lead sections and helical extensions used in anchorage length.
 - e. Type, size and number of plain extension sections used.
 - f. Type and size of adapter connection, thread bar, couplings, plates, and lock-off nuts.
 - g. Angle of anchor inclination.
 - h. Type of capacity verification (Performance test, Proof test, or Installation torque)
- (2) Drawings of the wall showing:
 - a. Plan view of the wall indicating the spacing orientation and overall length of the helical anchors. This view shall show all obstructions and ROW to demonstrate how the anchors will be installed to miss these items.
 - b. Elevation view of the wall showing locations of anchors with their anchor numbers labeled. The locations of the performance test and proof test anchors shall be indicated.
 - c. A detailed description of the construction procedures and installation sequence proposed including anchor assembly, installation, testing, anchor lock-off and removal. Also an overall site plan indicating the general order of anchors to be installed.
 - d. List of equipment proposed for installation, removal, stressing, testing, and torque monitoring.
- (3) Detail Drawings of the Helical Anchor elements showing:
 - a. Connection details indicating sizes, dimensions and hardware necessary to connect the helical anchor to the wall.
 - b. Connection details between helical lead, helical extensions, plain extensions, adapters and thread bars.
 - c. Any modifications to wall plans required to accommodate the helical anchor system proposed.
 - d. Typical elevation section of complete Helical ground anchor including helical lead sections, helical extensions, plain extensions sections, adapter, thread bar, plates, and lock-off nuts.
- (4) Calculations for the Helical Anchor Design including:
 - a. Geotechnical calculations supporting the proposed extension length and helical anchor configurations proposed.
 - b. Structural calculations supporting the member sizes and corrosion protections used.
 - c. Calculations, research data, field testing and other data to support the empirical relationship proposed for use on this project between ultimate helical anchor capacity and installation torque resistance.
 - d. Calculations supporting any modifications to the wall required to accommodate the helical anchor system.

No helical anchor installation work or orders for materials shall be permitted until the supplier qualifications and shop drawings have been reviewed and accepted in writing by the Engineer and the Railroad.

Materials. The helical plates shall conform to AASHTO M270 (M270M), ASTM A656 (A656M), or ASTM A1018 (A1018M). Each section shall be fabricated by steel plates welded to the central steel shaft anchor sections. Each fabricated section shall be hot dipped galvanized in accordance with AASHTO M232 (M232M).

The central steel shaft, consisting of lead sections, helical extensions, and plain extensions shall be hot rolled steel conforming to AASHTO M270 (M270M) and shall be hot dip galvanized according to AASHTO M111 (M111M).

The bolts used to connect the central steel shaft sections together shall conform to ASTM A193 (A193M) or A320 (A320M) and shall be hot dip galvanized according to AASHTO M232 (M232M).

Couplings, threaded bars, anchorages, adapters and other miscellaneous components shall meet the requirements as set forth in the manufacturer's specifications and shall be hot dip galvanized according to AASHTO M232 (M232M).

All welded connections shall conform to the requirements of the American Welding Society, "Structural Welding Code, AWS D1.1" and applicable revisions.

Design Criteria. Each helical ground anchor shall be designed to carry the design load indicated along the inclination angle shown on the contract plans. Any changes in inclination angle, design load, anchor location, construction sequence or other contract plan modification proposed by the contractor shall be included as part of the shop drawings design submittal.

The Contractor's design shall include sufficient extension length to ensure that the anchorage length (consisting of helical lead and helical extensions) is located beyond the minimum extension length shown on the plans. The design may use additional extension length and various helical lead and helical extensions to resist the design load shown on the contract plans with a minimum factor of safety of 2.0 against pull out using the soil boring data included in the contract plans. To assist in the helical anchor design as well as supplement the installation torque vs. capacity relationship proposed, the contractors may install a pre-production anchor and performance test the anchor according to the manufacturer's specifications at no additional cost to the Department.

All elements of the anchor and its connection to the wall shall be structurally sized to carry the design and test loadings as well as the installation stresses. Individual helical anchors shall be designed so that the maximum test loading will not exceed 90% of the minimum ultimate tension capacity of the central steel shaft material. The thread bar shall be sized so the design load does not exceed 60% of the guaranteed ultimate tensile strength of the thread bar. In addition, the thread bar shall be sized so the maximum test load does not exceed 80% of the guaranteed ultimate tensile strength of the thread bar.

Construction. The Contractor shall conduct installation torque resistance testing on all production anchors as set forth below:

(a) Installation Torque Testing. A torque indicator capable of providing continuous torque readings is required for the installation of each helical ground anchor. The contractor shall calibrate the torque measurement equipment at the project site in the presence of the Engineer or provide documentation from an independent testing agency that the equipment has been calibrated prior to use for production work. The equipment shall provide readings in increments of at least 500 ft.-lbs. (678 kN-m). The contractor shall record the torque readings at each 1 ft. (300 mm) intervals as the anchor is installed. The torque reading along with the date, time, anchor number, and any other installation observations shall be submitted to the Engineer for review and approval. The average of the last 3 torque resistance readings recorded in the end of penetration shall be used as the basis of comparison with the minimum required torque resistance indicated on the shop drawings.

(b) Installation Torque Acceptance Criteria. The torque as measured during the installation shall not exceed the torsional strength rating of the helical anchor steel. The minimum installation torque and minimum extension length criteria as shown on the working drawings shall be satisfied prior to accepting the helical anchor installation.

If the torsional strength rating of the anchor has been reached prior to achieving the minimum free-length required, the contractor may remove the deficient helical anchor and install a new one with fewer and/or smaller helixes to a depth such that the top most helix is at least 3 ft. (915 mm) beyond the location of the deficient anchor. The material used in the deficient anchor may not be damaged.

If the minimum installation torque shown on the shop drawings is not achieved at the proposed installation length, the contractor may:

(1) Add additional extensions to increase the overall length to increase the torque resistance.

(2) Remove the deficient helical anchor and install a new one with more and/or larger helixes to a depth such that the top most helix is at least 3 ft. (915 mm) beyond the location of the deficient anchor.

(3) Performance test the deficient anchor to obtain its allowable capacity and use an additional anchor to carry the remaining design load.

(c) Lock-off. Once an anchor installation capacity has been successfully verified by performance, proof, or torque testing, the anchors thread bar lock-off nut shall be tightened to a torque of 200 ft.-lbs. (271 kN-m) unless otherwise indicated on the contract or approved shop drawings.

(d) Tolerances. The anchor shall be installed such that the thread bar location at its intersection with the wall is no more than 3 in. (75 mm) from plan location. The angular tolerance between the installed anchor angle and inclination angle shown on the design plans or approved shop drawings shall not exceed +/- 3 degrees.

(e) Removal. All anchors shall be removed according to the plans after each stage is complete as directed by the Engineer. Backfill shall be placed to a minimum of 1'-0" below the anchor prior to removal.

Method of Measurement. This work will not be measured for payment.

Basis of Payment. This work will not be paid for separately and shall be included in the contract unit price for TEMPORARY SOIL RETENTION SYSTEM (SPECIAL) and shall be compensation in full for designing, furnishing, installing, testing and removing the helical ground anchors.

CONCRETE STRUCTURES (SPECIAL)

Description

This work shall consist of constructing cast-in-place concrete structures for the bridge abutments and wingwalls. The work shall be in accordance with Standard Specification Section 503, Supplemental Specifications and Recurring Special Provisions Check Sheet #23, and American Railway Engineering and Maintenance of Way Association (AREMA) "Manual for Railway Engineering", 2021 Edition, Chapter 8, Concrete Structures except as modified herein, as shown on the drawings and as directed by the Engineer.

Materials

The materials used shall be in accordance with the following:

- A. All concrete covered in this specification shall achieve a minimum compressive strength of 5,000 psi at 28 days.
- B. The Railway will not approve the use of blast furnace slag coarse aggregate or blast furnace slag cementitious materials in any work.
- C. Cement:
 - 1. The cement used in the concrete 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 according to ASTM C1260. The concrete to be tested shall be based on the proposed design concrete mix and source of aggregates, which is project specific. The Engineer must approve the acceptance of the cement.

Sampling

The Contractor shall engage and pay the costs associated with engaging an independent testing laboratory to execute the following quality control tests at the jobsite:

- A. A minimum of four (4) cylinders shall be made for each 50 cubic yards or portion thereof for each class of concrete for each day – two (2) for checking compressive strength at 14 days and two (2) for checking compressive strength at 28 days.
- 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.

These tests are in addition to the quality control requirements of Article 1020.09 in the Standard Specifications and Check Sheet #23 in the Supplemental Specifications and Recurring Special Provisions. All quality assurance tests by the Engineer shall be performed according to Check Sheet #23 in the Supplemental and Recurring Special Provisions.

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 Engineer.

Correction of Defective Work

All concrete work which does not conform to the requirements of the Contract Documents, including strength, tolerances, and finishing, shall be corrected as directed by the Engineer at the Contractor's expense. The Contractor shall be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

Method of Measurement

This work will be measured for payment in place and the volume computed 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). The unit price shall include all equipment, materials and labor required to place this concrete and other materials covered by this item.

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.

The following form liner suppliers and patterns have been pre-approved for Form Liner Textured Surface:

Milestones Incorporated

235 Monroe Street, Hudson, Wisconsin
(715) 381-9660

www.milestones-online.com

Pattern Name: MS-1006 Small Random Ashlar

Pattern Relief: 2"

Total Liner Thickness: 3"

Pre-approval of the form liner does not include material acceptance at the job site.

For Form Liner Textured Surface, the Contractor shall select a form liner pattern from above or propose an equivalent form liner.

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.

Concrete used for the cast-in-place concrete designated to receive form liner textured surfaces shall contain a high range water-reducing admixture according to Article 1021.03(c) of the "Standard Specifications" to obtain a 5" to 7" slump.

Submittals

For a proposed equivalent the Contractor shall submit to the Engineer one (1) specification including bonding and releasing agents, catalog cut sheet and 36" x 36" liner sample for the style of architectural form liner proposed for use on Form Liner Textured Surfaces on the project. Note that the same style of form liner shall be used on all surfaces to receive Form Liner Textured Surfaces within the project 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 the City of Naperville will have 14 calendar days to approve and notify the Contractor of which style of form liner is to be used on the project.

Contractor shall submit to the Engineer for approval evidence of the selected subcontractor's five years experience making stone masonry molds to create formed concrete surfaces to match natural stone shapes, surface textures.

Upon receipt of notification of the style of form liners 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 14 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 or the City of Naperville at no additional cost to the Department.

Upon approval of the form liner plans and details, the Contractor shall submit up to three 6' by 6' (minimum) mock-up concrete panel(s) of the simulated stone masonry finish of the Form Liner Textured Surface each. Include an area to demonstrate wall mold butt joint.

The sample panel(s) shall be delivered and positioned on the job site at a location to be determined by the Engineer. The approved form liners shall be used throughout the project to replicate natural stone surfaces unless otherwise noted in the plans. The approved mock-ups shall be the standard for replicated natural stone surfaces and special surfaces where required throughout the project.

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 manufacturers' 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 blemishes or tears and make repairs as needed following manufacturer's recommendations.

The Contractor shall install the form liners with less than ¼ 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 marks. The liner joints shall fall within pattern 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.

Releasing Form Liners

Products and application procedures for form liner release agents shall be approved by the form liner manufacturer. Release agents shall not cause swelling of the form liner material or

delamination of the form liner. Release agents shall not stain the concrete or react with the form liner material. Release agent shall coat form liner with a thin film. Following application of release agent, the form liner surface shall be cleaned of excess amounts of release agent using compressed air. Buildup of release agent caused by reuse of a form liner shall be removed at least every 5 uses.

Form liners shall release without leaving particles or pieces of form liner material on concrete and without pulling or breaking concrete from the textured surface. The concrete and textured surfaces exposed by removing form liners shall be protected from damage. Form stripping and related construction shall avoid creating defects in the concrete.

All concrete shall be cured in conformance with the Standard Specifications except that curing compounds will not be allowed.

Method of Measurement

This work will be measured for payment in place and the area computed in square feet for FORM LINER TEXTURED SURFACE. Measurement will include all costs associated with providing the aesthetic treatment on the walls including the furnishing, installing, stripping and reusing the form liner and providing the required submittals.

Basis of Payment

The work will be paid for at the contract unit price per square foot for FORM LINER TEXTURED SURFACE.

FURNISHING AND ERECTING STRUCTURAL STEEL, SPECIAL

Description

This section specifies requirements for furnishing and erecting structural steel. The Work under this section shall include furnishing all labor, materials, tools, equipment and incidentals required to furnish and erect structural steel for the bridge including, but not limited to, purchase, preparation and fabrication of structural steel components; all welding, drilling, bolting and other means of connection; carbon structural steel and high-strength low-alloy steel components; spherical graphited bronze expansion bearing plates and anchor bolts; non-destructive testing and any repairs and corrections determined by the Engineer to be necessary; all erection, shim plates and field modifications as required, field connections, temporary erection bents, erection derricks, shoring and cribbing; all shop cleaning including sandblasting, priming and painting; field cleaning including sandblasting, priming and field painting; all shipping and handling, including special permits if required; and all other appurtenant items required for this Work.

Standard

All materials, fabrication, inspection, testing and erection procedures shall conform to the applicable provisions of the following codes except as modified herein:

- A. Standard Specifications, Sections 505 and 506, including the current Supplemental Specifications for these sections.
- B. American Railway Engineering and Maintenance-of-way Association (AREMA) "Manual for Railway Engineering", Chapter 15, "Steel Structures", 2021 Edition, Parts 1, 3 and 4, with particular emphasis on Section 15.1.14, FRACTURE CRITICAL MEMBERS.
- C. CN Guidelines for Design of Railway Structures, January 2006.
- D. Surface preparation in accordance with the requirements of the latest issue of the following specifications and standards:
 - 1. Steel Structures and Painting Council:
 - 2. SSPC-SP1 Solvent Cleaning;
 - 3. SSPC-SP2 Hand Tool Cleaning;
 - 4. SSPC-SP3 Power Tool Cleaning;
 - 5. SSPC-SP6 Commercial Blast Cleaning;
 - 6. SSPC-SP10 Near White Blast Cleaning;
 - 7. SSPC-Vis 1 Guide to Pictorial Surface Preparation Standards for Painting Steel Surfaces.
- E. AWS – Bridge Welding Code, D1.5 – Dated 2015 (AWS).

Submittals

Submittals shall be made in accordance with the Standard Specifications and shall include the following:

- A. Mill Affidavits and Certifications: The Contractor shall supply to the Engineer mill chemical and physical test reports, and Charpy test results, when required, for all structural steel.
- B. Shop Drawings: The Contractor shall verify dimensions and bridge layout prior to preparation of Shop Drawings. Prior to fabrication of structural steel, the Contractor shall submit Shop Drawings for structural steel fabrication and erection prepared by a qualified steel detailer. The Shop Drawings shall indicate all connections, lengths, locations of shop splices, attachments, erection and fabrication plans, and types of steel used. The Contractor shall review all Shop Drawings and verify all dimensions and procedures. The Contractor shall submit Shop Drawings to the Engineer for his review. Fabrication shall not commence until approval is received from the Engineer. The Contractor shall direct the Shop Drawing preparer to make all corrections and modifications, as directed by the Engineer, and resubmit the Drawings to the Engineer. The Engineer's approval of the Shop Drawings in no way shall relieve the Contractor of responsibility for electability, fabrication and fit in the field.
- C. Bolt, Nut and Washer Affidavits and Certifications: The Contractor shall supply to the Engineer the bolt manufacturer's chemical and physical mill test reports by heat, including nut-proof load and washer hardness.
- D. Non-destructive Testing: The Contractor shall submit to the Engineer all radiographic, ultrasonic, magnetic particle and other test records and test reports. This requirement shall in no way relieve the Contractor of the responsibility for determining the suitability or adequacy of the materials and procedures.
- E. Paint Information: The Contractor shall submit a list of proposed paints, manufacturer's literature and printed application instructions. The contractor shall confirm with the paint manufacturers that the proposed paint system, from different manufactures will work properly.
- F. As-built shop drawings in electronic form (.pdf) shall be delivered to the Railway Company as soon as the shop fabrication is completed, drawings shall be addressed to:

CANADIAN NATIONAL RAILWAYS
Diane Lewis
Public Works Manager
17641 S. Ashland Avenue
Homewood, IL 60430
Email: diane.lewis@cn.ca

Qualifications

The structural steel fabricator fabricating the steel, shall be certified under the American Institute of Steel Construction Quality Certification Program – Fabricators of Advanced Bridges, in accordance with Article 3.1.1, Chapter 15 of the AREMA Specifications. Evidence of certification shall be submitted to the Engineer for his approval before beginning work.

Fracture Critical Members

The Contractor is notified that certain elements of the structure are defined on the Plans as FRACTURE CRITICAL MEMBERS (F.C.M.). The Contractor shall adhere to all requirements of Section 15.1.14 of the AREMA Manual for the fabrication, testing and necessary repairs of these members.

Inspection and Quality Control

- A. All materials and workmanship shall be subject to inspection by the Engineer in accordance with Article 505.05 "Inspection", of the Standard Specifications.
- B. The Contractor shall provide access to the work for inspection and testing purposes.
- C. The Engineer shall from time to time during the work inspect surfaces prior to painting for degree of cleanliness and after the painting has been completed make quality control tests, i.e., wet, dry film thicknesses, adhesion, etc.
- D. Areas found to be deficient with respect to preparation of surfaces and/or painting shall be corrected and made good by the Contractor, at his cost, to the satisfaction of the Engineer.

Non-Destructive Testing of Welding

Radiographic, ultrasonic and magnetic particle inspections shall be performed on all welded steel construction in accordance with Article 505.04(q)(6) of the Standard Specifications except as modified herein.

- A. The radiographic, ultrasonic and magnetic particle inspections shall be performed by the Contractor or his representative. Such inspections shall be at the Contractor's expense. In addition, the Engineer may use any method of non-destructive testing for examination of weld passes or completed welds.
- B. The Contractor shall give the Engineer sufficient advance notice of the date on which the material will be radiographic, ultrasonic or magnetic particle inspected so that he may be present during the inspection.
- C. An interpretation of all radiographic films shall be furnished to the Engineer by the Contractor. The interpretation report shall be submitted on a form approved by the Engineer. In the event the Contractor questions the Engineer's interpretation of the radiographic films, a joint review of the film will be made; however, the Engineer's final interpretation shall govern.

The Contractor's attention is directed to the requirement that the new superstructure will be erected in stages as shown on the Plans or as required by the Construction Schedule.

Materials

The materials used for the construction of the bridge shall be according to the following requirements:

- A. Steel: All structural steel shall be carbon structural steel conforming to the requirements of Structural Steel, ASTM A709, Grade 50W, unless otherwise specified herein or on the Plans. The webs and top and bottom flanges of the through plate girders, end floor

beams, floor beams, and bearing stiffeners of the bridge are designated as "Fracture Critical Members," and shall be in accordance with the requirements for the "Fracture Critical Members," Article 1.14, Part 1, Chapter 15 of the AREMA Specifications. The impact test requirements for fracture critical members shall be as required for Zone 3 service temperature (ASTM A709 Grade 50, F3). These components are noted on the Plans as Fracture Critical Members (F.C.M.). Rimmed or capped steel will not be permitted.

Material noted on the Plans to be corrosion-resistant (C.R.) steel shall conform to High-Strength Low-Alloy Steel, ASTM A709, Grade 50 W. The upper floor plate must be raised pattern steel floor plates conforming to the requirements of ASTM A 786 and be corrosion resistant steel in accordance with ASTM A588 as noted on the plans as (C.R.*).

- B. Bearing Plates: Self-lubricating bronze bearing plates shall be as detailed on the drawings. Either one or both surfaces, as indicated on the drawings, shall be provided with trepanned recesses which shall be filled with a lubricating compound capable of withstanding the atmospheric elements and consisting of graphite and metallic substance with a lubricating binder; the compound shall be pressed into the recesses by hydraulic presses so as to form dense, non-plastic lubricating inserts. The lubricating area shall comprise approximately 25 percent of the total area. The bearing metal shall meet the requirements of A.S.T.M. Specification B22-08, Copper Alloy UNS No. C86300 (Formerly Alloy E). The coefficient of friction shall not exceed 0.10.

Acceptable Lubricant Suppliers:

1. COSMEC XL, supplied by Cosmec, Inc., 7A Railroad Avenue, Attleboro, MA 02703, Tel. (508) 455-3290, Fax. (508) 455-3293
 2. G1 LUBRITE LUBRICANT, supplied by Lubrite Technologies, 145 Webster Street, Hanover, MA 02339, Tel. (781) 871-1420, Fax. (781) 871-1492.
- C. Masonry Plate Anchor Bolts: All anchor bolts for masonry plates shall conform to ASTM F1554 Grade 105; Heavy hex nuts shall conform to requirements of ASTM A563; washers shall conform to requirements of ASTM A36 and shall be galvanized in accordance with ASTM F2329.
- D. High-Strength Bolts: All bolts in structural connections shall be heavy hex high-strength structural bolts conforming to ASTM F3125 Grade A325, Type 3 unless noted on plans. All bolts, connecting to the floorplate and ballast stop plate that are in contact with the membrane waterproofing shall be ASTM F3125 Grade A325 Flat Head Countersunk bolts.
- E. Nuts: All nuts shall be heavy hex nuts conforming to ASTM A563-DH3 or C3. The manufacturer shall wax dip the nuts prior to shipping.
- F. Washers: Washers shall be hardened washers conforming to ASTM F436, Type 3.
- G. Bearing Pads: Rubber bearing pads shall conform to AREMA Chapter 15, Part 5, Article 5.6.2.1.a meeting the requirements of Table 15-5-5 Elastomeric Material Property Test

Requirements. The rubber pad shall be exposed to field temperatures falling to -40 °F, frequently for short duration and may remain below 5 °F continuously for up to 2 months. The test temperature for Low Temperature Propene -22 °F. The fabricator shall submit a certificate from his supplier to the Engineer stating the requirements have been met.

- H. Handrails: Pipe for handrails across the bridge walkways shall be according to ASTM A500 Class C and hot-dip galvanized.
- I. Metallization: Metalized girder bottom flanges and web around bearing areas shall be in accordance with SSPC-CS Guide 23.00 or ASTM B833 and as shown on the plans. Zinc metallizing shall not be less than 0.01-inch thickness.
- J. Joint Sealant: Joint sealant at the ballast stop plate and asphaltic panel interface and between floor plates shall be a two-component, non-staining gray sealing compound with polysulfide liquid polymer gun grade, meeting the requirements of Federal Specification TT-S-227e, Type 2.

Construction Requirements

- A. Fabrication: Structural steel shall be fabricated in accordance with Section 505 "Steel Structures", of the Standard Specifications, and also in accordance with Parts 1 and 3, Chapter 15 of the AREMA Manual as modified by CN Specification HC05121 Structural Steel Fabrication for Railway Bridges (Modified). Where differences occur in the provisions, the requirements shall be followed as determined by the Railroad Engineer. In addition, Fracture Critical Members, as designated on the Plans, shall also be fabricated in accordance with the requirements of the Fracture Control Plan for Non-redundant Members, Section 12 of the AWS D1.5.
- B. Holes: Holes for shop and field connections for the bridge shall be sub punched or sub drilled and reamed to size with parts assembled or drilled full size from the solid while assembled as required by the AREMA Specifications except as otherwise specified herein. All holes for field fasteners of end connections of intermediate and end floor beams, including those in shop-fastened connection angles, ends of floor beams, end floor beam connection plates, loose connection angles and plates and floor beam brackets shall be sub punched or sub drilled and reamed to size through steel templates. The corresponding field holes in the girder, stiffeners, connection plates or connection angles shall be reamed through the same template. Templates shall have hardened steel bushings. As an alternate, field holes may be reamed to size while floor beams and girders are shop-assembled and all parts match marked. Shop and field holes for diaphragms and their supports.
- C. Shop Assembly: The girders, floor beams, floor beam brackets, diaphragms, floor plates, ballast stop plates and connection angles shall be assembled at the fabrication plant. Assembled steel shall not be dismantled until after the shop inspection has been completed. Top flanges of floor beams for the bridge shall be in the same plane to provide uniform support for the floor plates. To compensate for over-run or under-run in the depth of the floor beams, the dimension between the tops of floor beams and the bottom of the girder web, marked "HOLD" on the Plans, shall be maintained through the length of the girder. The flanges of girders at bearings shall be perpendicular to the web. The holes in the webs for the floor beam connections shall be reamed through a template.

Bearing shall be assembled complete in the shop and checked for fit and bearing of all contact surfaces and match marked for assembly in the field.

- D. Connections: All shop and field connections for the bridge shall be bolted with high-strength bolts, except as otherwise shown or noted on the Plans. All high-strength bolts shall have a hardened washer under the element (nut or bolt head) turned in tightening. Bolts shall be installed by "turn-of-the-nut" method except as otherwise shown or noted on the plans; reference AREMA 15.3.2.2. Connections are to be prepared to meet AREMA Class B (Slip Coefficient 0.5) with minimum SSPC-SP6 blast cleaning.
- E. Welded Construction: All welding on the bridge shall be in accordance with the requirements of Chapter 15 of the current edition of AREMA Specifications and the applicable provisions of Article 505.04(q) of the Standard Specifications except as specified herein or on the Plans. In case of conflict between the AREMA Specifications and the Standard Specifications, the AREMA Specifications shall take precedence and shall govern. Gas metal-arc, electro slag and electro gas welding will not be permitted.
1. All shop splices in flanges or webs shall be shop welded with full penetration groove welds as shown on the plans, using the submerged arc automatic welding process. All fillet welding of stiffeners to webs and connections of flanges to webs shall also be done by the automatic submerged arc method. All other welds must be done with shielded metal-arc welding.
 2. Welding of fracture critical members (F.C.M.) shall be in accordance with the requirements of Section 1.14 of Chapter 15 of the AREMA Specifications.
 3. Welded splices of the flange plates and girder web not shown on the Plans will be considered for approval by the Engineer upon submittal by the contractor of the splice locations and weld details.
 4. All welding inspection shall be at the Contractor's expense. Inspection procedures and inspection personnel qualifications for non-destructive testing of welded members shall be in accordance with the applicable requirements of Chapter 15 of the AREMA Specifications except as modified herein. The Contractor's attention is directed to the special testing requirements specified in Article 1.14 of Chapter 15 of the AREMA Specification for Fracture Critical Members. The welded work shall be inspected within the following minimum limits:
 - a. All welds shall be visually inspected by the fabricator.
 - b. Ultrasonic inspection shall be as follows:
 - i. Bearing stiffeners: 100% ultrasonically tested at all times.
 - ii. All welds between the tension flanges and the webs of girders specified as (F.C.M.) shall be 100% ultrasonically tested.
 - c. Flange to web of plate girders: All flange to web fillet welds are to be Magnetic Particle Tested (MT) 50% concentrated at the center of the girders, at every stop and start location and repair location.

- d. Magnetic particle inspection shall be made of all fillet welds connecting stiffeners to beams or plate girder webs - 10%.
 - e. All shop butt welds approved for use in flanges or web plates of plate girders shall be 100% inspected by radiograph.
 - f. All fillet welds on other members, including bearings, shall be inspected by magnetic particle - 10%.
 - g. The inspection service shall report the amount of inspection performed in lineal feet, location and length of defects, if any, and furnish a certification that these tests were performed in accordance with these Specifications.
 - h. Welds requiring repairs shall be retested after repairs are made.
 - i. All joints to be RT inspected will be ground flush on both sides, and shall be free of paint, scale and grease. The direction of grinding shall be perpendicular to the length of the weld.
 - j. For all welding use E-70 Electrodes.
5. Engineer shall be furnished copies of all welding inspection reports, including a certificate stating that these inspections have been made and that all welds meet the quality requirements of the Standard Specifications, or AREMA Manual of Railway Engineering, Chapter 15, Part 1, Section 14 - Fracture Critical Members.
- F. Facing and Bearing Surfaces: Machine-finished surfaces of the sole plates and masonry plates of the bearings that are in contact with the bronze bearing plates shall be coated with an approved antirust compound applied as soon as the surfaces have been finished and accepted by the Engineer.
- G. Assembly and Erection: Structural steel shall be assembled and erected in accordance with Section 505 "Steel Structures," of the Standard Specifications, and also in accordance with Part 4 "Erection," Chapter 15 of the AREMA Manual and CN Guidelines for Design of Railway Structures. Where differences occur in the provisions of the Standard Specifications and the AREMA Manual, the more stringent requirement shall be followed, as determined by the Engineer.
- 1. Field welds other than those shown on the Plans or specified herein are prohibited unless specifically authorized by the Engineer.
 - 2. Bolt heads shall face outward on exterior girder webs.
 - 3. The Contractor shall prepare the bridge seats, place the bearing units and perform other necessary work before erection to avoid unnecessary delay in erecting the structural steel in place. The Contractor shall carefully establish elevations and required shimming required to ensure that the deck plate on the existing and new spans match in elevation at the pier. A shim pack consisting of 2 -1/8", 2-1/4" and 2-1/2" adjusting shim plates shall be provided for each bearing in addition to all other plates or shims and they shall be placed between the Bed

Plate and the Neoprene Pad if required. Shim plates shall match the footprint of the Bed Plate and shall be galvanized.

4. The Contractor's attention is directed to the requirements that the structural steel shall be delivered and erected as specified in the Construction Procedure, and meet Railroad requirements for train operations.
 5. The Contractor shall be required to submit to the Engineer an erection plan sufficiently in advance of erection to allow the Engineer time to approve the proposed method. The erection plan shall include the type and size of crane to be used for erection, total weight of the crane, location of the crane and its outriggers in relation to the existing beams, boom heights and maximum "reach-length" of the boom. The Contractor shall not proceed with the steel erection until the erection plan has been approved by the Engineer.
- H. Unauthorized Fittings: The use of field welding, except as permitted on the Plans, or the temporary attachment of hooks, pintles, lifting or fitting devices, or field burning of holes are prohibited.
- I. Preparation of Metal Surfaces: Clean all surfaces by removing paint, rust, mill scale, welding slag, dirt, oil, grease and other foreign substances by Commercial Blast cleaning in accordance with SSPC-SP6. Remove all salts and surface contaminants by water blasting or steam cleaning prior to dry abrasive blasting. When cleaning by air blasting with sand, provide adequate separators and traps to remove detrimental amounts of water and oil from compressed air before reaching nozzle. Remove traces of blast products from surface and from pockets and corners by brushing with clean brushes, by blowing with clean compressed air, or by vacuum cleaning. Do not damage partially or completed work adjacent to area being cleaned. Hand and power tool clean areas inaccessible to blasting equipment. Such cleaning shall be in accordance with SSPC-SP2 and SSPC-SP3.
- J. Protection of Adjacent Properties and Public: Protect adjacent properties, landscaping, watercourses and public, including vehicles, from any damage due to painting operations.
- K. Protection of Surfaces: Apply primer or paint as soon as possible after surface has been cleaned and before deterioration of surface occurs.
1. In the event that rusting occurs after completion of surface preparation, clean surfaces again.
 2. Prevent contamination of cleaned surfaces by sand, grit, salts, acids, alkali, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats of paint. Must remove such contaminants from surface to the satisfaction of the Engineer and apply paint immediately.
 3. Protect cleaned and freshly painted surfaces from excessive dust produced by traffic, and from dust, sand and grit produced by blasting operation at no extra cost.

4. Chemical pretreatment of bare metal surfaces shall not be permitted.
- L. Mixing Paint: Do not dilute or thin paint for brush application; use as received from manufacturer and thin only as recommended by the manufacturer for spray application.
1. Mix ingredients in container before use and ensure breaking up of lumps, complete dispersion of settlement pigment, and a uniform composition. If mixing is done by hand, pour off most of vehicle (liquid) into a clean container; lift the pigment in the paint from the bottom of container with a broad, flat paddle; break up lumps and thoroughly mix with vehicle. Return the poured off vehicle to paint with simultaneous stirring or pouring repeatedly from one container to another until composition is uniform.
 2. Mix paint often enough during application to keep pigment in suspension and composition uniform.
 3. Mixing or keeping paint in suspension by means of an air stream bubbling under paint surface will not be permitted.
- M. Paint Film Thicknesses: Paint shall be applied using one of the following methods:
1. Paint System I - One coat zinc rich primer to a minimum dry film thickness of 2 mils, and two coats epoxy coating to a minimum dry film thickness of 2 mils per coat for a total dry film thickness of 6 mils. Do not exceed maximum dry film thickness recommended by coating manufacturer.
 2. Paint System II - One coat zinc rich primer to a minimum dry film thickness of 3 mils, and two coats epoxy coating to a minimum dry film thickness of 3 mils per coat for a total dry film thickness of 9 mils. Do not exceed maximum dry film thickness recommended by coating manufacturer.
- N. Applying Paint: Paint shall be applied with the following requirements:
1. Applying paint by spraying. Use brushes, sheepskins or daubers only when no other method is practicable in places of difficult access.
 2. Do not apply paint when:
 - i. Air temperature is below 4 °C (40 °F) or when temperature is expected to drop to 0 °C (32 °F) before paint has dried.
 - ii. Fog or mist occur at site; it is raining or snowing; there is a danger of rain or snow.
 - iii. Relative humidity is above 85 percent, unless otherwise authorized by the Engineer.
 - iv. Surface to be painted is wet, damp or frosted.
 - v. Previous coats are not thoroughly dry.

- vi. Steel temperature is more than 3 deg C below dew point temperature.
 - vii. Wind velocity jeopardizes protection of the public and/or the environment.
3. Provide all necessary instrumentation to the Engineer or his/her representative to measure atmospheric conditions (i.e. ambient temperature, relative humidity, dew point, wind speed, etc.) as well as wet and dry paint thicknesses.
 4. To maximum extent possible, apply each coat of paint as a continuous film of uniform thickness, free of pores. Repaint and permit to dry any thin spots or areas missed in application before next coat of paint is applied.
 5. Stripe coat edges of flanges and angles, rivet heads, nuts, bolts, etc. by spray or brush prior to applying full coat of paint to ensure adequate coverage.
 6. Brush Application:
 - i. Work paint into all cracks, crevices and corners where possible and paint surfaces not accessible to brushes by spray, daubers or sheepskins.
 - ii. Brush out runs or sags.
 - iii. Leave a minimum of brush marks in applied paint.
 7. Spray Application:
 - i. Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied and equipped with suitable pressure regulators and gauges.
 - ii. Provide traps or separators to remove oil and water from compressed air and drain periodically during operations.
 - iii. Keep paint ingredients properly mixed in spray pots or containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - iv. Apply paint in a uniform layer, with overlapping at edge of spray pattern.
 - v. Brush out immediately any runs and sags.
 - vi. Use brushes to work paint into cracks, crevices and blind spots which are not adequately painted by spray. In areas not accessible to spray gun, use brushes, daubers or sheepskins.

O. Shop Painting: Requirements for painting in the shop shall be as follows:

1. Surfaces of plates adjacent to edges to be field welded shall not be painted closer than 2" to the edge of the plate. Unpainted areas shall be coated with an

anti-rust compound as specified in Article 506.09 of the Standard Specifications. After welding, these surfaces shall be field painted with the same total number and color of shop and field coats applied to the adjacent surfaces. Surfaces that will be inaccessible for field painting after erection, as specified in Article 506.10 of the Standard Specifications, shall be given two shop coats of shop primer and, prior to erection, shall be field spot painted with primer and given one field top coat of paint.

2. High strength joints for girder and floor system excluding floorplate connections shall be Class B and blast-cleaned to SSPC-SP6 or better as shown in AREMA Table 15-1-11a. All surfaces that will be in contact with other steel parts that are not to be bolted together with high-strength bolts or welded, that are in sliding contact shall be given two shop coats of shop primer and, prior to erection, shall be field spot painted. These surfaces are as follows: The top surfaces of floor beams in contact with the floor plates; floor beam bracket surfaces in contact with the ballast stop plates; the bottom surfaces of the floor plates that are in contact with their supporting members; the surfaces of the ballast stop plates that are in contact with their supporting members; lower surfaces of floor plates and ballast stop plates in sliding contact; the top and bottom surfaces of plates anchored in the concrete backwalls; and surfaces of all other similar conditions. Anchor bolts embedded in concrete shall not be painted.
3. The surfaces of the floor plate and ballast stop plates that are to receive deck waterproofing membrane will not be painted.

Method of Measurement

No separate measurement shall be made for Structural Steel.

Basis of Payment

Structural steel and other material complying with the requirements of this item including, furnished and erected complete in place, in accordance with the Specifications and accepted, will be paid for at the Contract Lump Sum Price as shown in the Schedule of Prices for FURNISHING AND ERECTING STRUCTURAL STEEL, SPECIAL, which price shall be payment in full for all materials and fabrication, shop work, transportation and erection. The costs of cleaning and painting steel structures will not be paid for separately, but shall be included in the cost of FURNISHING AND ERECTING STRUCTURAL STEEL, SPECIAL.

FURNISH AND INSTALL WALKWAY

Description

Description. This work shall consist of furnishing and installing the Steel Grate Walkway as shown on the plans and as directed by the Engineer including, but not limited to purchase, preparation and fabrication of grating and all associated materials, shipping and handling. The following requirements are in addition to the requirements specified in Standard Specifications Section 505.

Materials

The Steel Grate Walkway shall comply with standard specifications for Metal Bar Grating published in ANSI/NAAMM A202.1 'Metal Bar Grating Manual'. Welded and fabricated steel grating shall have bearing bars 1-1/2 inch x 1/8 inch, minimum spaced 1-3/16 inches on center and across bars 5/16" inch minimum diameter, spaced 4 inch on center. Traffic surface for the steel bar grating shall be serrated. The fabricated steel grating shall be hot-dipped galvanized in accordance with ASTM A-123. Installation of grating shall comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details. Saddle clips shall be Fisher & Ludlow Type H-3.

Length of panels shall not exceed 20 feet. Grating panels shall be fully banded. Gratings shall be fabricated and installed in such a manner that the cross bars in each grating runs continuously in the same direction.

Method of Measurement

Steel Grate Walkway shall be measured for payment in feet along the length of the Steel Grate Walkway.

Basis of Payment

Steel Grate Walkway will be paid for at the contract unit price per foot for FURNISH AND INSTALL WALKWAY.

PRECAST CONCRETE BOX CULVERTS 16' X 11' (SPECIAL)

Description

The Precast Concrete Box Culvert 16' x 11' (Special) shall be constructed as detailed in the plans and in accordance with Section 540 of the Standard Specifications. The Precast Concrete Box Culvert 16' x 11' (Special) shall meet the design requirements of ASTM C 1577.

Method of Measurement

This work shall be measured for payment in place in feet along the length of the box culvert.

Basis of Payment

This work shall be paid at the contract unit price per foot for PRECAST CONCRETE BOX CULVERTS 16' X 11' (SPECIAL).

MEMBRANE WATERPROOFING (SPECIAL)

Description

The work under this section shall include, but not be limited to, furnishing all labor, materials, tools, equipment and incidentals necessary to complete the placement of waterproofing.

Submittals

F. Certificates of compliance attesting that the materials meet specification requirements shall be submitted.

G. Instructions:

1. Manufacturer's instructions for installation of the deck waterproofing shall be submitted for approval. Instructions shall stress safety precautions required in handling.
2. Manufacturer's instructions for installation of the asphalt panels shall be submitted for approval.

H. Samples: The following samples shall be submitted for approval:

Seamless Spray Applied System	3-inch square section
Asphalt Panels	1-foot square section

I. Shop Drawings: Shop Drawings shall be submitted for approval and shall show size of sheets, position of sheets and splices and termination details.

Seamless Spray Applied System

Seamless Spray Applied System shall be one of the following:

- A. Two-component elastomer membrane such as bridge deck membrane as manufactured by Bridge Preservation.
- B. Two-component methyl methacrylate resin membrane as manufactured by Stirling Lloyd.

Asphaltic Panels

The protective cover over the Seamless Spray Applied System shall be two layers of asphaltic panels. The asphaltic panels shall be in accordance with the requirements for Asphaltic Panels, as specified in Part 29, Chapter 8, of the AREMA Specifications. The thickness of each sheet shall be as specified on the plans and the width not less than four feet. The portion of the asphaltic panels which is exposed above the ballast shall be coated with Fibred Aluminum Roof Coating in accordance with Paragraph 14.4.4(b) of Part 29, Chapter 8, of the AREMA Specifications.

Sealing Compound

The sealing compound for sealing unavoidable gaps between asphaltic panels shall be compatible with materials containing bitumens and any other materials in contact with it. The type of sealing compound, with evidence of compatibility, shall be submitted to the Engineer for approval before it may be furnished.

Product Delivery and Storage

Materials shall be delivered to the job site in the manufacturer's original, unopened packages, clearly marked with the manufacturer's name, brand name and description of contents. Membrane and adhesives shall be stored in clean, dry areas. Storage temperature for adhesives shall be between 60 °F and 80 °F.

Preparation of Surfaces

Immediately prior to the application of the waterproofing, all areas of the floor plates and ballast stop plates to be covered with the waterproofing shall be carried out in accordance to the waterproofing manufacturer's requirement. Surfaces to be waterproofed shall be clean, smooth, dry and free of fins, sharp edges, oil, grease and loose or foreign materials. Projections or depressions on the surface on which the waterproofing is to be applied, that may cause injury to the waterproofing, shall be filled or removed as directed by the Engineer.

Installation of Deck Waterproofing System

The deck waterproofing materials shall be installed in accordance with the applicable requirements of Part 29, Chapter 8, of the AREMA Specifications and according to the manufacturer's specifications except as modified herein.

The component parts of the system shall be applied on the deck in the following order:

1. Seamless Spray Applied System
 - a) Seamless apply waterproofing should be applied in accordance to the manufacturer's specifications.
 - b) During the process of the work, care shall be exercised to prevent injury to the waterproofing membrane by the passage of men and equipment. As soon as practicable after the membrane waterproofing has been placed, it shall be protected from damage by the installation of the asphaltic panels.
2. Placing of Asphaltic Panels:
 - a) The asphalt protection boards shall be placed over the horizontal and the vertically inclined waterproofed surface of the deck, as shown on the Plans and as specified herein. The asphaltic panels shall be laid in accordance with Part 29, Chapter 8, of the AREMA Specifications except as modified herein. The panels placed on the horizontal surfaces of the deck shall be placed dry. Those placed on the vertical surfaces shall be laid in a coating of bonding approved adhesive. Asphaltic panels shall be installed in two layers with joints staggered on the half-sheet module, and shall be carefully placed to ensure tight proximity to adjacent members.
 - b) Immediately prior to placing the protection course, the surface of the waterproofing membrane shall be cleaned of all dirt and loose material. Unless the air temperature is above 50 °F, the asphalt protection boards for the protection course shall be heated before being laid. If heated, they shall be heated to a temperature as many degrees above 50 °F as the air temperature is below 50 °F. The temperature of the sheets after heating shall not exceed the calculated temperature by more than 10 °F. Heating shall be accomplished in a shed by an approved method which will result in bringing the sheets uniformly to the required temperature.

- c) Each asphaltic panel shall be crowded up closely against adjoining asphaltic panels, using wedges, jacks, bars or other suitable means so as not to injure the waterproofing membrane or the edges of the asphaltic panels. Any asphalt board which splits, crumbles or is damaged in any manner during its installation, shall be removed and replaced by a new panel.
- d) After completion of placing the second layer, unavoidable gaps shall be filled with a compatible sealing compound.
- e) The asphaltic panels shall be covered with ballast as soon as possible after installation to minimize exposure to the weather.
- f) Where edges or protrusions of asphaltic panels are exposed to prolonged sunlight exposure, coat exposed areas with Fibred Aluminum Roof Coating, meeting ASTM D 2824, Type 2, at a rate of 12 square feet per gallon (1/8" thickness).

Quality Control

The Contractor shall establish and maintain quality control for work under this section to assure compliance with Contract requirements, and maintain records of this quality control for all construction operations.

A copy of the records of inspections and tests, as well as the records of corrective action taken, shall be furnished to the SP Lines as directed by the Engineer.

Method of Measurement

Membrane Waterproofing, Special will be measured for payment in square foot basis, complete in place. Payment will constitute full compensation for surface preparation and furnishing and placing the seamless spray system, asphaltic panels and all other materials, labor, equipment and incidentals necessary to complete this item as shown on the Plans and specified herein.

Basis of Payment

This work shall be paid at the contract unit price per square foot for MEMBRANE WATERPROOFING, SPECIAL.

TEMPORARY BRIDGE

Description

This Section includes all the work required to construct the Temporary Shoo-fly Structure as indicated in the Plans. Construction includes but is not limited to driving piling, furnishing and erecting precast concrete bent caps, furnishing and erecting structural steel, installing a new open timber deck, placing track, and installing the walk and handrail. It also includes removal of the temporary bridge.

Standards

- a) Canadian National Railroad Safety Rules
- b) Canadian National Railroad – Guidelines for Design of Railway Structures, January 2006
- c) AREMA: Manual for Railway Engineering, 2019 edition

Submittals

The Contractor shall prepare Shop Drawings for submittal in accordance with the Standard Specifications showing details for all elements.

Quality Assurance

Construction Supervision – The bridge construction shall be progressed with skilled supervision and labor and the Contractor shall construct the structure in such a manner as may be required by the Engineer. Any supervisor or laborer not satisfactory to the Wisconsin Central Ltd. Railroad or the Engineer shall be removed from the Project on request of the Engineer.

Materials

The materials used for the construction of the temporary bridge shall be according to the following requirements:

- a) Polyurethane Bearing Pads: Polyurethane bearing pads (80 durometer) shall meet the requirements of the AREMA Manual for Railway Engineering, Chapter 15, Part 5, Table 15-5-5.
- b) Precast Concrete Caps and Wingwalls: Precast concrete caps and wingwalls shall conform to the applicable requirements of the Standard Specifications, Sections 503 and 504. The minimum compressive strength of concrete for precast concrete members shall be 5,000 psi at 28 days. Precast concrete elements shall be carefully lowered into their proper positions and to the specified elevations. After the elements are in place and fastened as designated in the Plans, the lifting loops may be cut to ½" below the surface of the cap and the recess filled with non-shrink grout to top of surrounding concrete.
- c) Steel Piles HP14x89: HP14x89 piles and Pile Shoes shall conform to Article 512 of the Standard Specifications.
- d) Driving Piles: Driving of piles shall conform to Article 512 of the Standard Specifications.
- e) Reinforcement Bars: Reinforcement Bars (plain) shall conform to Article 508 of the Standard Specifications.

- f) Structural Steel: Structural steel shall conform to the applicable requirements of the special provision for Furnishing and Erecting Structural Steel, Special.
- g) Stud Shear Connectors: Stud Shear Connectors shall conform to the applicable requirements of the Standard Specifications, Section 1006.32.
- h) Anchor Bolts and Anchor Rods: Anchor bolts and anchor rods shall be according to ASTM F1554 Grade 36. Anchor bolts and anchor rods shall be galvanized according to ASTM F2329.
- i) Handrail: The galvanized wire cable shall be according to ASTM A475, Siemens-Martin grade, with Class A coating. Handrail posts shall be according to the applicable requirements of the special provision for Furnishing and Erecting Structural Steel, Special.
- j) Walkway Grating: Walkway grating shall be according to the special provision for Steel Grate Walkway.
- k) Trackwork: Ties, rail, inner guard rail, and other track material shall be as detailed in the plans.

Execution

- a) Driving Piles: Driving of piles shall conform to Section 512 of the Standard Specifications.
- b) Erecting Structural Steel: Erection of Structural Steel shall conform to the applicable requirements of the special provision for Furnishing and Erecting, Structural Steel, Special.
- c) Stud Shear Connectors: Welding and workmanship shall be according to the requirements of the AWS D1.5-Bridge Welding Code.
- d) Walkway Grating: Walkway grating shall be installed in accordance with the manufacturer's instructions or as directed by the Engineer.
- e) Trackwork: Placement of ties, rail, inner guard rail, and other track material shall be according to the Wisconsin Central Ltd. Railroad Standards and AREMA.

Method of Measurement

Construction of the temporary shoo-fly structure will be measured for payment in units of a lump sum at the location designated on the Plans. Individual components of the temporary shoo-fly structure as described and shown on the Plans will not be measured for payment.

Basis of Payment

This work will be paid for at the Contract unit lump sum price for TEMPORARY BRIDGE completely installed and accepted in the location designated on the Plans. This payment shall be considered to be full compensation for all work, including all labor, furnishing and shipping materials, and equipment necessary to construct the structure.

ANTI-GRAFFITI PROTECTION SYSTEM

Description. This work shall consist of the furnishing and application of an anti-graffiti coating to exposed concrete surfaces designated on the plans.

General Requirements. Product features shall include: Zero VOC, 10 year unlimited warranty for graffiti removals, binary prime coat, non-yellowing, non-chalking and breathable.

The anti-graffiti coating 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.

Qualifications. The anti-graffiti coating shall be a product that has been commercially available for a period of at least five (5) years. Contractor shall apply the material to a test patch following the manufacturer's recommendation. After the manufacturer's recommended curing period, the Engineer will apply various types of graffiti materials to the coating. After three (3) days the removal agent shall be used to remove the graffiti. If after graffiti removal the anti-graffiti coating is clean and undamaged, with no evidence of ghosting, shadowing or staining, then the anti-graffiti coating is approved for use.

Surface Preparation. Prior to application of the anti-graffiti coating, all designated surfaces shall be cleaned of loose debris, previous coatings (except staining) and all foreign matter by a method as recommended by the coating manufacturer and approved by the Engineer. All surfaces shall be thoroughly clean, dry and free of dust that might prevent penetration of the coating. New concrete should be thoroughly cured before application of the coating. Glossy, glazed and slick troweled surfaces of unstained concrete should be lightly etched or abraded 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. A technical representative of the manufacturer shall be present to approve surface preparation and application of the anti-graffiti coating.

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 the 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. All coatings shall be applied in the presence of the Engineer. Film thickness shall be measured by the Contractor in the presence of the Engineer and shall be according to the manufacturer's recommendation.

In a contrasting color of the same anti-graffiti system, the name of the system used and the date of application shall be stenciled in letters not to exceed 2 inches high. The location of the stencil shall be near one end of the work at the bottom of the surface to be protected. For projects greater than 3,000 sq. ft. the stencil shall be periodically repeated once for every 3,000 sq. ft. near the bottom at the locations designated by the Engineer.

Cleaning Agent. The Contractor shall supply the Engineer with an initial quantity of the removal agent and written instructions for its use, as recommended by the manufacturer for graffiti removal. The amount shall be furnished at a rate of one (1) gallon per 81 sq. yd. of treated surface.

Method of Measurement. This work shall be measured in place per square foot of surface area upon which the anti-graffiti coating has been applied and accepted by the Engineer. No surface area will be measured for payment for areas below final grade. Applying anti-graffiti coating to mock-up will not be measured for payment.

Basis of Payment. This work shall be paid for at the contract unit price per square foot for ANTI-GRAFFITI PROTECTION SYSTEM which shall be payment in full for the cleaning of designated surfaces, the application of the anti-graffiti coating, supplying the manufacturer's technical representative and supplying the initial quantity of cleaning agent.

PRECONSTRUCTION VIDEO TAPING

Description. This work shall consist of videotaping the project site prior to commencing construction activities in order to provide a basis to determine whether visible damage occurred during construction.

General. Detailed recording of the construction site shall be taken and submitted to the Engineer for approval prior to project mobilization and start of construction. The videotaping shall encompass the entire area between the right-of-way lines. Prior to videotaping the Contractor shall coordinate with the Engineer to ensure that any areas of special emphasis are noted and sufficiently covered during the videotaping process. Included in the item is complete documentation of project site existing conditions, location of all objects which include street signage, road, driveways, trees, landscaping and mailboxes within the project limits.

The videotaping shall consist of a minimum of two passes. The videotaping shall be performed at a traversing speed not to exceed 50 feet per minute. The recording shall include a continuous audio track. The accompanying narrative shall also include address information. The Contractor shall provide one copy of the recording on a standard flash drive to the Engineer and shall indicate the date the video recording was taken.

Method of Measurement. The work will be measured for payment in units of lump sum.

Basis of Payment. This work will be paid for at the contract lump sum price for PRECONSTRUCTION VIDEO TAPING, which shall be payment in full for all materials, labor and equipment required to perform the videotaping as described herein.

DUCTILE IRON WATER MAIN (AURORA)

This item consists of furnishing all labor, materials, and equipment necessary to perform the work required under this Special Provision and shall be in accordance with the Specifications, the Plans, and as directed by the Engineer. It shall consist of providing, hauling and distributing all pipe, castings, fittings, and accessories and shall also include the excavation of trenches to the required depth; sheeting, bracing and supporting the adjoining ground or structures where necessary; dewatering; provide barricades, guards and warning lights; restrained joints; V-bio polyethylene encasement; laying and testing the pipe, castings, fittings, and accessories, backfilling and consolidating the trenches; dewatering the underlying soil stratum; relocation and/or bracing of power poles and street lights; cleaning and restoration of the work site and maintaining the streets or other surfaces over the trenches as required. The water main shall be laid to meet all vertical and horizontal separation requirements as described in section 41-2.01 of the Standard Specifications for Water and Sewer Construction in Illinois, latest edition, as amended and the separation details provided in the improvement plans.

All appropriate parts shall be lead free and be stamped "NL". Any variation from the special provisions below should be approved by the Engineering Division prior to installation.

All contamination preventive measures, pressure testing, preliminary flushing, chlorination, and bacteriological sampling of the water main shall be conducted under the supervision of the City of Aurora's Engineering Division or its designated representative. The installation Contractor shall notify the City of Aurora's Engineering Division or its designated representative a minimum of 48 hours in advance of each of the following activities: starting construction of a project, scheduling shutdowns, connections, pressure testing, preliminary flushing, chlorination, and bacteriological sampling of any water main piping. Refer to the separate special provisions regarding each of those activities.

Contamination Preventive Measures During Construction

Soil, organic matter, and other heavy material typically contain bacteria and can prevent even high concentrations of chlorine from contacting and killing the organisms. These bacteria can cause failure of bacteriological sampling. Preventing these types of materials from entering water main pipe either during or before installation is critical. Preventive measures are described in detail in AWWA Standard C651-14 Section 4.8. At a minimum, the following preventive measures shall be followed during water main pipe installation:

- a) *Keep pipe clean and dry.* The interiors of pipes, fittings, and valves shall be protected from contamination. All openings in the pipeline shall be closed watertight or with rodent-proof plugs when pipe laying is stopped at the close of the day's activities or for other reasons.
- b) *Joints.* Joints of all pipe in the trench shall be completed before work is stopped.
- c) *Cleaning and swabbing.* If dirt or other foreign material enters the pipe, it shall be removed and the interior of the pipe surface swabbed with a 1 to 5% sodium hypochlorite (NaOCl) disinfecting solution. If in the opinion of the City of Aurora Engineering Division, or its designated representative, the foreign material in the pipe will not be removed by preliminary flushing activities, the interior of the pipe shall be cleaned using mechanical means at no additional cost to the City of Aurora and then swabbed as described above.

Brass wedges shall be installed per Section 41-2.05D of the Standard Specifications for Water and Sewer Construction in Illinois, latest edition, as amended.

The Contractor shall be required to keep existing water mains in service until the existing service connections are transferred to the newly installed water main. Any work associated with temporarily capping or disconnecting existing mains, or installing temporary services shall be considered incidental to the contract and shall not be paid for separately unless the activity requires a separate dig location/occurrence and is specified on the improvement plans and bid schedule. **Reducing the pressure in the water main below 20 PSI will result in the issuance of a precautionary boil order to all services connected to that section of the water main. The engineer may provide direction or the improvement plans may show the proposed steps to be taken to avoid dropping the pressure below this threshold which may necessitate the use of a line stop or the installation of an inserta-valve at specific locations.** Prior to performing any water main shutdowns, the Contractor shall assist the City with notifying any affected residents or businesses per the NOTIFICATION special provision.

Specification references made herein for manufactured materials such as pipe, fittings, valves and hydrants refer to designations for AWWA, or to ANSI, as effective on the date of call for bids.

Unless specified in the pay items or on the plans, Ductile Iron Water Main (DIWM) shall be used for all water mains in this project. Ductile-iron pipe for water mains shall conform to ANSI Specification A21.51 or AWWA C151. Class 52, thickness designation, casting, marking, testing, etc. shall be provided in accordance with applicable ANSI or AWWA standards.

Zinc Pipe Coating

The exterior of the ductile iron pipe shall be coated with arc-sprayed zinc. The mass of zinc is to be 200 g/m² of surface area. A bituminous top coat shall be provided on top of the zinc. Zinc coating shall meet ISO 8179 except where noted within the specifications. The zinc coating of the water main shall be included in the lineal foot unit price of the water main.

All ductile-iron pipe and appurtenances shall be protected against corrosion with V-bio polyethylene wrapping in accordance with AWWA C-105-82 and the Protection Against Corrosion special provision.

Cement lining shall be included in accordance with ANSI A21.4 (AWWA C-104). All pipe and fittings shall be cement mortar lined in the shop with centrifugally spun lining in accordance with AWWA C205-85 or cement mortar lined mechanically in accordance with AWWA C602-83. Use ASTM C150, Type II, cement for lining. Field joints shall be made in accordance with AWWA C205, Appendix A.

Pipe joints shall be either mechanical or push-on (rubber gasket) type as recommended by the pipe manufacturer. Restrained joints shall be of the type recommended by the pipe manufacturer and approved by the Engineer. Backfilling and bedding shall be accomplished in accordance with Trench Details shown within these plans.

Laying of Pipe

The pipe shall be installed so that the entire length of pipe shall have full bearing. The bedding shall be shaped such that the pipe is uniformly supported over its entire length.

Installation of the water main pipe shall be accomplished to line and grade in the trench only after the bedding has been completely de-watered and is free of mud, loose silt, or foreign material. All foreign material shall be kept out of the pipe.

Dirt or other foreign material shall be prevented from entering the pipe or pipe joint during handling or laying operations and any pipe or fitting that has been installed with dirt or foreign material in it shall be thoroughly cleaned. At times when pipe installation is not in progress, and at the end of each working day, the open ends of the pipe shall be closed by a water-tight plug to ensure absolute cleanliness inside the pipe.

Water Main Restraint – Mechanical Joint Restraint

In lieu of thrust blocking, joint restraint systems such as a mechanical joint fitting or a joint restraint gasket can be utilized for restraining the system and shall be installed to the lengths specified in the Minimum Restraint Length (ft) on both sides of the Fitting detail located in the improvement plans. Field Lok 350 Gaskets shall be utilized for the joint restraint gaskets. All nuts, bolts, and threaded rods shall be stainless steel, Grade 304 bolts and Grade 316 nuts.

Water Main Restraint – Thrust Blocking

Additionally, the Contractor may install thrust blocking to prevent movement of lines under pressure at bends eleven and one-quarter (11¼) degrees and greater, tees, caps, valves and hydrants shall be precast or poured Portland cement concrete, rated at 3500 psi, a minimum of twelve (12") thick. Stainless steel tie rods are to be used in addition to blocking on all fittings and shall be anchored in such a manner that pipe and fitting joints will be accessible for repairs. Poured concrete shall not hinder access to metal fittings and bolts or hydrant drainage. All nuts, bolts, and threaded rod shall be stainless steel. When used for restraint, the thrust blocking and tie rods shall be considered included in the cost of the water main.

Installation of Mechanical Joints for Ductile Iron Pipe

The outside of the spigot and the inside of the bell of mechanical joint pipe shall be thoroughly cleaned to remove all foreign matter from the joint. The cast iron gland shall then be slipped on to the spigot end of the pipe with lip extension of the gland toward the socket or bell end. The rubber gasket shall be placed on the spigot end with the thick edge toward the gland. The pipe shall be pushed forward to completely seat the spigot end in the bell. The gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. The cast iron gland shall then be moved along the pipe into position and bolted.

Nuts spaced 180 degrees shall be tightened alternately to AWWA C-600 Standards in order to produce an equal pressure on all parts of the gland.

Jointing Gasket Joint Pipe (AWWA C111, AWWA C900, AWWA C200, ASTM F477, AWWA C950)

The inside of the bell shall be thoroughly cleaned to remove all foreign matter from the joint. The gasket shall be inserted in the gasket seat provided.

A thin film of gasket lubricant shall be applied to inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other solution supplied by the pipe manufacturer and approved by the Owner. The spigot end of the pipe shall be cleaned and entered into the rubber gasket in the bell, using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the seat of the bell. Care must be taken not to damage

exterior or interior lining when joining the pipe. Field cut pipe lengths shall be beveled to avoid damage to the gasket and facilitate making the joint.

All pipe shall be furnished with a depth mark to assure that the spigot end is inserted to the full depth of the joint.

All fittings shall be ductile iron conforming to the latest ANSI specifications A21.10 for fittings, twelve inches (12") or less, and AWWA C110 for fittings fourteen inches (14") or larger. Joints for all fittings shall be mechanical joints with Mega Lug wedge action retaining glands. All nuts and bolts used for jointing shall be stainless steel, Grade 304 bolts, and Grade 316 nuts.

Method of Measurement. Water main (of the diameters specified) will be measured by the lineal foot in place. Water mains shall be measured along the centerline of the water main from the center of the valve to the center of the valve, fittings, or end of pipe.

Basis of Payment. Payment for water main shall be made at the contract unit price per foot for DUCTILE IRON WATER MAIN, of the diameter specified, and denoted as AURORA. Payment shall be payment in full for all labor, equipment and material to install and/or relocate the water mains as shown on the plans or as directed by the Engineer in the field. All fittings, caps and plugs shown on the plans shall be considered included in the cost of the water main.

WATER MAIN, DUCTILE IRON PIPE, CLASS 52, 12", DIRECTIONALLY DRILLED (AURORA)

The work under this item consists of constructing water main of the required type and size, by horizontal directional drilling method.

Material requirements for pipe shall be as specified for water main installed in open trench, except that joints shall be restrained utilizing ductile iron components. The pipe joints shall be designed specifically for use in the directional drilling application. Contractor shall submit, for Owner's review and concurrence, the proposed locations of the drill rig set-up and receiving pits. The downhole shall be located as needed to ensure that the ends of the installed pipe will be at the elevations/depths specified.

Contractor shall provide necessary equipment to facilitate the recovery of the drilling fluids without releasing the slurry onto the surrounding ground, or into drainage structures or surface waters. Prior to beginning work, Contractor shall provide Owner with a detailed plan indicating the means and methods which will be employed to maintain clean and safe conditions, including a list of materials and equipment that will be on-site during drilling and pipe insertion/pull-back.

The pilot hole shall establish the horizontal plane of the pipeline. A plot of length versus elevation versus left/right variance will dictate the actual as-built plan and profile of the pipeline. Data feedback and electronic guidance systems and supplemental surface tracking systems shall be used to provide confirmation of position.

Reaming shall consist of using an appropriate tool to open the pilot hole to a slightly larger diameter than the carrier pipeline. The percentage oversize shall depend on soil types, soil stabilities, depth, drilling fluid hydrostatic pressure, etc. Normal over-sizing shall be from 120 to 150 percent of the carrier pipe diameter. Drilling fluid shall be forced down the hole to stabilize

the hole and to remove soil cuttings. Drilling fluid shall be bentonite clay mixture. The drilling fluid may contain a polymer additive at Contractor's option. Fluid and additives shall not be hazardous to the environment. Drilling fluid shall be adjusted within acceptable limits such that ground heaving and subsurface cavity formation through erosion are prevented.

After completing the reaming operation, Contractor shall pull the ductile iron pipeline back through the drilling fluid along the reamed hole pathway. Proper pipe handling, cradling, bending minimization, surface force readings, drilling fluid flow circulation/exit rate, and footage length installed shall be recorded. The pull-back speed shall be within the pipe manufacturer's recommendations. Contractor shall keep a log giving the horizontal and vertical position of the pipe at 25-foot intervals along the pipe to confirm its conformance to specified depth and line and grade shown on the Drawings. No payment for any pipe shall be made without the required logs accompanying it.

Contractor shall finalize as-built drawings based on the final course followed by the reamer and the installed pipeline. Gravity forces may result in the reamer going slightly deeper than the pilot hole, and the buoyant pipe may be resting on the crown of the reamed hole. A variation greater than 6-inches from the horizontal plan or designated grade is sufficient reason for rejection of the pipe, and pipe shall be re-bored to proper grade if so directed by Engineer at no cost to Owner.

Any bits, drills, reamers, or other tools lost or stuck in the borehole shall be removed at Contractor's expense. If tools cannot readily be removed, Contractor may, at Contractor's option, abandon the hole. No payment will be made for any lost equipment, material, or work on abandoned holes.

Spent drilling fluid and cuttings shall be confined to the vicinity of the drilling rig. Any drilling fluid which enters the pipe shall be removed by flushing or other suitable means.

Contractor shall be responsible for all clean-up and restoration, should the borehole blow out due to excessive pressure in the drilling fluid. No additional compensation will be allowed for the costs incurred by Contractor to perform any recovery/clean-up of lost drilling fluid which is required by Owner, Engineer, or regulatory agencies. Polyethylene encasement and tracer wire shall be included as specified in the special provision for "Ductile Iron Water Main". The tracer wire shall be pulled through the borehole along with the pipeline.

Basis of Payment. This work shall be paid at the Contract Unit Price per foot for WATER MAIN, DUCTILE IRON PIPE, CLASS 52, 12", DIRECTIONALLY DRILLED, measured in place, which prices shall include all materials, labor, and equipment necessary to complete the Work as specified herein.

WATER MAIN AND WATER SERVICE CROSSINGS (AURORA)

Crossing of water mains and services with storm and sanitary sewers shall comply with Sections 31-1.02 and 41-2.01 of the Standard Specifications for Water and Sewer Main Construction in Illinois. In the event of a break in the water main, the Contractor shall replace said main with new Ductile Iron Pipe Class 52 (cement lined) across the full width of the trench and an additional distance on each side of the trench so that the connection to the existing main is on solid ground. However, in no case shall this additional distance on each side of the trench

for said connections be less than eighteen inches (18"). All connections shall be made using a ductile iron transition sleeve with transition gaskets for varying outside diameters of pipe complying with mechanical joint ductile iron fittings ANSI-A21.10 and AWWA C-110 Specifications, and said fittings shall not be less than twelve inches (12") in length.

VALVE IN VALVE VAULT (AURORA)

This work shall consist of all excavation, furnishing and installing the valve; valve vault; frame and closed lid and appurtenances; testing; disinfecting; protection; removal of existing valve, valve box or vault, and installation of corporation stops, installation and removal of copper whips for flushing and testing, removal of surplus material; and clean-up, all in accordance with the plans and specifications.

Corporation stops shall be installed on both sides of all valves within the valve vaults. The corporation stops shall be 1" diameter, unless otherwise called out in the plans or needed to provide minimum flushing velocities.

Gate Valve

Gate valves shall be resilient wedge with cast iron body, fully bronze mounted, non-rising stem with upper and lower thrust collars. Waterways shall be smooth. All valves shall open by turning counterclockwise. Valves shall meet or exceed AWWA C-500. Valves shall be Waterous. All nuts, bolts, and threaded rods shall be stainless steel, Grade 304 bolts and Grade 316 nuts. All gate valves shall be furnished with O-Ring Stem Seals. Number, size and design shall conform to the AWWA Standard for R/W valve O-Ring Stem Seals.

End Connections

End connections of all valves shall be mechanical joint.

The minimum requirements for all valves shall, in design, material and workmanship, conform to the standards of the latest AWWA C509-87, and C504. All materials used in the manufacture of waterworks valves shall conform to the AWWA standards designed for each material listed. The Contractor shall provide corporation stops on either side of all valves. The corporation stop shall be a minimum of 1" diameter. Larger diameter corporation stops may be required if needed to provide adequate flushing velocities.

Valve Vaults

Valve Vaults shall be 4' in diameter for 10" and smaller valves and 5' in diameter for 12"- 16" valves. Valve vaults shall be constructed in accordance with the plans and details and shall include all excavation, testing, frame and cover, granular trench backfill, and all other appurtenances.

Manufacture and Marking

The valves shall be standard pattern and shall have the name or mark of the manufacturer, size and working pressure plainly cast in raised letters on the valve body.

Basis of Payment. This work shall be paid for at the contract unit price per each for WATER VALVES of the size specified and VALVE VAULTS, TYPE A, 5' OR 6'-DIAMETER, TYPE 1 FRAME, CLOSED LID. Payment shall be full compensation for excavation, removal of spoils,

valve and vault, blocking, bedding, backfill, and all labor materials, equipment and incidentals as shown on the plans and as specified herein to install the valve with vault.

CONNECTIONS TO EXISTING WATER MAINS (AURORA)

This work shall consist of all excavation, furnishing and installing the tapping valve, saddle; valve vault; frame and closed lid and appurtenances; furnishing and installing the valve tie downs and thrust blocking; fittings; reducers; sleeves; testing; disinfecting; protection; removal of surplus material; and clean-up, all in accordance with the plans and specifications.

Tapping Sleeve

Tapping sleeves shall be ductile iron construction meeting ASTM A536 Grade 65-45-12.

Tapping Valve

Tapping valves shall be resilient wedge with cast iron body, fully bronze mounted, non-rising stem with upper and lower thrust collars. Waterways shall be smooth. All valves shall open by turning counterclockwise. Valves shall meet or exceed AWWA C-500. Valves shall be Waterous. All nuts, bolts, and threaded rods shall be stainless steel, Grade 304 bolts and Grade 316 nuts.

End connections of all valves shall be mechanical joint with Mega Lug retainers.

Valve Stem Seals

All gate valves shall be furnished with O-Ring Stem Seals. Number, size and design shall conform to the AWWA Standard for R/W valve O-Ring Stem Seals.

The minimum requirements for all valves shall, in design, material and workmanship, conform to the standards of the latest AWWA C509-87, and C504. All materials used in the manufacture of waterworks valves shall conform to the AWWA standards designed for each material listed.

Valve Vaults

Valve Vaults shall be 5' in diameter for 12" diameter and smaller pressure connections. Valve Vaults shall be 6' in diameter for pressure connections greater than 12" diameter.

Manufacture and Marking

The valves shall be standard pattern and shall have the name or mark of the manufacturer, size and working pressure plainly cast in raised letters on the valve body.

Non pressure connections to existing mains shall consist of the installation of necessary fittings, reducers, and sleeves; the location of the existing main to determine size and alignment prior to the installation; notification to affected residents in accordance with the special provisions; properly plugging the portion of existing main to be abandoned.

Basis of Payment. This work shall be paid for at the contract unit price per each for CONNECTION TO EXISTING WATER MAIN, of the size specified and DUCTILE IRON WATER MAIN TEE, of the size specified. Payment shall be full compensation for excavation, removal of spoils, 2" copper whip, blocking, bedding, trench backfill, and all labor materials, equipment and incidentals as shown on the plans and as specified herein. Gate Valves, Valve Boxes and Valve Vaults will be quantified separately.

FIRE HYDRANT ASSEMBLY (AURORA)

This item shall consist of the installation of new fire hydrant assemblies, including: all excavation; furnishing and installing the fire hydrant, tees, fittings, up to 15 feet of six inch (6") DIWM pipe, auxiliary gate valve, cast iron valve box with lid, thrust blocks, drainage system and appurtenances; testing; disinfecting; protection; removal of surplus excavated material; and clean-up. The fire hydrant shall be red in color.

Description

These specifications are to be used in conjunction with the AWWA Standard C502 for fire hydrants for ordinary water works service, and the City of Aurora's Standard Specifications for Improvements.

Materials

All materials used in the production of fire hydrants for ordinary service shall conform to the specifications designated for each material listed in AWWA Standard C502.

The hydrant shall be Waterous Pacer WB-67 (5 1/4" barrel) of a pattern approved by the Engineer. The seat must be bronze. The name or mark of the manufacturer, size of the valve opening shall be plainly cast in raised letters and so placed on the hydrant barrel as to be visible after the hydrant has been installed.

All nuts, bolts, and threaded rods shall be stainless steel, Grade 304 bolts and Grade 316 nuts.

Basis of Payment. This work shall be paid for at the contract unit price per each for FIRE HYDRANT WITH AUXILARY VAVLE AND VALVE BOX. Payment shall be full compensation for furnishing and installing the fire hydrant with auxiliary valve and box, drainage stone, thrust block, backfilling and all specified appurtenances. Any vertical adjustments or hydrant extensions will not be paid for separately but shall be considered included in the cost of the fire hydrant assembly.

FIRE HYDRANT REMOVAL (AURORA)

This work shall consist of removing and if necessary disposing of existing fire hydrants, auxiliary valves, valve boxes, including all required excavation, plugging the existing hydrant lead with brick and mortar, and trench backfill. The Contractor shall keep existing hydrants in service until the proposed water main improvements have passed all required testing and have been placed into service.

Existing hydrants and valves being removed shall be delivered to 649 S. River St., Aurora and unloaded at the location designated by City personnel.

Basis of Payment. This work will be paid for at the contract unit price each for FIRE HYDRANTS TO BE REMOVED, which price shall include all excavation; backfilling including fine aggregate and disposal of surplus materials. The removal of auxiliary valves will not be paid for separately but shall be included in the cost of FIRE HYDRANTS TO BE REMOVED.

PRESSURE TESTING WATER MAINS (AURORA)

The newly laid water mains or any valved sections of it shall be subject to a hydrostatic pressure test of no less than one-hundred and fifty (150) psi. All testing activities shall be recorded and witnessed by the City of Aurora's Engineering Division or its designated representative. Any testing not witnessed will not be accepted. The Contractor shall furnish the pump pipe connection and all necessary apparatus, including gauges and meters.

After the water main has been laid and partly backfilled, the water main shall be slowly filled with water to eliminate air pockets prior to testing. If necessary, taps with corporate stops shall be placed at points of highest elevation allowing trapped air to be expelled before being plugged. The main shall be filled with water at a rate to ensure that the water within the main will flow at a velocity no greater than 1 foot/second.

Before applying the test pressure, air shall be completely expelled from the pipe. The test pressure shall be at least 150 psi and the test shall last for a minimum of 2 hours. A loss of more than 5 psi during the test shall result in a test failure and the test must be restarted. Upon completion of the test, the volume of recovery water shall be defined as the amount necessary to restore the pressure within the test section to the value at the commencement of the test. The allowable leakage shall be as determined by AWWA Standard C600-100 Sec. 5.2, based on an allowable leakage of 10.49 gpd/mi/inch. While lengths greater than 1,000 feet may be tested at one time, the permissible leakage will be calculated for the length of water main tested up to a maximum of 1,000 feet regardless if the actual length of main tested is longer.

All joints showing visible leaks shall be repaired until tight. Any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material and the entire pressure test shall be repeated until satisfactory to the Engineer. The Contractor will not be allowed to utilize "Bell Joint Clamps" to repair leaks at push-on joints.

This work shall not be paid for separately, but shall be considered included in the costs for installation of the water main.

PROTECTION AGAINST CORROSION (AURORA)

This covers material specifications and installation procedures for **V-bio polyethylene wrapping** of the underground installations of ductile iron pipe, and other related appurtenances or water main. **The Contractor shall use a V-bio enhanced polyethylene wrap.** To ensure protection against corrosive soils, all ductile iron pipe installed as part of the public system shall include V-bio polyethylene encasement. The encasement shall be installed in accordance with the following specifications.

Table 1 – Raw Material Used to Manufacture Polyethylene Film

All Characteristics	In accordance with ASTM Standard Specification D-1238-68
Type	I
Class	A (Natural Color) or C (Black)
Grade	E-I
Flow Rate (Melt Index)	0.4 Maximum
Thickness	0.008 inch (8 mils) Minimum
Volume Resistivity	Minimum Ohm-cm ³ = 10 ¹⁵
Tensile Strength	1200 psi Minimum
Elongation	300% Minimum
Dielectric Strength	800 Volts per mil Minimum

Thickness Tolerance

Polyethylene film shall have a minimum thickness of 0.008 inch (8 mils). The minimum thickness tolerance is ten percent (10%) of the nominal thickness.

Table 2 – Minimum Polyethylene Width

Nominal Diameter of Pipe (Inch)	Flat Tube	Sheet
6	21	48
8	24	48
10	27	54
12	30	60
16	37	74
24	54	108
30	67	134
36	81	162

General Installation

The V-bio polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely air and water tight enclosure. Overlaps shall be secured by the use of adhesive tape, plastic string, or other material capable of holding the V-bio polyethylene encasement in place until backfilling operations are completed.

Pipe Wrapping

The standard includes three different methods for the installation of V-bio polyethylene encasement on pipe. For polyethylene supplied in tubes, use Methods A and B. Method C is for use with polyethylene sheets.

METHOD A

Cut polyethylene tube to a length approximately two feet (2') longer than that of the pipe section. Slip the tube around the pipe, centering it to provide a one foot (1') overlap on each adjacent pipe section, and bunching it accordion fashion length-wise until it clears the pipe ends.

Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation to the polyethylene tube.

After assembling the pipe joint, make the overlap of the polyethylene tube. Pull the bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe and secure in place. Then slip the end of the polyethylene from the new pipe section over the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe.

Secure the overlap in place. Take up the slack width to make a snug, but not tight fit along the barrel of the pipe, securing the fold at quarter point.

Repair any rips, punctures, or other damage to the polyethylene with adhesive tape or with a short length of polyethylene tube cut open, wrapped around the pipe and secured in place. Proceed with installation of the next section of pipe in the same manner.

METHOD B

Cut polyethylene tube to length approximately one foot (1') shorter than that of the pipe section. Slip the tube around the pipe, centering it to provide six inches (6") of bare pipe at each end. Make polyethylene snug, but not tight; secure ends as described elsewhere.

Before making up a joint, slip a three foot (3') length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion lengthwise. After completing the joint, pull the three foot (3') length of polyethylene tube over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least one foot (1'); make snug and secure each end as described elsewhere.

Repair any rips, punctures, or other damage to the polyethylene. Proceed with installation of the next section of pipe in the same manner.

METHOD C

Cut polyethylene sheet to a length approximately two feet (2') longer than that of the pipe section. Center the cut length to provide a one foot (1') overlap on each adjacent pipe section, bunching it until it clears the pipe ends. Wrap the polyethylene around the pipe. Secure the cut edge of polyethylene sheet at intervals of approximately three feet (3').

Lower the wrapped pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene. After completing the joint, make the overlap as described above.

Repair any rips, punctures or other damage to the polyethylene. Proceed with installation of the next section in the same manner.

Pipe Shaped Appurtenances Wrapping

Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in the same manner as the pipe.

Odd Shaped Appurtenances Wrapping

When valves, tees, crosses, and other odd-shaped pieces cannot be wrapped practically in a tube, wrap with a flat sheet or split length of polyethylene tube by passing the sheet under the appurtenance and bringing it up around the body. Make seams by bringing the edges together, folding over twice, and taping down. Handle width and overlaps at joints as described above. Tape polyethylene securely in place at valve stem and other penetrations.

This work shall not be paid for separately, but shall be considered included in the contract unit price per foot for DUCTILE IRON WATER MAIN, of the diameter specified, and denoted as AURORA.

FLUSHING OF WATER MAINS (AURORA)

After satisfactory completion of pressure/leakage testing, the water main shall receive a preliminary flush. Flushing of water mains shall be conducted under the supervision of the City of Aurora's Engineering Division, or its designee, in accordance with the approved flushing plan. The flushing shall include 100% of the newly installed water main as well as every fire hydrant installed. During the flushing operation the direction of flow through the mains shall be reversed. All main line and hydrant valves shall be opened and closed while flushing in each direction.

The flushing velocity in the main shall be a minimum of 3.0 feet/second. See Table A for recommended flows to properly flush piping.

Table A
 Required Flow and Openings to Flush Pipelines*

Pipe Diameter (Inch)	Flow Required to Produce 3.0 ft/s Velocity in Main (gpm)	Size of Tap			Number of 2-1/2 inch Hydrant Outlets
		1-inch	1-1/2 inch	2-inch	
		Number of Taps on Pipe**			
4	120	1	-	-	1
6	260	-	1	-	1
8	470	-	2	-	1
10	730	-	3	2	1
12	1,060	-	-	3	2
16	1,880	-	-	5	2

*Assuming 40 psi residual pressure in existing water main

** Number of taps on pipe based on discharge through 5 ft. of galvanized iron (GI) pipe with one 90 degree elbow.

NOTE: Flushing is no substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity.

This work shall not be paid for separately, but shall be considered included in the costs for installation of the water main.

REQUIREMENTS OF CHLORINE (AURORA)

Water Main Disinfection

Disinfection shall be accomplished by the use of liquid sodium hypochlorite (NaOCl) or chlorine gas only. The City of Aurora's Engineering Division or its designated representative shall witness the chlorination of the water main. Chlorination of the water main shall not be permitted until the main has passed the pressure/leakage test and a preliminary flush has been performed, witnessed, and approved.

Under the supervision of the project field representative, water from the existing distribution system shall be made to flow at a constant rate into the newly laid water main. At a point not more than 10 feet downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will receive not less than 50 mg/L of free chlorine (see Table B or C below).

If chlorine gas is utilized, a minimum of two people employed by the Chlorinator are required when chlorinating a main. One person to monitor the chlorine gas system at the cylinder and one person to monitor the free chlorine levels at the whip/sample locations. The chlorine gas cylinder is not to be left unattended at any time during the disinfection procedure.

All main line and hydrant valves (except for valves at the connection between the new and existing systems) shall be operated after the main has been chlorinated in order to allow the valve disk to make contact with the chlorine solution. As an optional procedure (if specified by the City of Aurora or its designee), water used to disinfect the new main during the application of chlorine will be supplied through a temporary connection. This temporary connection shall be installed with an appropriate cross-connection control device to prevent backflow into the distribution system.

Table B

*Chlorine Gas Required to Produce 50 mg/L
 Concentration in 100 ft. of Pipe*

Pipe Diameter (Inch)	100% Chlorine Gas* (Pounds / 100 LF)
4	.026
6	.060
8	.108
10	.170
12	.240
16	.434

* Approximate dosages required

Table C

*1% Sodium Hypochlorite (NaOCl) Solution Required to
 Produce 50 mg/L Concentration in 100 ft. of Pipe*

Pipe Diameter (Inch)	1% Sodium Hypochlorite Solution* (Gallons / 100 LF)
4	.32
6	.72
8	1.30
10	2.04
12	2.88
16	2.60

* Approximate dosages required

A minimum free chlorine residual of 25 mg/l shall remain in the water main after standing 24 hours in the pipe as tested/confirmed by the City's Engineering Division or designated representative. A free chlorine concentration less than 25 mg/L indicates an unusually large chlorine demand and can be an indication of significant contamination within the pipe. This condition shall require the Contractor to perform a second preliminary flush and also to chlorinate the main a second time prior to collection of any samples.

Final Flushing and Bacteriological Testing

A minimum of 24 hours after the water main has been properly chlorinated, the Contractor shall schedule an appointment for bacteriological testing. The Contractor shall contact the City of Aurora's Microbiology Laboratory at 630-256-3255 to schedule sample collection. Typically, sample collection will occur on the next business day. Samples will NOT be collected on Fridays, Saturdays, or Sundays, unless advance coordination has been completed and the Contractor is willing to pay for the sampling.

All of the water main that is covered by one IEPA permit must be tested and sampled as a complete project. Bacteriological sampling will not begin until the entire length of the water main being permitted by the IEPA for that particular project has been installed, pressure tested, and chlorinated. Modifications of this requirement must be discussed with the city's representative 7 days prior to disinfection procedures.

Just prior to sampling, the main shall be flushed under the supervision of approved City of Aurora personnel or a designated representative to reduce the free chlorine concentration to no more than 3.5 mg/L. City of Aurora Water Production Division personnel shall collect all bacteriological samples. Sample points shall consist of only copper whips attached to the main and shall be located every 1,200 feet, plus one location from the end of the line, and at least one location from each branch greater than one pipe length long (generally 20 feet). Representative samples shall be collected at locations as directed by the City of Aurora's Water Production Division. **Samples shall not be drawn from hydrants.**

All water mains must be shown to be free of bacterial contamination before being placed into service. All samples shall be analyzed for bacteriological contamination at the City of Aurora's Illinois Department of Public Health certified laboratory. If an initial sample set indicates no bacterial contamination in the water main then the disinfection will be considered satisfactory. If any of the samples that are part of the initial sample set do not pass satisfactorily, then two consecutive water samples collected at least 24 hours apart from each of the unsatisfactory locations must pass to indicate no bacteriological contamination and to allow the main to be placed into service.

The City of Aurora will collect a total of three samples from each designated sample location free of charge. If any of the third samples collected from any location indicate bacteriological contamination then the Contractor must again perform preliminary flushing and chlorination (as described above) on the water main before additional samples will be collected by the City of Aurora. If the portions of the water main which have not passed the bacteriological sampling can be properly isolated from the portions that have passed, and the City of Aurora Engineering Division or its designated representative approves, then only the unsatisfactory portions of the main will be required to be re-flushed, re-chlorinated, and re-sampled.

Once samples are collected, City of Aurora employees or its designated representative shall stop the flow of water through the copper sample whip and the main. Thus, all valves associated with all hydrants, copper whips, and new main isolation valves shall be closed and may not be left "running" between collections of samples on consecutive days.

After samples are collected, City of Aurora personnel or its designated representative shall close the main isolation valve that provides water from the existing water main into the newly installed water main being tested. This valve shall remain closed until the water main project receives approval to become active or if additional sampling or flushing is required. Approved City of Aurora personnel, or its designated representative, shall be the only individuals allowed to operate this valve.

Any questions concerning installation, testing, or disinfection procedures should be directed to the City's designated representative or the Water Production Division at 630-256-3250.

This work shall not be paid for separately, but shall be considered included in the costs for installation of the water main.

DUCTILE IRON WATER MAIN (NAPERVILLE)

Description. The Contractor shall furnish and install the proposed water main of the diameter specified at the locations shown on the plans. The water main shall include excavation, granular CA-11 bedding, installation of the water main, iron fittings, restraint devices, polyethylene wrap, testing and chlorination of the water main, backfill and compaction of the trench, topsoil replacement and all incidental items required for a complete and operational water main.

In areas where existing water main requires removal to install piping, the contractor shall be responsible for removal of water main to 6-feet below grade as shown on plans. Any existing pipeline that have a portion of the pipe removed and are to remain in service shall be properly restrained with thrust block to prevent movement of the remaining pipe. This work shall be considered incidental to new water main installation.

Water main pipe shall be Class 52 ductile iron pipe, 250 pressure class minimum, conforming to ANSI/AWWA C151/A21.51-02 (or latest edition).

All ductile iron pipe and/or fittings shall have an interior cement mortar lining and bituminous seal coat conforming to the requirements of ANSI/AWWA C104/A21.4-03 (or latest edition).

Joints for water main shall be rubber push-on joints or mechanical joints, conforming to ANSI/AWWA C111/A21.11-07 (or latest edition).

Stainless steel nuts, bolts/T-bolts, and washers, Type 304 or better, will be required on all water main installations. This would apply to hydrants, tapping sleeves, valves, fittings, restraint, and other appurtenances buried or in valve vaults. Mechanical joints and restraint glands require 304 stainless steel T-bolts. An anti-seize compound shall be factory applied to nuts or bolts – any damage to this coating shall be repaired with field applied anti-seize compound that is a molybdenum-base lubricant, Bostik Never-Seez.

Push-on Joints

Sections of water main pipe shall be connected by means of push on joints, consisting of bells cast integrally with the pipe, which have interior angular recesses conforming to the shape and dimension of a rubber sealing gasket. The interior dimensions of which is such that it will admit the insertion of the spigot end of the joining pipe in a manner that will compress the gasket tightly between the bell of the pipe and the inserted spigot, thus securing the gasket and sealing the joint. Such push on joints shall be of the following makes conforming to the requirements of AWWA C111 (ANSI A21.11).

- (1) American Cast Iron Pipe Company- Fastite
- (2) Tyton U.S. Pipe and Foundry Co.

The lubricant used in conjunction with the push on joints shall be of material that is recommended by the suppliers specified above, or an acceptable commercially processed animal fat or vegetable shortening.

Restrained Joints

Restrained joint pipe shall be 250 pressure class, minimum Class 52 ductile iron pipe with manufacturer designed restrained flexible joints and smoothly contoured bells. Joints shall be boltless, flexible, restrained and shall be U.S Pipe- TR Flex or American- Flex Ring Joints.

Restrained joint gaskets are not acceptable alternatives.

Mechanical Joints

Restraint of mechanical joints shall be incorporated into the follower gland and shall include a mechanism to impart multiple wedging action that increases with increasing pipe pressure. Follower glands with restraining mechanisms shall be manufactured of ductile iron conforming to ASTM A536. Dimensions of the follower gland shall conform to and shall be compatible with mechanical joints conforming to ANSI/AWWA C111/A21.11. The mechanical joint restraint device shall have a working pressure of 250 psig and a minimum safety factor of 2:1. All retainer glands when required to restrain valves, fittings, hydrants, and pipe joints shall be mechanical joint wedge action type MEGALUG 1100 Series as manufactured by EBBA Iron, Inc. or UNI-FLANGE BLOCKBUSTER 1400 SERIES as manufactured by Ford Meter Box Co. and shall be for use on ductile iron pipe conforming to ANSI/AWWA C151/A21.51, for nominal pipe sizes 3" through 48".

Fittings shall be cement lined, tar coated ductile iron with mechanical joints rated 250 psi per AWWA C110/ANSI 21.10. (American, U.S. Pipe). Ductile iron compact fittings 3 inches to 24 inches in diameter shall be in accordance with ANSI/AWWA C153/A21.53-00 (or latest edition).

The water main shall be installed as detailed on the plans and in accordance with the applicable provisions of the Standard Specifications for Water and Sewer Main Construction in Illinois. The water main shall be installed to the grades shown on the plans and shall have a nominal minimum depth of cover of five feet (5' 0"). The excavation for the water main could be made using trenching equipment or other suitable excavating equipment.

If the excavation has been made deeper than necessary, the water main shall be laid at the lower depth, and no additional cost shall be charged to the OWNER for the extra excavation, or for subsequent adjustments to fire hydrants, valve vaults. All excavated materials not needed for backfilling the trenches shall be disposed of by the Contractor.

Non paved areas shall be backfilled from a point above the bedding with originally excavated material free from rocks, frozen material or large clods and shall be carefully placed and compacted to prevent damage to or the dislodging of the water main pipe. Cost of this backfilling shall be considered incidental to the water main construction.

After backfill is completed all trenches within the non-paved areas shall be compacted by jetting and watersoaking in accordance with Section 20 4.06B of the Standard Specifications for Water and Sewer Main Construction in Illinois, or by other approved methods set forth in said Standard Specifications.

When work is not on going and backfilling has not been completed to bring the trench back to original grade, excavation areas greater than 14" and less than 3' in depth shall be completely fenced. Excavations greater than 3' shall be plated.

In paved areas, trench backfill and surface restoration shall be done in accordance with the applicable sections of these Special Provisions.

Maximum deflections at the pipe joints and laying radius for various pipe lengths are as found in the following standards:

Ductile Iron Pipe Mechanical Joints AWWA C600
Ductile Iron Pipe Push-On Joints AWWA C600

At no time shall the deflection of the pipe joints exceed the manufacturer's maximum recommended deflection.

Where a water main must cross a sanitary or storm sewer, the invert of the water main shall be a minimum of 18 inches above the crown of the sewer for at least 10 feet each side of the crossing, in accordance with IEPA separation requirements.

Where proper vertical separation over the storm sewer is not obtainable, or the water main crosses under the storm sewer or sanitary sewer, the storm or sanitary sewer shall be replaced with water main grade pipe at least 10 feet on either side of the crossing. The water main shall be backfilled with granular material.

Water in the trench shall be removed during pipe laying and jointing operations. Provisions shall be made to prevent floating of the pipe. Trench water shall not be allowed to enter the pipe at any time.

Adequate provisions shall be made for safely storing and protecting all water pipe prior to the actual installation in the trench. Care shall be taken to prevent damage to the pipe castings, both inside and out. Provisions shall be made to keep the inside of the pipe clean throughout its storage period and to keep mud and/or debris from being deposited therein.

All pipe shall be thoroughly cleaned on the inside before laying. Proper equipment shall be used for the safe handling, conveying and laying of the pipe. All pipe shall be carefully lowered into the trench, piece by piece, by means of suitable tools or equipment, in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main material be dropped or dumped into the trench.

The pipe shall be inspected for defects. All lumps, blisters and excess coal tar coating shall be removed from the ends of each pipe, and the inside of the bell.

Field-cut pipe shall be beveled to avoid damage to the gasket and facilitate making the joint.

The pipe shall be installed with 8 mil. polyethylene film in tube or sheet form and shall be in accordance with AWWA C105/A21.5-05 suitable for the appropriate diameter of pipe and as detailed on the plans. Cost of this wrap shall be considered included in the cost of the water main construction.

Reinforced tracer wire shall be installed directly above the water main and secured every 5 feet on center. Tracer wire shall have a copper clad steel conductor, insulated with min 30 mils high density, high molecular weight coating, and shall be rated for direct burial use at 30 volts. Insulation color shall meet the APWA color code standard for identification of buried utilities. Tracer wire shall be Copperhead #12 HS-CCS tracer wire, Trace-Safe Water Blocking tracer wire. Cost of the tracer wire shall be considered included in the cost of the water main construction.

When connecting joints, all portions of the joining materials and the socket and spigot ends of the joining pipe shall be wiped clean of all foreign materials. The actual assembly of the joint shall be in accordance with the manufacturer's installation instructions. During the construction and until joining operations are complete, the open ends of all pipes shall be at all times protected and sealed with temporary water tight plugs.

The entire section of the pipe shall be pushed forward to seat the spigot end into the bell. After the section of pipe is inserted into the bell (when joining pipe to mechanical joint fittings) the gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. Restrained joint pipe shall be installed per manufacturer's requirements.

When installing iron fittings, all fittings which deflect the flow 11-1/4 degrees or greater shall have restrained joints and a thrust block. Thrust blocks shall be poured concrete of the dimensions shown on the drawings and in accordance with the provisions of the Standard Specifications for Water and Sewer Main Construction in Illinois as shown on the plans.

When a stretch of pipe and appurtenances have been completed the Contractor shall furnish proper appliances and facilities for testing and draining the same, without injury to the work or surrounding territory. He shall test by filling the pipe with clean water under a minimum hydrostatic pressure of one hundred fifty (150) pounds per square inch for four (4) hours in accordance with City of Naperville requirements. Water for performing tests shall be supplied by The City of Naperville for filling and flushing the main.

After completion of the pressure test, the Contractor shall measure the leakage under the specified test pressure. The measured leakage shall be in conformance with 41 2.14C of the "Standard Specifications for Water and Sewer Main Construction in Illinois," Seventh Edition. Allowable leakage shall be as shown in the following table:

Table 1. Allowable leakage for pipeline per 1,000 feet (gallons per hour)

Avg. Test Pressure PSI	Pipe Size in Inches											
	2	3	4	6	8	10	12	14	16	18	20	24
150	0.17	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49	1.66	1.99

Water mains shall be subjected to a hydrostatic/leakage test in accordance with Naperville Standard Specifications. Test pressure shall be no less than 150 psi for a period of 4 hours and not vary by more than + 5 psi during the test. The test gauge shall be approved by the City and shall be glycerin or oil filled, with a range of not more than 200 psi and increments not greater than 5 psi, 4" minimum dial size.

When pressure and leakage tests are completed and prior to being placed into service, the water main pipe and appurtenances shall be disinfected by a method of chlorination approved by the Engineer. Disinfection of the water main shall conform to Sections 41 2.15 through 41 2.15I of the "Standard Specifications for Water and Sewer Main Construction in Illinois," Seventh Edition.

Any defects, cracks or leakage that may develop or may be discovered, either in the joints or in the body of the castings, shall be promptly repaired by the Contractor at his own expense.

Method of Measurement. Water main (of the diameters specified) will be measured by the lineal foot in place. Water mains shall be measured along the centerline of the water main from the center of the valve to the center of the valve, fittings, or end of pipe.

Basis of Payment. Payment for water main shall be made at the contract unit price per foot for DUCTILE IRON WATER MAIN, of the size specified, and denoted as NAPERVILLE. Payment shall be full compensation for excavation, bedding, polyethylene wrap, iron fittings, installation of water main, restraint devices, backfill compaction, connection to existing water main, pressure testing, taps, chlorination, bacteriological sampling/testing and all labor materials, equipment and incidentals as shown on the plans and as specified herein to construct a complete and operational water main.

WATER MAIN CONNECTIONS (NAPERVILLE)

Description. This work shall consist of connecting newly installed water main to existing water main with the use of pressure taps, cut-in sleeves, tees, crosses or other fittings as needed at the locations shown on the plans or as directed by the engineer. This work shall include the preparation, excavation, backfill and installation of all fittings, tees, retainer glands, thrust blocking, flushing, chlorinating and testing necessary to provide a complete connection.

Where existing water mains are to be abandoned in place, the main shall be cut and capped in the general area indicated in the plans. The portion of the water main that is to remain live shall

be capped with a mechanical plug and restrained with concrete thrust blocks. The portion of the water main that is to be abandoned in place shall be capped with a mechanical plug. Cutting, capping, and abandoning the existing water main will not be paid for separately, but shall be included in the cost of CONNECTION TO EXISTING WATER MAIN, of the size specified.

The use of stainless steel or ductile iron tapping sleeves will not be permitted. Work to remove a portion of 12" ductile iron pipe and install the tee shall be considered included in the cost of DUCTILE IRON WATER MAIN TEES, of the size specified.

For flushing purposes, Contractor shall assume a 2" corporation stop and 2" copper service whip will be installed at each connection point. The final location of these taps will be determined during construction. Whips shall be removed prior to final acceptance. This work will not be paid for separately, but shall be considered included in the cost of each water main connection.

Basis of Payment. This work shall be paid for at the contract unit price per each for CONNECTION TO EXISTING WATER MAIN, of the size specified and DUCTILE IRON WATER MAIN TEE, of the size specified. Payment shall be full compensation for excavation, removal of spoils, 2" copper whip, blocking, bedding, trench backfill, and all labor materials, equipment and incidentals as shown on the plans and as specified herein. Gate Valves, Valve Boxes and Valve Vaults will be quantified separately.

ADJUSTING WATER MAIN (NAPERVILLE)

Description. This work shall consist of adjusting existing water mains when directed by the Engineer where they are in conflict with new improvements or where the proposed construction will reduce the cover over the water main. All materials used in adjusting water mains shall meet the requirements of the owning agency's standards and shall be in accordance with the Standard Specification for Water and Sewer Main Construction in Illinois, latest edition. All adjustment in the line or grade of the existing water main shall be approved by the Engineer.

Materials. All materials, labor, and equipment necessary to adjust the water main shall be on hand before shutdown and cutting of the existing main. The Contractor shall take every precaution to hold the interruption of service to a minimum.

General. A minimum clearance of eighteen inches (18") shall be maintained between the adjusted main and improvement for which the adjustment was made. A downward adjustment will be required unless 5.5' of cover can be maintained for an upward adjustment or as approved by the Engineer.

Adequate precautions shall be taken to prevent contaminants from entering the existing main. The inside surface of all new materials used in the adjustment shall be cleaned of all foreign materials and swabbed with a solution of efficient bactericide before assembly. The adjusted section shall then be flushed with potable water.

Mechanical Joints

Restraint of mechanical joints shall be incorporated into the follower gland and shall include a mechanism to impart multiple wedging action that increases with increasing pipe pressure. Follower glands with restraining mechanisms shall be manufactured of ductile iron conforming

to ASTM A536. Dimensions of the follower gland shall conform to and shall be compatible with mechanical joints conforming to ANSI/AWWA C111/A21.11. The mechanical joint restraint device shall have a working pressure of 250 psig and a minimum safety factor of 2:1. All retainer glands when required to restrain valves, fittings, hydrants, and pipe joints shall be mechanical joint wedge action type MEGALUG 1100 Series as manufactured by EBBA Iron, Inc. or UNI-FLANGE BLOCKBUSTER 1400 SERIES as manufactured by Ford Meter Box Co. and shall be for use on ductile iron pipe conforming to ANSI/AWWA C151/A21.51, for nominal pipe sizes 3" through 48".

The Contractor shall provide protection from movement of water main piping, plugs, caps, tees, valves, hydrants, and bends of 11 ¼ degrees or greater shall have restrained joints and a thrust block. Thrust blocks shall be poured concrete of the dimensions shown on the drawings and in accordance with the provisions of the Standard Specifications for Water and Sewer Main Construction in Illinois as shown on the plans.

Forty-eight (48) hours prior to disruption or shutdown of the existing main for the adjustments, the facility owner and all users that will be affected shall be notified in writing. Shutdowns impacting businesses are not permitted. The Contractor shall distribute notices of the shut down to the residents affected. The Contractor shall cooperate with the local agency personnel to locate valves necessary to isolate the work area. All valves will be operated by personnel from the owning agency.

Method of Measurement. ADJUSTING WATER MAIN shall be measured in place, in feet, of actual water main pipe installed.

Basis of Payment. This work will be paid for at the contract unit price per foot for ADJUSTING WATERMAIN of the size specified. This price shall include the cost of all materials, pipe, adapters, joint materials, fittings, retainer glands, blocking, trench backfill, removal and disposal of existing main, and all work and equipment necessary to make a complete and finished installation.

FIRE HYDRANTS TO BE REMOVED (NAPERVILLE)

Description. This work shall consist of removal and stockpiling of fire hydrants and fire hydrants with auxiliary valves.

The hole formed by the removal of these items shall be backfilled with fine aggregate.

All fire hydrants including those with auxiliary valves shall remain the property of the City of Naperville and be stored on site for the City forces to pick up. The Contractor shall make arrangements with the City of Naperville for the pick-up prior to removal.

Basis of Payment. This work will be paid for at the contract unit price each for FIRE HYDRANTS TO BE REMOVED, which price shall include all excavation; backfilling including fine aggregate and disposal of surplus materials. The removal of auxiliary valves will not be paid for separately but shall be included in the cost of FIRE HYDRANTS TO BE REMOVED.

FIRE HYDRANT WITH AUXILIARY VALVE AND VALVE BOX (NAPERVILLE)

Description. Fire hydrants shall be Clow Medallion, Waterous Pacer WB-67, or Mueller A-421 with a 5 ¼" valve opening. Model shall be a breakaway flange type and shall be equipped with two 2-1/2 inch hose connections and one 4-1/2 inch male pumper connection. Outside diameter of the male thread on the 2 ½" inch hose connection shall be National Standard threads.

A suitable tee of the quality and kind herein specified shall be placed in the water main opposite each of the fire hydrants and shall be connected with the hydrant by means of the valve and connecting pipe. Each hydrant should be provided with stainless steel rods, restrained joints, meg-a-lug joint restraint, along with thrust block. All joints from the tee at the main to the fire hydrant shall be restrained. See City of Naperville Standard Detail on the plans for further information.

Each hydrant shall be provided with a drain that will leave no water standing in the barrel of the hydrant when the hydrant is closed. This drain shall close tightly before the hydrant begins to open. The hose and pumper connections shall be securely leaded and locked into the hydrant and each shall be provided with a suitable cast iron threaded cover securely attached to the hydrant.

The fire hydrant shall be designed to withstand, without leaking or damage to the hydrant, a hydraulic pressure of 300 pounds per square inch and an operating pressure of 150 pounds per square inch.

Gate valves shall meet the requirements of the latest revision of AWWA C509. Gate valves shall open to the left (counter clockwise) and shall have mechanical joints ends. Gate valves through 12" in diameter shall have resilient seats. Gate valves installed in fire hydrant leads shall have "O" ring stuffing box. Gate valves shall be as manufactured by Clow, American, Waterous, or Kennedy. Stem, indicators, and all working parts shall be fully protected from moisture or weather damage by complete enclosure. Operating nuts shall be bronze. Operating nuts shall be 2 inches square.

Each hydrant shall be rodded to the supplying tee fitting and set on a flat stone or concrete thrust block not less than 24 inches by 24 inches by 4 inches in thickness. A minimum of one-half cubic yard of gravel shall be placed around the base of the hydrant in order to provide drainage for the hydrant drain.

All hydrants shall be set plumb and shall have their nozzles parallel with edge of pavement; the pumper connection shall be facing the edge of pavement. Hydrants shall be set to the established grade, with nozzles eighteen (18") inches above the ground or as directed by the OWNER.

All nuts, bolts and threaded rods and lugs, buried or in vaults, shall be stainless steel, Type 304 or better.

All excavation around the fire hydrant and auxiliary valve shall be backfilled to the natural line or finished grade as rapidly as possible. The backfill material shall consist of the excavated material or trench backfill as herein specified.

All backfill material shall be deposited in the excavation in a manner that will not cause damage to the fire hydrant or auxiliary valve. Any depressions which may develop within the area involved in a construction operation due to settlement of backfill material shall be filled in a manner consistent with standard practice.

The fittings, piping and valves for the hydrant shall be provided with restrained joints in addition to the rodded connection and the thrust block behind the base elbow. Hydrants shall have polyethylene encasement to surface.

Each hydrant shall be factory painted using Tnemec-Low VOC Tneme-Gloss Series 2HS. Hydrants delivered with other paint systems or colors shall be rejected. Nozzle chains shall be removed/ not permitted.

All retainer glands when required to restrain valves, fittings, hydrants, and pipe joints shall be mechanical joint wedge action type MEGALUG 1100 Series as manufactured by EBBA Iron, Inc. or UNI-FLANGE BLOCKBUSTER 1400 SERIES as manufactured by Ford Meter Box Co. and shall be for use on ductile iron pipe conforming to ANSI/AWWA C151/A21.51, for nominal pipe sizes 3" through 48".

Basis of Payment. This work shall be paid for at the contract unit price per each for FIRE HYDRANT WITH AUXILIARY VALVE AND VALVE BOX. Payment shall be full compensation for furnishing and installing the fire hydrant with auxiliary valve and box, drainage stone, thrust block, backfilling and all specified appurtenances.

GATE VALVE, VALVE BOX OR VALVE VAULT, TYPE 1 FRAME, CLOSED LID (NAPERVILLE)

Description. The valves shall be resilient wedge gate valves suitable for ordinary water works service, intended to be installed in a normal position on buried pipe lines or water distribution systems. Valves shall be installed where shown on the engineering plans.

The minimum requirements for all valves shall, in design, material and workmanship, conform to AWWA C509-01. All materials used in the manufacture of water works valves shall conform to the AWWA standards designed for each material listed. All exposed hardware/bolts shall be stainless steel. Gate valves allowed are Clow, American, Waterous, and Kennedy.

New water main valves, including pressure tap valves, adjacent to an existing water main, and existing water main valves shall only be operated by the City of Naperville, Department of Public Utilities CEECM Division personnel with 48-hour notice (Monday-Friday) 630-420-4122.

Vaults shall be constructed of precast concrete sections conforming to ASTM C-478 and in accordance to detail provided on plans.

Basis of Payment. This work shall be paid for at the contract unit price per each for WATER VALVES of the size specified and VALVE VAULTS, TYPE A, 5' OR 6'-DIAMETER, TYPE 1 FRAME, CLOSED LID. Payment shall be full compensation for excavation, removal of spoils, valve and vault, blocking, bedding, backfill, and all labor materials, equipment and incidentals as shown on the plans and as specified herein to install the valve with vault.

PRESSURE CONNECTION (NAPERVILLE)

Description. This work shall consist of installing a valve in a six foot diameter vault under pressure on the existing water main when directed by the Engineer so as not to disrupt service to the existing main. The connection shall be constructed in accordance with Standard Details, all applicable portions of Article 561 of the Standard Specifications and Section 46 of the "Standard Specifications of Water and Sewer Main Construction in Illinois."

Materials. Tapping sleeve shall be made of cast iron, ductile iron or heavy-duty stainless steel. All approved stainless steel heavy-duty tapping sleeves shall be Cascade CST-EX, Ford FTSS, Romac Industries SST III, or Smith Blair Model 665. All nuts, bolts and washers shall be stainless steel, Type 304 or better.

Material Specifications. All tapping sleeves shall conform to the following:

- d) Sleeve to be pressure rated at 150 psi working pressure and 225 psi test pressure.
- e) Construction to be T-304, 18-8 stainless steel, 14 gauge minimum.
- f) Gaskets to provide 360 degree pipe coverage in addition to a full circumference branch seal gasket.
- g) A stainless steel test port and plug shall be provided and the sleeve installation shall be tested prior to cutting the existing pipe.
- h) V-lugs shall be fabricated to the sleeve and drop-in stainless steel bolts, nuts and washers provided. Nuts shall be coated to prevent galling

Construction Requirements. Tapping sleeves of stainless steel shall not be used for "size on size" installations nor on water mains larger than 12 inches in size.

The outside surface of the existing main and the inner face of the tapping sleeve shall be disinfected with a 1% chlorine solution.

After the existing water main pipe surface has been properly cleaned and disinfected, the tapping sleeve shall be mounted to the main and tapping valve to form a pressure-tight connection. The installation shall be pressure tested at operating pressure plus 50 percent, to insure the integrity of the installation. This shall be a hydrostatic test, introduced through a port on the tapping machine, or through a tapped mechanical joint plug on the outlet side of the tapping valve. The tapping machine and the tapping valve and sleeve assembly shall be externally supported so that no additional weight is placed upon the main(s).

Basis of Payment. This work shall be paid for at the contract unit price per each for PRESSURE CONNECTION, of the main size X branch size, which price shall be payment in full for all labor, equipment, and materials necessary to complete the work specified herein including water tapping valves.

Valve vaults shall be paid for separately as VALVE VAULTS, TYPE A, 5' OR 6'-DIAMETER, TYPE 1 FRAME AND CLOSED LID.

WATER MAIN REMOVAL (NAPERVILLE)

Description. This work shall consist of the removal of abandoned water main as shown on the plans. Water main shall be removed according to Article 561 of the Standard Specifications and in conformance with the methods identified in Article 551.03 of the Standard Specifications.

The Contractor is advised that the work will be performed on a potable water system owned and operated by the City of Naperville. As such, all operations shall be performed in such a way as to avoid contamination of the water system through the introduction of contaminants or the process of the work. All work will require the review and approval of the Engineer as coordinated with the City of Naperville prior to the commencement of work operations.

Method of Measurement. This work shall be measured for payment according to Article 561.04 of the Standard Specifications.

Basis of Payment. This work shall be paid for at the contract unit price per foot for WATER MAIN REMOVAL, of the size specified. Payment shall be in full for all labor, equipment and materials necessary to complete the work as described and includes proper disposal of pipe and fittings to be removed.

VALVE VAULTS AND BOXES TO BE REMOVED (NAPERVILLE)

Description. This work shall consist of the removal and disposal of existing water valves, vaults and boxes at locations shown on the plans or as directed by the Engineer.

General. All water shut downs shall be coordinated with the City of Naperville. The excavation left behind may be filled with trench backfill material in accordance with Section 208 of the Standard Specifications. All work and materials necessary to backfill will be incidental to the water main removal pay item and no further compensation will be provided.

Method of Measurement. This work will be paid for at the contract unit price per each for VALVE VAULTS TO BE REMOVED or VALVE BOXES TO BE REMOVED.

Basis of Payment. This work will be paid for at the contract unit price per each for VALVE VAULTS TO BE REMOVED or VALVE BOXES TO BE REMOVED which price shall include all labor, equipment, and materials necessary to perform said work.

SANITARY SEWERS

Description. This work shall conform to Section 550 of the Standard Specifications and to the Standard Specifications for Water and Sewer Main Construction in Illinois.

Construction Requirements. The excavation, bedding, pipe laying, backfilling, and clean up shall be completed in accordance with the applicable portions of Divisions II and III of the Standard Specifications for Water and Sewer Main Construction in Illinois. The bedding for the pipe shall be CA-11 or CA-13 coarse aggregate and shall be placed from 6" below the pipe to 12" over the top of the pipe. The cost for the bedding shall be included in the work.

Materials. All sanitary sewer pipe materials shall conform to the latest applicable ANSI, ASTM, AWWA, AASHTO, or other nationally accepted standards. Ductile-Iron pipe shall meet the minimum requirements for Thickness Class 50.

The name of the manufacturer, class and date of issue shall be clearly identified on all sections of pipe. The contractor shall also submit bills of loading, or other quality assurance documentation when requested by the Engineer.

All sanitary sewer pipes will be bedded in select granular material conforming to the gradation of CA 7.

All trenches for sanitary sewers falling under or within five (5) feet of proposed or existing paved surfaces, or structures shall be backfilled with trench backfill.

Method of Measurement and Basis of Payment. This work will be measured and paid for at the contract unit price per foot for SANITARY SEWER, 8".

SANITARY SEWER REMOVAL

Description: This work shall consist of removing the existing 6" or 8" sanitary sewer as shown in the plans and as directed by the Engineer.

Basis of Payment: This work shall be measured and paid for at the contract unit price per foot for SANITARY SEWER REMOVAL 6" or SANITARY SEWER REMOVAL 8". This item shall include all necessary labor, material, excavation and equipment necessary to complete the work.

SANITARY MANHOLES

Description. This work shall consist of furnishing and construction manhole structures at the locations and to the depths and details shown on the drawings. Manholes shall be in accordance with IDOT Section 1042.10, Type "A" of the inside diameter shown on plans and shall be complete with full height poured concrete invert. Any required exterior drop assemblies shall be incidental to this item. The joints between sections shall have additional bituminous sealing, hand troweled, around the entire exterior of the joint. All manholes shall be reinforced precast concrete construction with steps in accordance with details and diameter shown on the Contract Drawings. The manhole frame and lid shall be as shown on the Contract Drawings.

The watertight frame and bolt-down lid shall be as shown on the Contract Drawings. All bolts shall be stainless steel. The frame shall be set in an "Easy Stick" mastic bed and Contractor shall fill all voids between the cast iron frame and concrete manhole with mastic to provide a watertight seal. The word "sanitary" shall be cast on the lid. Adjusting rings 2" or greater shall be precast concrete, rings less than 2" shall be HDPE in accordance with IDOT Section 1043. All castings shall be set flush with pavement or surrounding surface.

Upon completion of manhole installation, all manholes shall be tested for leakage by vacuum testing. A vacuum of 10" (254 mm) Hg shall be placed on the manhole and the time shall be measured for the vacuum to drop to 9" (229 mm) Hg. The vacuum shall not drop below 9" (229 mm) Hg for the following time periods for each size of manhole:

- a) 48-inch diameter - 60 seconds
- b) 60-inch diameter - 75 seconds

The manhole frame and adjusting rings shall be in place when testing. Any manholes that fail the test shall be sealed and re-tested until acceptable.

APPLICABLE STANDARD SPECIFICATIONS

The work and materials shall conform to applicable provisions of the "Standard Specifications for Water and Sewer Main Construction in Illinois" and in accordance to the details shown on the plans.

Basis of Payment. This work will be paid at the contract unit price each for SANITARY MANHOLE, of the inside diameter shown on plans, which price shall be full compensation for all work and materials, connections to existing pipes, vacuum testing, and any other incidental items required for a completed structure including the frame and closed lid. Backfill material shall be paid separately under the appropriate item of TRENCH BACKFILL or CLSM as indicated in their respective pay item.

SANITARY MANHOLES TO BE ADJUSTED OR RECONSTRUCTED

Description: This work shall consist of adjusting (depth of repair \leq 2 feet) existing sanitary manholes to meet final grade elevations.

General: This work shall be performed according to Section 602 of the Standard Specifications and the following:

The frame shall be set in an "Easy Stick" mastic bed and Contractor shall fill all voids between the cast iron frame and concrete manhole with mastic to provide a watertight seal. Adjusting rings 2" or greater shall be precast concrete, rings less than 2" shall be HDPE in accordance with IDOT Section 1043. An Adaptor-Seal, Infi-Shield, CanUSA (Wrapid Seal), or Flexrib chimney seal shall be installed. All castings shall be set flush with pavement or surrounding surface. Upon completion of manhole installation, all manholes shall be tested for leakage by vacuum testing. A vacuum of 10" (254 mm) Hg shall be placed on the manhole and the time shall be measured for the vacuum to drop to 9" (229 mm) Hg. The vacuum shall not drop below 9" (229 mm) Hg for the following time periods for each size of manhole:

- a) 48-inch diameter - 60 seconds
- b) 60-inch diameter - 75 seconds

The manhole frame and adjusting rings shall be in place when testing. Any manholes that fail the test shall be sealed and re-tested until acceptable.

Basis of Payment. This work shall be paid for at the contract unit price per each for SANITARY MANHOLES TO BE ADJUSTED or SANITARY MANHOLES TO BE RECONSTRUCTED. The unit price shall include all setting or resetting the frame with lid, and excavation and backfill, except excavation in rock, materials, vacuum testing, labor and equipment necessary to adjust the sanitary manhole complete in place.

SANITARY MANHOLES TO BE REMOVED

Description. This work shall consist of removing the existing sanitary manholes at locations noted on the plans and in accordance with the appropriate portions of Section 605 of the Standard Specifications, and this special provision.

Basis of Payment. This work shall be paid for at the contract unit price per Each for SANITARY MANHOLES TO BE REMOVED, which price shall include all labor, material, and equipment necessary to complete the work as specified above.

RESTRICTED DEPTH DRAINAGE STRUCTURES

Description. This work shall consist of constructing restricted depth manholes, catch basins and inlets with a specified frame and grate/lid at locations identified on the plans.

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"; the applicable IDOT Highway Standard(s) for the drainage structure type (manhole, catch basin or inlet); the IDOT Highway Standard Drawing 602601 [flat slab top] and the following:

- *The reinforced concrete slab shall be used in lieu of the cone section.*
- *A 24" sump shall be provided in a Catch Basin.*
- *For structures having Type 8 grates, a 24" inside diameter by 4" (minimum) high riser shall be installed on the flat slab to provide earth cover over the slab for vegetation.*

Method of Measurement. This work will be measured per each of the type drainage structure installed. Drainage structures of like type, size and frame and grate/lid will be counted under the same pay item regardless of whether a cone section (regular) or flat slab (restricted depth) top is used.

Basis of Payment. This work will be paid for at the contract unit price per each for MANHOLES, CATCH BASINS or INLETS, of the type and diameter specified, and with the frame and grate or frame and lid specified. The unit price shall include all equipment, labor and materials to install the drainage structure. No additional compensation will be made for drainage structures constructed as restricted depth.

TEMPORARY INLETS, CATCH BASINS AND MANHOLES

Description. This work shall consist of furnishing, installing, maintaining and removing (or abandoning as noted on the plans) temporary inlets, catch basins and manholes complete with frames, grates and lids of the type specified and at the locations shown in the Temporary Drainage and Erosion Control plans for the purpose of providing positive pavement drainage during construction. This work shall be performed in accordance with Section 602 of the Standard Specifications.

Temporary Inlets, Catch Basins and Manholes of the types specified in the plans will meet the following Illinois Department of Transportation Highway Standards;

Inlet Type	Standard	Description
A	602301	Inlet Type A

Catch Basin Type	Standard	Description
A	602001	Catch Basin Type A
C	602011	Catch Basin Type C

Manhole Size (Ft.)	Standard	Description
4	602401	MANHOLE TYPE A 4' (1.22m) DIAMETER
5	602402	MANHOLE TYPE A 5' (1.52m) DIAMETER
6	602406	MANHOLE TYPE A 6' (1.8m) DIAMETER
7	602411	MANHOLE TYPE A 7' (1.8m) DIAMETER
8	602416	MANHOLE TYPE A 8' (1.8m) DIAMETER
9	602421	MANHOLE TYPE A 9' (1.8m) DIAMETER

The Contractor is responsible for determining the appropriate rim elevations of the temporary structures in order for them to properly drain the excavation during each Maintenance of Traffic Stage in which the structures are in use. Preformed adjusting rings shall be used to bring temporary structures to grade, with the approval of the Engineer. Concrete adjusting rings shall not be used. The Contractor shall tie partially-built storm sewers to the appropriate manholes and inlets at the side of the completed pavement structure or at the appropriate local low point. The Contractor is responsible for supplying and installing temporary sewer pipe as required and/or functioning mission couplings as needed to provide a watertight connection between the storm sewer and the temporary drainage structure. Any storm sewers that are damaged during construction shall be replaced in kind by the Contractor at no additional cost to the contract. Temporary Inlets, Catch Basins and Manholes may be re-used with the approval of the Engineer.

Basis of Payment. This work will be paid for at the contract unit price per each for TEMPORARY INLET, TEMPORARY CATCH BASINS or TEMPORARY MANHOLE, regardless

of the type or diameter specified, which shall include Frames, Grates and Lids, couplings and all costs for installation and removal of the temporary structures.

TEMPORARY STORM SEWER

Description. This work will consist of the construction and removal of temporary storm sewer as indicated on the Temporary Removal plans or as directed by the Engineer.

Temporary storm sewer shall be constructed to provide a fully-functional storm sewer system throughout staged construction. Upon completion of the permanent sewers and at the direction of the Engineer, the temporary storm sewer shall be removed and disposed of according to Article 202.03. All work shall comply with the applicable portions of Section(s) 550, 551, and Section 605 of the Standard Specifications. Materials shall meet the requirements of Articles 550.02 and 550.03 of the Standard Specifications.

Method of Measurement. TEMPORARY STORM SEWER 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 TEMPORARY STORM SEWERS of the class, type and diameter specified. The unit price shall include all materials, labor, equipment, and miscellaneous work necessary to complete the installation, removal, and disposal of the items.

CLASS SI CONCRETE (OUTLET), SPECIAL

Description. This work shall consist of constructing a combination concrete curb and gutter outlet. Construction Requirements: All work shall be installed as shown and detailed in the contract plan drawings and in accordance with Section 606 of the Standard Specifications.

Method of Measurement. This work will be measured for payment in Cubic Yards.

Basis of Payment. This work will be paid for at the contract unit price per cubic yard for CLASS SI CONCRETE (OUTLET), SPECIAL.

CHAIN LINK FENCE, 4' ATTACHED TO STRUCTURE

Description. This work shall consist of all labor, materials and equipment necessary for the mounting of a chain link fence on retaining walls, in accordance with the details and locations shown on the plans and the requirements of Section 664 of the Standard Specifications.

Construction Requirements. All posts shall be vertical when erected; the base plate must be welded to the post at the proper angle to account for any slope along the top of the wall. The fence fabric shall be Type I, Class D and shall be in accordance with Article 1006.27 of the Standard Specifications.

The steel base plate shall meet the requirements of AASHTO M183.

Method of Measurement. This work will be measured for payment per Each.

Basis of Payment. The work under this item will be paid at the contract unit price per foot for CHAIN LINK FENCE, 4' ATTACHED TO STRUCTURE.

BALLAST

Description

This work shall consist of furnishing and installing 8" pre-ballast material required for WCL temporary and WCL final track installations.

Construction Requirements

Contractor shall install and grade the Ballast to a depth 8" above top of sub-ballast prior to any track installation or re-alignment performed by WCL forces. WCL forces shall install the remaining Ballast during track installation.

Materials

Ballast shall be crushed granite, per CN specifications (limestone, dolomite or slag will not be allowed), subject to approval by CN. Ballast shall conform to Section 2.10.4 of the AREMA Manual. AREMA size No. 5 shall be used.

Measurement and Payment. The work under this item will be measured and paid at the contract unit price per ton for BALLAST.

BOLLARDS

Description

This work shall consist of furnishing and installing 6" diameter bollards at location as directed by the Engineer in accordance with the details shown in the plans, Section 634 of the Standard Specifications, and this special provision.

Basis of Payment. This item of work will be measured and paid for at the contract unit price per each for BOLLARDS, and shall include all labor, excavation, equipment and materials to construct the item.

TRACK MONITORING

Description

This work shall consist of developing and implementing a Track Monitoring Program to provide pre-construction and post-construction track surveys, existing bridge, and temporary bridge and daily monitoring of the WCL Railroad tracks for vertical and horizontal movements during all operations that may impact the existing railroad embankment. These operations shall include, but not be limited to:

1. Installation and removal of all TEMPORARY SOIL RETENTION SYSTEM (SPECIAL)
2. Installation and removal of TEMPORARY BRIDGE
3. Installation of all piles

4. All backfilling operations

The Track Monitoring Program shall adhere to all guidelines and restrictions as set forth by the WCL Railroad. No construction activities impacting the existing WCL Railroad embankment shall be permitted prior to approval of the Track Monitoring Program by the Engineer and the WCL Railroad.

Submittals

A Track Monitoring Program to be implemented by the Contractor shall be prepared and sealed by a Professional Engineer licensed in the state of Illinois who is experienced in this type of construction and shall be submitted to the WCL Railroad and the Engineer for approval prior to the start of any survey work.

As part of the Track Monitoring Program, the following submittals, at a minimum, shall be provided to the Engineer and WCL Railroad:

1. Pre-Construction survey report
2. Post-Construction survey report
3. Weekly track condition reports
4. Contingency Plan

The Track Monitoring Program must be submitted for review at least 30 days before commencement of construction activities impacting the existing railroad embankment.

Construction

Prior to the start of any work on the WCL Railroad's right-of-way, the Contractor shall meet with the WCL Railroad Representative to determine his/her requirements for flaggers and all other necessary items related to the work activities on, over and next to the WCL Railroad facilities.

A pre-construction track survey and inspection shall be performed prior to any construction operations taking place which shall consist of the Contractor establishing a horizontal baseline and track elevations. The following track monitoring criteria, at a minimum, shall be met:

1. Each rail shall be monitored 100' north of the proposed bridge to 100' south of the proposed bridge.
2. Each rail of the temporary shoofly track shall be monitored 100' north the temporary bridge to 100' south of the temporary bridge.
3. Establish at least two (2) monitoring points on the existing bridge's north abutment, two (2) points on the existing bridge's south abutment, four (4) points on the existing steel span, four (4) points on the Temporary Bridge steel spans, two (2) points on each stage of each new bridge abutment, and (4) points on the Temporary Soil Retention System (Special).
4. Baseline values shall be set a week prior to the construction of the TEMPORARY SOIL RETENTION SYSTEM (SPECIAL), or any alternate construction activity impacting the railroad embankment that may proceed earth retention elements.
5. Monitor horizontal and vertical ground and track displacements at least three (3) times daily for the first week and at least once daily thereafter. During Temporary Soil Retention System installation, ground displacements shall be monitored on a near continuous basis using a remote monitoring system capable of provided real-time data. Continue monitoring for at least two weeks after the completion of the construction operation.

6. The WCL Railroad shall be notified of any movement noticed during track monitoring, even when below the 1/8" threshold value. The Contractor's Contingency Plan shall be enacted when movements reach the 1/8" threshold value.
7. If ground surface displacements are still occurring after two weeks, continue monitoring up to another four weeks until the displacement stabilizes, or as directed by the WCL Railroad or the Engineer.

The Contingency Plan shall be implemented if the track displacements exceed the threshold (1/8") movement value. Construction activities must be discontinued if track movements exceed the 1/4" shutdown value as established by the pre-construction track survey. Permissible mitigation measures to correct excessive movement of the tracks may include, but are not limited to:

1. Compaction grouting through the embankment to raise the grade
2. Coordination with the WCL Railroad to re-level the tracks affected. Track re-leveling would be done by WCL Railroad forces at their earliest convenience.

Any mitigation measures shall be the responsibility of the Contractor, performed at the Contractor's expense prior to resuming construction operations. Construction shall not resume until mitigation measures are satisfactory to the WCL Railroad.

The Track Monitoring Program shall utilize a remote monitoring system that does not require fouling of the tracks to take the survey readings; fouling the tracks to survey movement is not acceptable other than to place any track monitoring targets. Monitoring targets should be placed such that monitoring is possible when a train is present. However, monitoring during the passing of a train is not required. The same targets should be maintained throughout the duration of the Track Monitoring Program. Targets should be removed once the monitoring phase is completed.

Track conditions shall be documented and tabulated for weekly submittal to the WCL Railroad and the Engineer.

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 and as accepted by the WCL Railroad and the Engineer. If multiple operations are on-going concurrently, the post-construction track survey shall be performed based off the operation that is completed last. All pre-construction and post-construction track survey work shall be included in the cost of the daily track monitoring.

Method of Measurement

The track monitoring will be measured for payment per calendar day until the post-construction track survey is completed. Additional track monitoring that extends beyond the post-construction track survey due to continued ground surface displacements will not be measured for payment.

Basis of Payment

This work will be paid for at the contract unit price per calendar day for TRACK MONITORING.

SUB-BALLAST

Description. Sub-ballast shall be crushed stone and shall meet the requirements as set out in the IDOT Standard Specification, Section 1004, Coarse Aggregate. The Sub-ballast shall be gradation CA 6.

Construction Requirements. The Contractor shall place and grade ballast to the lines, grades and depths shown on the Plans or as directed by the Engineer. Sub-ballast shall be placed with a minimum thickness of 12 inches placed in 6-inch lifts to within 0.5 inches of plan elevations.

Sub-ballast shall be compacted to ninety five (95%) percent and verify with a modified proctor test using a nuclear density meter for every two thousand five hundred (2,500 sq ft) square feet of sub-ballast furnished and installed.

The Sub-ballast shall be placed within 0.5" of plan elevations.

Basis of Payment. The work under this item will be paid at the contract unit price per cubic yard for SUB-BALLAST.

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).

ELECTRIC UTILITY SERVICE CONNECTION

Description. This item shall consist of payment for work performed by NDPU-E 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. For the North Aurora Road and Frontenac Road intersection, It shall be the Contractor's responsibility to contact Naperville Department of Public Utilities – Electric (NDPU-E) and comply with the NDPU-E Rules and Policies. The Contractor shall coordinate the work fully with the NDPU-E 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 NDPU-E, Electric Distribution & Support Services at (630) 420-6193 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 NDPU-E for service. In the event of delay by NDPU-E, 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.

For the North Aurora Road and Pennsbury Lane intersection, It shall be the Contractor's responsibility to contact ComEd. The Contractor shall coordinate his work fully with 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 NDPU-E 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.

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. For bidding purposes, this item shall be estimated as \$10,000.

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.

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.

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 coilable 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.”

HANDHOLES

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. 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.

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.

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.

ACCESSIBLE PEDESTRIAN SIGNALS

Effective: April 1, 2003

Revised: March 1, 2025

888.02TS

Description. This work consists of furnishing and installing accessible pedestrian signals (APS). Each APS consists of an interactive vibrotactile pedestrian push-button with a speaker, informational sign, light emitting diode (LED) indicator light, solid-state electronic control board, power supply, wiring, and mounting hardware. The APS must 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 must be used to assure proper orientation and accessibility where needed. The bracket and/or extension is 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 of the Standard Specifications:

“Stations must be designed to be mounted to a post, mast arm pole or wood pole. The station must be aluminum and must accept a 3 in. round push-button assembly and a regulatory pedestrian instruction sign according to MUTCD sign series R10-3e 9 in. x 15 in. sign with arrow(s) for a countdown pedestrian signal. Stations must be powder coated yellow with a black push-button and a stainless steel tactile arrow on the push-button.”

Electrical Requirements. The APS must 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 must contain a power protection circuit consisting of both fuse and transient protection.

Audible Indications. A push-button locator tone must sound at each push-button and must be deactivated during the associated walk indication and when associated traffic signals are in flashing mode. Push-button locator tones must have a duration of 0.15 seconds or less and must repeat at 1 second intervals. Each actuation of the push-button must be accompanied by the speech message “Wait”. Locator tones must be audible 6 to 12 ft from the push-buttons.

If two accessible pedestrian push-buttons are placed less than 10 ft apart or placed on the same pole, the audible walk and don't walk indication must be a speech message. This speech message must sound throughout the Walk interval only. The common street name must be used and not the route number of the street unless there is no common street name. Locations without a street name (ex: private benefit driveways, shopping plaza entrances, etc.) must use the general term “Commercial Driveway” as a street name for that leg. The speech message must be modeled after: “[Street Name]. Walk Sign is on to cross [Street Name].” For signalized intersections utilizing exclusive pedestrian phasing, the verbal message must be “Walk sign is on for all crossings”. Speech walk messages should not contain any additional information, except they should include designations such as “Street” or “Avenue” where this information is

necessary to avoid ambiguity at a particular location.

In addition, a speech push-button information message must be provided by actuating the APS push-button during the Don't Walk interval. This verbal message must be modeled after: "Wait". The extended press option verbal message must be: "Wait to cross [Street Name] at [Street Name]".

Where two accessible pedestrian push-buttons are separated by 10 ft or more, the Walk indication must be an audible percussive tone. The percussive tone must repeat at 8 to 10 ticks per second with a dominant frequency of 880 Hz. Percussive tones must be uniform at all stations at the intersection and must not change for different directions.

Automatic volume adjustments in response to ambient traffic sound level must be provided up to a maximum volume of 100 dB. Locator tones and speech messages must be no more than 5 dB louder than ambient sound. Locator tones and speech messages must be programmed at the same volume; one must not be significantly louder than the other and must be adjusted as directed by the Engineer.

Railroad Preemption.

At locations interconnected to a railroad crossing, APS push-buttons must be capable of receiving a railroad preemption similar to a traffic signal controller and must be hard wired to the railroad preemption relay inside the traffic signal cabinet. A shelf mount control unit must 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 push-buttons must use speech messages only and must 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: "[Street Name.] 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 simultaneously state "Train Approaching" – this message must be stated two (2) times.

At locations with emergency vehicle preemption (EVP), no additional speech message will be provided during preemption.

At locations with an equestrian push-button style installation, the APS push-buttons must use speech messages only and must emit the audible message from the bottom mounted push-button only.

Locations with Corner Islands or Center Medians

At locations with corner islands, push-buttons must follow the requirements as specified herein regarding the use of a percussive tone vs. a speech message. When push-buttons are closer than 10 ft apart, the speech message must follow the format specified herein for the main street crossing. The speech message must follow the below speech models for the unusual configurations.

Crossing of the right turn lane to or from corner island: “Wait to cross right turn lane for [Street Name] at [Street Name]” and “Walk sign is on to cross right turn lane for [Street Name] at [Street Name]”.

Crossing to refuge island where second push-button actuation is required: “Wait to cross [Street Name] at [Street Name] to median with second push-button” and “Walk sign is on to cross [Street Name] to median with second push-button”.

Center medians on divided highways with a single push-button must have a dual tactile arrow on the push-button.

Pedestrian Push-button. Pedestrian push-buttons must be at least 2 in. (50 mm) in diameter or width. The force required to activate the push-button must be no greater than 3.5 lb (15.5 N).

A red LED must be located on or near the push-button which, when activated, acknowledges the pedestrian’s request to cross the street.

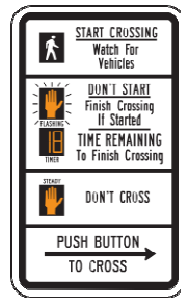
APS push-button systems that utilize any wireless technology to place calls or communicate with the traffic signal controller, including Bluetooth technology, will not be allowed. A central control unit must be provided and installed in the traffic signal cabinet with the latest available firmware. Push-buttons must be connected directly to the central control unit in the traffic signal cabinet using only 2 wires. All push-buttons must be capable of placing a pedestrian call request into the controller and must be hard wired. APS push-buttons must be a direct replacement of existing standard push-buttons and must be weather resistant with a minimum warranty of five (5) years.

APS push-buttons must be compatible with one another and easily replaceable on future replacements or maintenance repairs. Multiple model variations will not be allowed.

All APS push-buttons must come with speech messages pre-programmed for each particular intersection regardless of their location or distance of separation. Final field adjustments, including the use of percussive tones or speech messages, must be completed once push-buttons are installed in the final location. All push-buttons must be programmed with the appropriate parameters and settings as directed by the Engineer. These settings must be standard for all push-buttons and will vary based on the manufacturer. Access to push-button settings must be provided via an application either through wired, wireless or Bluetooth connection. Push-button information, settings and access instructions must all be provided in a weatherproof pouch and safely stored inside each traffic signal cabinet.

The Contractor must 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, the Contractor is to disconnect the power to the isolation board and any wires while leaving the board mounted. This work is included in the cost of APS and will not be paid for separately.

Signage. A sign must be located immediately above the pedestrian push-button and parallel to the crosswalk controlled by the push-button. The sign must 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 push-button, must be provided on the push-button.

Vibrotactile Feature. The push-button must pulse when depressed and must 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 includes furnishing, installation, mounting hardware, extension brackets, and programming of the push-button.

TEMPORARY TRAFFIC SIGNAL INSTALLATION

Effective: May 22, 2002

Revised: March 1, 2025

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 and then back to the existing or proposed cabinet at the end of the contract unless the contract specifies otherwise. The temporary signal cabinet shall have an antenna supplied by the Contractor. Any existing network switches shall be temporarily relocated to the temporary signal and relocated back to the existing cabinet at the end of construction if a new switch is not being installed. 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 UNITERRUPTABLE 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.

MODIFYING EXISTING CONTROLLER CABINET

Effective: May 22, 2002
Revised: July 1, 2015
895.01TS

The work shall consist of modifying an existing controller cabinet as follows:

- (a) Uninterruptable Power Supply (UPS). The addition of uninterruptable power supply (UPS) to an existing controller cabinet could require the relocation of the existing controller cabinet items to allow for the installation of the uninterruptable power supply (UPS) components inside the existing controller cabinet as outlined under Sections 862 and 1074.04 of the Standard Specifications and the wiring of UPS alarms.
- (b) Light Emitting Diode (LED) Signal Heads, Light Emitting Diode (LED) Optically Programmed Signal Heads and Light Emitting Diode (LED) Pedestrian Signal Heads. The contractor shall verify that the existing load switches meet the requirements of Section 1074.03(b)(2) of the Standard Specifications and the recommended load requirements of the light emitting diode (LED) signal heads that are being installed at the existing traffic signal. If any of the existing load switches do not meet these requirements, they shall be replaced, as directed by the Engineer.
- (c) Light Emitting Diode (LED), Signal Head, Retrofit. The contractor shall verify that the existing load switches meet the requirements of Section 1074.03(b)(2) of the Standard Specifications and the recommended load requirements of light emitting diode (LED) traffic signal modules, pedestrian signal modules, and pedestrian countdown signal modules as specified in the plans. If any of the existing load switches do not meet these requirements, they shall be replaced, as directed by the Engineer.
- (d) This item shall include the upgrade of all non-railroad controller software to the latest version available at the time of the signal TURN-ON.

Basis of Payment.

Modifying an existing controller cabinet will be paid for at the contract unit price per each for MODIFY EXISTING CONTROLLER CABINET. This shall include all material and labor required to complete the work as described above, the removal and disposal of all items removed from the controller cabinet, as directed by the Engineer. The equipment for the Uninterruptable Power Supply (UPS) and labor to install it in the existing controller cabinet shall be included in the pay item Uninterruptable Power Supply, Special or Uninterruptable Power Supply, Ground Mounted.

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.”

TRAFFIC SIGNAL GENERAL REQUIREMENTS (D1 LR)

Effective: April 1, 2016

Revised: July 20, 2016

LR800.01TS

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 IMSA 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 this 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 Vendor. Company that sells a particular type of product directly to the contractor or the Equipment Supplier.

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

- Be full service with on-site facilities to assemble, test and trouble-shoot traffic signal controllers and cabinet assemblies.
- Maintain an inventory of IDOT District One approved controllers and cabinets.
- Be staffed with permanent sales and technical personnel able to provide traffic signal controller and cabinet expertise and support.
- Technical staff shall hold current IMSA Traffic Signal Technician Level III certification and shall attend traffic signal turn-ons and inspections with a minimum 14 calendar day notice.

Submittals.

Revise Article 801.05 of the Standard Specifications to read:

All material approval requests shall be submitted to the Resident Engineer, who will then forward the submittal on to the IDOT Local Agency Area Engineer and the Local Agency. Electronic material submittals shall follow the District's Traffic Operations Construction Submittals guidelines. General requirements include:

1. All material approval requests shall be made prior to or no later than one week after 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 requested by the Bureau of Local Roads and Streets, the number of requested sets of the manufacturer's descriptive literatures and technical data for the traffic signal materials shall be submitted.
5. 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.
6. When hard copy submittals are necessary for structural elements, four 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.
7. Partial or incomplete submittals will be returned without review.
8. 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. The Contractor shall account for the additional review time in his schedule.
9. The contract number, the name of the lead local agency (as indicated on the cover sheet of the plans), section number, project location/limits and corresponding pay code number must be on each sheet of correspondence, catalog cuts and mast arm poles and assemblies drawings.
10. 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.
11. 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 'Information Only'. 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.
12. The Contractor shall secure approved materials in a timely manner to assure construction schedules are not delayed.
13. All submitted items reviewed and marked 'APPROVED AS NOTED' or 'DISAPPROVED' are to be resubmitted in their entirety, unless otherwise indicated within the submittal comments or transmittal accompanying the documents, with a disposition of previous comments to verify contract compliance at no additional cost to the contract.
14. 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.

15. 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.

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 equipment supplier in District One. The Department reserves the right to request any controller and cabinet to be tested at the equipment supplier's facility prior to field installation, at no extra cost to this contract.

Maintenance and Responsibility.

Revise Article 801.11 of the Standard Specifications to read:

- a. Existing traffic signal installations and/or any electrical facilities at all or various locations may be altered or reconstructed totally or partially as part of the work on this Contract. The Contractor is hereby advised that all traffic control equipment, presently installed at these locations, may be the property of the State of Illinois, Department of Transportation, Division of Highways, County, Private Developer, Municipality or Transit Agency in which they are located. Once the Contractor has begun any work on any portion of the project, all traffic signals within the limits of this contract or those which have the item "Maintenance of Existing Traffic Signal Installation," "Temporary Traffic Signal Installation(s)" and/or "Maintenance of Existing Flashing Beacon Installation," shall become the full responsibility of the Contractor. The Contractor shall supply the Resident Engineer, IDOT Local Agency Area Engineer, Local Agency, the Owner of the traffic signal, and/or their Electrical Maintenance Contractor with two 24-hour emergency contact names and telephone numbers.
- b. Automatic Traffic Enforcement equipment such as red lighting running and railroad crossing camera systems are owned and operated by others and the Contractor shall not be responsible for maintaining this equipment.
- c. Regional transit, County and other agencies may also have equipment connected to existing traffic signal or peripheral equipment such as PTZ

cameras, switches, transit signal priority (TSP and BRT) servers and other devices that shall be included with traffic signal maintenance at no additional cost to the contract.

- d. When the project has a pay item for "Maintenance of Existing Traffic Signal Installation," "Temporary Traffic Signal Installation(s)" and/or "Maintenance of Existing Flashing Beacon Installation," the Contractor must notify the Resident Engineer, the Local Agency, the Owner of the traffic signal, and/or their Electrical Maintenance Contractor 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. If work is started prior to an 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 no cost to the owner of the traffic signal. 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.
- e. 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 of the Engineer. Approval to shut down the traffic signal installation will only be granted during the period extending from 10:00 a.m. to 3:00 p.m. on weekdays. Shutdowns shall not be allowed during inclement weather or holiday periods.
- f. The Contractor shall be fully responsible for the safe and efficient operation of the traffic signals and other equipment noted herein. Any inquiry, complaint or request by the Department, the Local Agency, the Owner of the traffic signal, and/or their Electrical Maintenance Contractor, or the public, shall be investigated and repairs begun within one hour. Failure to provide this service will result in liquidated damages of \$1000 per day per occurrence. In addition, the Department 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 \$1000 per month per occurrence. Unpaid bills will be deducted from the cost of the Contract. The Department, the Local Agency, the Owner of the traffic signal, and/or their Electrical Maintenance Contractor may inspect any signaling device under their jurisdiction at any time without notification.

- g. 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.
- h. The Contractor shall be responsible to clear snow, ice, dirt, debris or other condition that obstructs visibility of any traffic signal display or access to traffic signal equipment.
- i. The Contractor shall maintain the traffic signal in normal operation during short or long term loss of utility or battery back-up power at critical locations designated by the Engineer. Critical locations may include traffic signals interconnected to railroad warning devices, expressway ramps, intersection with an SRA route, critical corridors or other locations identified by the Engineer. Temporary power to the traffic signal must meet applicable NEC and OSHA guidelines and may include portable generators and/or replacement batteries. Temporary power to critical locations shall not be for separately but shall be included in the contract.

Damage to Traffic Signal System.

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

Any traffic signal control equipment damaged or not operating properly from any cause shall be replaced with new equipment meeting current District One traffic signal specifications and/or applicable Local Agency 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 otherwise the traffic signal installation will not be accepted. Cable splices are only allowed at the bases of post and mast arms.

Temporary replacement of damaged or knockdown of a 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.

Automatic Traffic Enforcement equipment, such as Red Light Enforcement cameras, detectors, and peripheral equipment, 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:

It is the intent to have all electric work completed and equipment field tested by the Equipment Supplier 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 road is open to traffic, except as otherwise provided in Section 850 of the Standard Specifications, the Contractor may request a turn-on and inspection of the completed traffic signal installation at each separate location. This request must be made to the Bureau of Local Roads and Streets at (847) 705-4487 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, or TEMPORARY TRAFFIC SIGNAL TIMINGS, 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 control equipment vendor's office 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 Agency that is responsible for the maintenance of each traffic signal installation will assume the maintenance upon successful completion of this inspection.

The District requires the following Final Project Documentation from the Contractor at traffic signal turn-ons in electronic format in addition to hard copies where noted. A CD/DVD shall be submitted with separate folders corresponding to each numbered title below. The CD/DVD shall be labelled with date, project location, company and contract or permit number. Record Drawings, Inventory and Material Approvals shall be submitted prior to traffic signal turn-on for review by the Department as described here-in.

Final Project Documentation:

1. Record Drawings. Signal plans of record with field revisions marked in red ink. One hard copy set of 11"x17" record drawings shall also be provided.
2. Inventory. Inventory of new and existing traffic signal equipment including cabinet types and devices within cabinets in an Excel spread sheet format. One hard copy shall also be provided.

3. Pictures. Digital pictures of a minimum 12M pixels of each intersection approach showing all traffic signal displays and equipment. Pictures shall include controller cabinet equipment in enough detail to clearly identify manufacture and model of major equipment.
4. Field Testing. Written notification from the Contractor and the equipment vendor of satisfactory field testing with corresponding material performance measurements, such as for detector loops and fiber optic systems (see Article 801.13). One hard copy of all contract required performance measurement testing shall also be provided.
5. Materials Approval. The material approval letter. A hard copy shall also be provided.
6. Manuals. Operation and service manuals of the signal controller and associated control equipment. One hard copy shall also be provided.
7. Cabinet Wiring Diagram and Cable Logs. Five (5) hard copies 11" x 17" of the cabinet wiring diagrams shall be provided along with electronic pdf and dgn files of the cabinet wiring diagram. Five 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.
8. Controller Programming Settings. The traffic signal controller's timings; backup timings; coordination splits, offsets, and cycles; TBC Time of Day, Week and Year Programs; Traffic Responsive Program, Detector Phase Assignment, Type and Detector Switching; and any other functions programmable from the keyboard. The controller manufacturer shall also supply a printed form, not to exceed 11" x 17" for recording that data noted above. The form shall include a location, date, manufacturer's name, controller model and software version. The form shall be approved by the Engineer and a minimum of three (3) copies must be furnished at each turn-on. The manufacturer must provide all programming information used within the controller at the time of turn-on.
9. Warrantees and Guarantees. All manufacturer and contractor warrantees and guarantees required by Article 801.14.
10. GPS coordinate of traffic signal equipment as describe 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 the traffic signal. If approved, traffic signal acceptance shall be verbal at the "turn on" 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 final inspection. The Contractor shall notify the Electrical Maintenance Contractor to inspect 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 above requirements 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 above requirements 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 2nd paragraph of Article 801.16 of the Standard Specifications to read:

“When the work is complete, and seven days before the request for a final inspection, the reduced-size 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 for review and approval. 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 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 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.”

As part of the record drawings, the Contractor shall inventory all traffic signal equipment, new or existing, on the project and record information in an Excel spreadsheet. The inventory shall include equipment type, model numbers, software manufacturer and version and quantities.

Add the following to Article 801.16 of the Standard Specifications:

“In addition to the specified record drawings, the Contactor shall record GPS coordinates of the following traffic signal components being installed, modified or being affected in other ways by this contract:

- All Mast Arm Poles and Posts
- Traffic Signal Wood Poles
- Rail Road Bungalow
- UPS
- Handholes
- Conduit roadway crossings
- Controller Cabinets
- Communication Cabinets
- Electric Service Disconnect locations
- CCTV Camera installations
- Fiber Optic Splice Locations
- Conduit Crossings

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:

- File shall be named: TSXXX-YY-MM-DD (i.e. TS22157_15-01-01)
- 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, per the IDOT special provisions

Examples:

Date	Item	Description	Latitude	Longitude
01/01/2015	MP (Mast Arm Pole)	NEQ, NB, Dual, Combination Pole	41.580493	-87.793378
01/01/2015	HH (Handhole)	Heavy Duty, Fiber, Intersection, Double	41.558532	-87.792571
01/01/2015	ES (Electrical Service)	Ground mount, Pole mount	41.765532	-87.543571
01/01/2015	CC (Controller Cabinet)		41.602248	-87.794053
01/01/2015	RSC (Rigid Steel Crossing)	IL 31 east side crossing south leg to center HH at Klausen	41.611111	-87.790222
01/01/2015	PTZ (PTZ)	NEQ extension pole	41.593434	-87.769876
01/01/2015	POST (Post)		41.651848	-87.762053
01/01/2015	MCC (Master Controller Cabinet)		41.584593	-87.793378
01/01/2015	COMC (Communication Cabinet)		41.584600	-87.793432
01/01/2015	BBS (Battery Backup System)		41.558532	-87.792571
01/01/2015	CNCR (Conduit Crossing)	4-inch IL 31 n/o of Klausen	41.588888	-87.794440

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 1 foot. 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.

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 a minimum 1 foot 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."

Delete the last sentence of the 3rd paragraph of Article 801.16.

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 this Contract requires the services of an Electrical Contractor, the Contractor shall be responsible at his/her own expense for locating existing IDOT electrical facilities prior to performing any work. If this Contract does not require the 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 may be at the expense of the Contractor. For non-IDOT signals, the Contractor shall coordinate with the agency owning the traffic signals for locating the existing electrical facilities. 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.

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

Bagging Signal Heads.

Light tan colored traffic and pedestrian signal reusable covers shall be used to cover dark/un-energized signal sections and visors. 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 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.

CONDUIT SPLICE

Description. This work shall consist of locating and intercepting the existing conduit at locations as shown on the plans or as directed by the Engineer. The contractor shall locate the conduit and make any preparations to the existing conduit in order to connect the proposed galvanized steel conduit.

Basis of Payment. This work shall be paid for at the contract unit price each for CONDUIT SPLICE which shall include all connections, materials and labor, necessary to locate the existing conduit and prepare the existing conduit for connection to the new galvanized steel conduit. The galvanized steel conduit shall be paid for separately

REMOVE EXISTING SIGNAL CABLE

Revise Article 895.08 Paragraph 6 of the Standard Specifications to read:

Basis of Payment:

Removal of existing signal electric cable shall be included in the contract unit cost for REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT. The salvage value of the removed cables shall be reflected in the contract bid price.

GENERAL ELECTRICAL REQUIREMENTS

In addition to the below requirements the contractor is to follow the Naperville Standard Specifications for Construction and Standard Details – Section 600 and Aurora “Section II. Streets” Part K.

<https://www.aurora-il.org/887/Section-II-Streets>

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.

Within 30 calendar days after contract execution, the Contractor shall submit, for approval, 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.

Each PDF document must be a vector format PDF from the originating supplier or program and not scanned images.

The submittal must clearly identify the specific model number or catalog number of the item being proposed.

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.

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 Department may provide a list of pay items broken out by discipline upon request for a particular contract.

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 Department.

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 transfer and Preconstruction Inspection:

General. Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall request a maintenance transfer and preconstruction site inspection, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting and/or traffic control systems which may be affected by the work. The request for the maintenance transfer and preconstruction inspection shall be made no less than fourteen (14) calendar days prior to the desired inspection date. The maintenance transfer and preconstruction inspection shall:

Establish the procedures for formal transfer of maintenance responsibility required for the construction period.

Establish the approximate location and operating condition of lighting and/or traffic control systems which may be affected by the work

Marking of Existing Cable Systems. The party responsible for maintenance of any existing lighting and/or traffic control systems at the project site will, at the Contractor's request, mark and/or stake, once per location, all underground cable routes owned or maintained by the State. A project may involve multiple "locations" where separated electrical systems are involved (i.e. different controllers). The markings shall be taken to have a horizontal tolerance of at least 1 foot (304.8 mm) to either side. The request for the cable locations and marking shall be made at the same time the request for the maintenance transfer and preconstruction inspection is made. The Contractor shall exercise extreme caution where existing buried cable runs are involved. The markings of existing systems are made strictly for assistance to the Contractor and this does not relieve the Contractor of responsibility for the repair or replacement of any cable run damaged in the course of his work, as specified elsewhere herein. Note that the contractor shall be entitled to only one request for location marking of existing systems and that multiple requests may only be honored at the contractor's expense. No locates will be made after maintenance is transferred, unless it is at the contractor's expense.

Condition of Existing Systems. The Contractor shall conduct an inventory of all existing electrical system equipment within the project limits, which may be affected by the work, making note of any parts which are found broken or missing, defective or malfunctioning. Megger and load readings shall be taken for all existing circuits which will remain in place or be modified. If a circuit is to be taken out in its entirety, then readings do not have to be taken. The inventory and test data shall be reviewed with and approved by the Engineer and a record of the inventory shall be submitted to the Engineer for the record. Without such a record, all systems transferred to the Contractor for maintenance during construction shall be returned at the end of construction in complete, fully operating condition."

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.

Damage to Electrical Systems. Should damage occur to any existing electrical systems through the Contractor's operations, the Engineer will designate the repairs as emergency or non-emergency in nature.

Emergency repairs shall be made by the Contractor, or as determined by the Engineer, the Department, or its agent. Non-emergency repairs shall be performed by the Contractor within six working days following discovery or notification. All repairs shall be performed in an expeditious manner to assure all electrical systems are operational as soon as possible. The repairs shall be performed at no additional cost to the Department.

Lighting. An outage will be considered an emergency when three or more lights on a circuit or three successive lights are not operational. Knocked down materials, which result in a danger to the motoring public, will be considered an emergency repair.

Temporary aerial multi-conductor cable, with grounded messenger cable, will be permitted if it does not interfere with traffic or other operations, and if the Engineer determines it does not require unacceptable modification to existing installations.

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 Department.

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 shall be measured and recorded with all loads disconnected. Prior to performance of the insulation resistance test, the Contractor shall remove all fuses within all light pole bases on a circuit to segregate the luminaire loads.

On tests of new cable runs, the readings shall exceed 50 megohms for phase and neutral conductors with a connected load over 20A and shall exceed 100 megohms for conductors with a connected load of 20A 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.

ITS. The following test shall be made in addition to the lighting system test above.

Detector Loops. Before and after permanently securing the loop in the pavement, the resistance, inductance, resistance to ground, and quality factor for each loop and lead-in circuit shall be tested. The loop and lead-in circuit shall have an inductance between 20 and 2500 microhenries. The resistance to ground shall be a minimum of 50 megohms under any conditions of weather or moisture. The quality factor (Q) shall be 5 or greater.

Fiber Optic Systems. Fiber optic testing shall be performed as required in the fiber optic cable special provision and the fiber optic splice special provision.

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 120 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 Department.

- (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.

The warranty for an uninterruptable power supply (UPS) shall cover a minimum of two years from date the equipment is placed in operation; however, the batteries of the UPS shall be warranted for full replacement for a minimum of five years.

Record Drawings. Alterations and additions to the electrical installation made during the execution of the work shall be made on the PDF copy of the as-Let documents using a PDF editor. Hand drawn notations or markups and scanned plans are not acceptable. These drawings shall be updated daily and shall be available for inspection by the Engineer during the work. The record drawings shall include the following:

- Cover Sheet
- The Electrical Maintenance Contract Management System (EMCMS) location designation, i.e. "L" number
- Summary of Quantities, electrical items only
- Legends, Schedules, and Notes
- Plan Sheets
- Pertinent Details
- Single Line Diagrams
- 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

The following electronic inventory forms are available from the Engineer:

- Lighting Controller Inventory
- Lighting Inventory
- Light Tower Inspection Checklist
- ITS Location Inventory

The information shall be entered in the forms; handwritten entries will not be acceptable; except for signatures. Electronic file shall also be included in the documentation.

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 through TOCS, on CD-ROM 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 three 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 three hardcopies and two CD-ROMs of the final documentation shall be submitted. The identical material shall also be submitted through the TOCS system utilizing the following final documentation pay item numbers:

Pay Code	Description	Discipline
FDLRD000	Record Drawings - Lighting	Lighting
FDSRD000	Record Drawings - Surveillance	Surveillance
FDTRD000	Record Drawings - Traffic Signal	Traffic Signal
FDIRD000	Record Drawings - ITS	ITS
FDLCC000	Catalog Cuts - Lighting	Lighting
FDSCC000	Catalog Cuts - Surveillance	Surveillance
FDTCC000	Catalog Cuts - Traffic Signal	Traffic Signal
FDICC000	Catalog Cuts - ITS	ITS
FDLWL000	Warranty - Lighting	Lighting
FDSWL000	Warranty - Surveillance	Surveillance
FDTWL000	Warranty - Traffic Signal	Traffic Signal
FDIWL000	Warranty - ITS	ITS
FDLTR000	Test Results - Lighting	Lighting
FDSTR000	Test Results - Surveillance	Surveillance
FDTTR000	Test Results - Traffic Signal	Traffic Signal
FDITR000	Test Results - ITS	ITS
FDLINV00	Inventory - Lighting	Lighting

FDSINV00	Inventory - Surveillance	Surveillance
FDTINV00	Inventory - Traffic Signal	Traffic Signal
FDIINV00	Inventory - ITS	ITS
FDLGPS00	GPS - Lighting	Lighting
FDSGPS00	GPS - Surveillance	Surveillance
FDTGPS00	GPS - Traffic Signal	Traffic Signal
FDIGPS00	GPS - ITS	ITS

Record Drawings shall include Marked up plans, controller info, Service Info, Equipment Settings, Manuals, Wiring Diagrams for each discipline.

Test results shall be all electrical test results, fiber optic OTDR, and Fiber Optic power meter as applicable for each discipline.

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.
- Control Buildings.
- Structures with electrical connections, i.e. DMS, lighted signs.
- Electric Service locations.
- CCTV Camera installations.
- Roadway Surveillance installations.
- Fiber Optic Splice Locations.
- Fiber Optic Cables. Coordinates shall be recorded along each fiber optic cable route every 200 feet.
- All fiber optic slack locations shall be identified with quantity of slack cable included. When sequential cable markings are available, those markings shall be documented as cable marking into enclosure and marking out of enclosure.

Datum to be used shall be North American 1983.

Data shall be provided electronically. 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

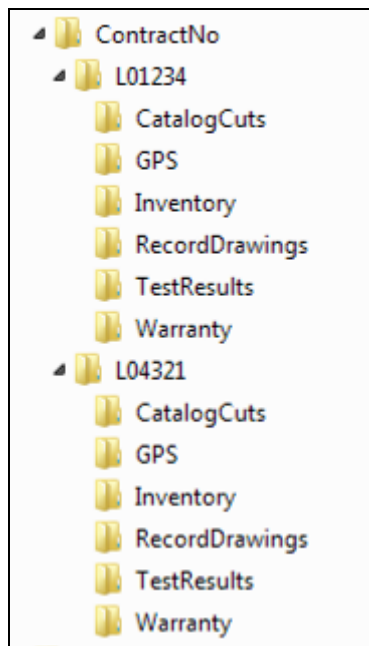
A spreadsheet template will be available from the Engineer for use by the Contractor.

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.”

The documents on the CD shall be organized by the Electrical Maintenance Contract Management System (EMCMS) location designation. If multiple EMCMS locations are within the contract, separate folders shall be utilized for each location as follows:



Extraneous information not pertaining to the specific EMCMS location shall not be included in that particular folder and sub-folder.

The inspection will not be made until after the delivery of acceptable record drawings, specified certifications, and the required guarantees.

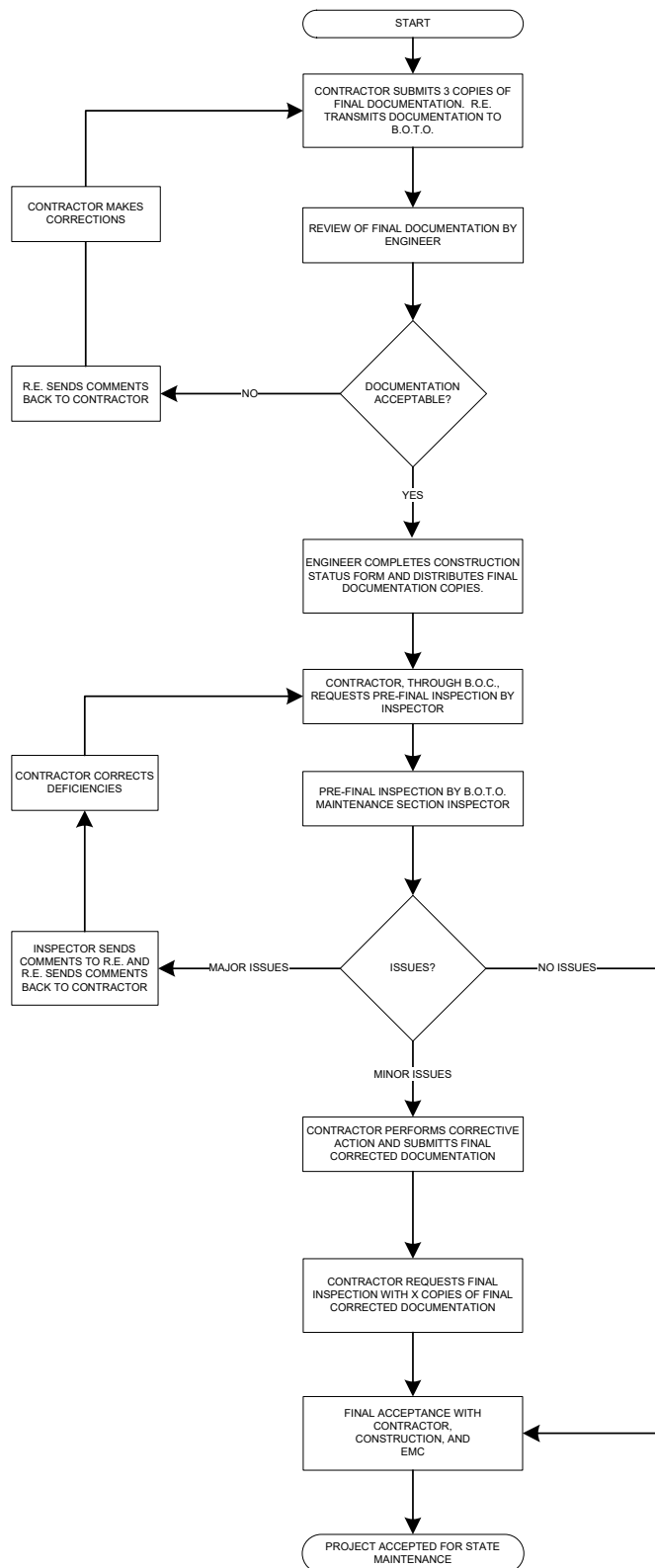
The Final Acceptance Documentation Checklist shall be completed and is contained elsewhere herein.

All CD's shall be labeled as illustrated in the CD Label Template contained herein.

Acceptance. Acceptance of electrical work will be given at the time when the Department 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		
-Three 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"/>
(Three 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		
(Three 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		
(Three Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Lighting Controller Inventory Form		
(Three Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Light Tower Inspection Form		
(If applicable, Three Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>

Three 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 shall be 11” x 17” size. 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.

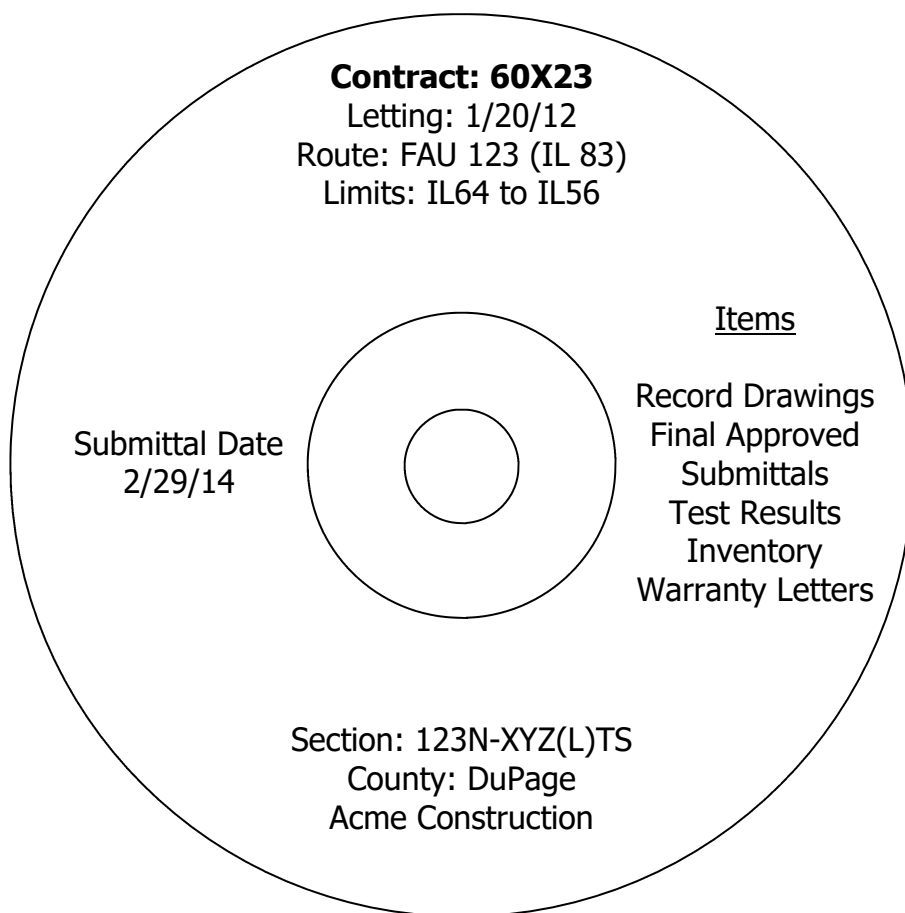
Lighting Inventory Form – Inventory form should include only proposed light poles, proposed light towers, proposed combination (traffic/light pole) lighting and proposed underpass luminaires.

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.



MAINTENANCE OF LIGHTING SYSTEMS

Effective: March 1, 2017

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 State.

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, State of Illinois, Department of Transportation, Division of Highways, District One. 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 Department 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 State'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 SAFETY CABLE ASSEMBLY

Effective: January 1, 2012

Description: This item shall consist of providing a luminaire safety cable assembly as specified herein and as indicated in the plans.

Materials. Materials shall be according to the following:

Wire Rope. Cables (wire rope) shall be manufactured from Type 304 or Type 316 stainless steel having a maximum carbon content of 0.08 % and shall be a stranded assembly. Cables shall be 3.18 mm (0.125") diameter, 7x19 Class strand core and shall have no strand joints or strand splices.

Cables shall be manufactured and listed for compliance with Federal Specification RR-W-410 and Mil-DTL-83420.

Cable terminals shall be stainless steel compatible with the cable and as recommended by the cable manufacturer. Terminations and clips shall be the same stainless steel grade as the wire rope they are connected to.

U-Bolts. U-Bolts and associated nuts, lock washers, and mounting plates shall be manufactured from Type 304 or Type 316 stainless steel.

CONSTRUCTION REQUIREMENTS

General. The safety cable assembly shall be installed as indicated in the plan details. One end of the cable assembly shall have a loop fabricated from a stainless steel compression sleeve. The other end of the cable assembly shall be connected with stainless steel wire rope clips as indicated. Slack shall be kept to a minimum to prevent the luminaire from creeping off the end of the mast arm. Unless otherwise indicated in the plans, the luminaire safety cable shall only be used in conjunction with luminaires which are directly above the traveled pavement.

Basis of Payment: This work shall be paid for at the contract price each for LUMINAIRE SAFETY CABLE ASSEMBLY, which shall be payment for the work as described herein and as indicated in the plans.

HELIX FOUNDATION AND BREAKAWAY DEVICE

Description. This work consists of furnishing and installing steel helix foundations and a breakaway device at the locations shown on the plans.

Submittals. Contractor shall submit Shop drawing(s) of the helix foundation and breakaway device for review and approval by the Engineer. The Contractor shall be responsible for the design of the helix foundation, foundation hardware and breakaway coupling assembly in accordance with AASHTO "Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals" loading. The shop drawings shall be stamped by a structural engineer licensed in Illinois.

A calibration report dated within 45 days of commencement of the work shall be submitted to the Engineer for each torque indicator or torque motor to be used on the Project. The report shall include the name of the testing company and contact information, the serial numbers of the items tested, a description of the test, and the results.

Signed installation records shall be submitted to the Engineer as described herein.

Materials. Helix foundations shall be steel a maximum of eight (8) feet in length with a minimum shaft diameter of 3 ½ inches.

The helix foundation shall comply with the following properties:

Installation Torque Factor (k)	Axial Compression Load Limit	Ultimate-Limit Tension Strength	Useable Torsional Strength
8	115,000 lb.	120,000 lb.	13,000 ft-lb

Helical steel shaft shall conform to ASTM A500, A572 or A53 and wall thickness shall conform to ASTM A513 and provide a minimum yield strength of 65 ksi. Helix plate(s) shall be a minimum of 10" inches in diameter and 3/8 inches in thickness and comply with ASTM A500, A635, or A572 Grade 50. Helix plate geometry shall conform to ICC-ES AC358. An 8"X8" X ¾ inch thick steel base plate conforming to ASTM A36 shall be welded to the top of the helix foundation in accordance with AWS D1.1 Structural Welding Code and Article 505.04 (q). The base plate shall contain four bolt holes for connecting the post to the helix foundation and a center hole for routing the ground conductor. A hole shall be provided in the shaft just below ground surface to route the grounding conductor to the ground rod. Helix foundation and base plate shall be hot dipped galvanized in accordance with AASHTO M111 and ASTM A123.

Construction Requirements. The helix foundation shall be installed in accordance with the manufacturer's recommended procedures. The installation shall be accomplished by either a boom type or a bed mounted type digger truck. The maximum torque limit of 13,000 ft.-lb. shall not be exceeded to avoid damage to the foundation. In the case of extremely difficult soils that cause the mechanical limit of the foundation to be exceeded, the foundation may be installed at the discretion of the Engineer in one of two methods. Predrilling a hole that is less than the shaft diameter or using water as a lubricant. When the foundation is installed by either method, minimum torque requirements of 5000 ft.-lb. shall be used during installation. The installation torque shall be

measured by torque measuring devices for that purpose or by calibrating the hydraulic system of the installing equipment. Any minor voids within the helix foundation shall be filled with fine aggregate.

A minimum No. 2 AWG solid bare copper wire shall connect the radar speed sign post ground bus bar to a 5/8" diameter by 8 foot long copper clad ground rod in accordance with the plans. The grounding conductor shall be connected to the ground rod using exothermic welding. A No. 6 AWG conductor placed in a 1" diameter UL approved liquid-tight conduit including fittings, shall be used to ground the radar speed sign electronics to the ground bus bar.

The Contractor shall prepare and submit accurate records of the foundation installation. For each installation the record shall include the date and time of installation, name and model of installation equipment, type of torque indicator used, details of the helix foundation, total length of installed helix anchor, exact installation angle, installation torque at 1 foot intervals, and comments regarding any interruptions, obstructions, or other relevant information. The records shall be signed by an authorized Contractor representative and submitted to the Engineer.

Method of Measurement. HELIX FOUNDATION AND BREAKAWAY DEVICE shall be counted as each upon successful completion of installation as described herein for payment.

Basis of Payment. This item will be paid for at the contract unit price each for furnishing and installing HELIX FOUNDATION AND BREAKAWAY DEVICE, which shall be payment in full for all material and work as specified herein.

WOOD POLE, 35 FT, CLASS 4

Description. This item shall consist of furnishing and erecting 35' wood poles at locations specified in the plans and in accordance with Article 830 of the Standard Specifications.

Basis of Payment. This work will be paid for at the contract unit price per each for WOOD POLE, 35 FT, CLASS 4 which shall be payment in full for labor, materials, and equipment required to erect the pole.

LIGHT POLE FOUNDATION, 24" DIAMETER, OFFSET

Description. This item shall consist of the construction of a steel reinforced concrete offset foundation, 24 inches in diameter, with offset construction, as indicated, and complete with raceways, all as indicated on the Contract Drawings. The foundation shall include an excavation, reinforcement, concrete, anchor bolts, nuts, washers, and raceways.

Materials.

- 2.1 Concrete shall be Class SI complying with Article 503 of the Standard Specifications.
- 2.2 Epoxy coated reinforcement bars shall comply with Article 508 of the Standard Specifications.
- 2.3 Unless otherwise indicated, anchor bolts shall comply with the requirements of ASTM Designation A687. Unless otherwise indicated, nuts shall be hexagon nuts in conformance with ASTM A563, Grade A, and washers shall be in conformance with ASTM F436.
- 2.4 The entire length of the anchor bolts as well as the nuts and washers shall be hot dip galvanized in accordance with the requirements of ASTM Designation A153.
- 2.5 Unless otherwise indicated, conduit raceways shall be heavy wall rigid polyvinyl chloride (PVC) conduit, Schedule 40, UL listed and in conformance with NEMA TC2. Raceways shall be of the number and size as indicated.

Construction Requirements.

- 3.1 The foundation depths shall be as directed by the Engineer based upon evaluation of the soil conditions encountered. The Engineer may determine soil condition by visual inspection, or, where practical, by the use of a pocket penetrometer and will establish foundation depth based upon the foundation depth table shown on the Plans, where applicable.
- 3.2 The hole for the foundation shall be made by drilling with an auger of the same diameter as the foundation. The foundation shall be cast-in-place and allowed to cure for 10 days minimum before the light pole is erected. If soil conditions require the use of a liner to form the hole, the liner shall be withdrawn as the concrete is deposited. The top of the foundation shall be constructed level so that no shims or other leveling devices will be needed to set the light standard plumb on the foundation. A liner or form shall be used to produce a uniform smooth side to the top of foundation. The top of foundation shall be chamfered $\frac{3}{4}$ inch unless otherwise indicated.

3.3 Extreme care shall be used in establishing the top elevation of concrete foundations, especially when foundations are installed before final grading is complete. Foundations shall not protrude above grade more than the limits indicated on the plans. Unless otherwise indicated, foundations shall not protrude above grade more than 4 inches above a 60-inch chord centered at the foundation, at any point around the circumference. Where foundation heights extend beyond specified limits, the Engineer may direct replacement of the foundation at no cost to the State or Village.

3.4 The steel reinforcement, the raceway conduits, and the anchor bolts shall be secured in place to each other and properly positioned in the augered hole so that at the time of concrete placement, the above-said components retain their proper positions. Special attention shall be paid to the positioning of the anchor bolts. It is of utmost importance that the anchor bolt projections on top of the foundation remain in a vertical position after placement of the concrete.

Method Of Measurement. The foundation shall be measured for payment in linear feet of foundation in place, with the measurement to be taken along the vertical and horizontal centerlines of the foundation except that the total depth shall not be greater than indicated on the Plans unless directed by the Engineer.

Basis Of Payment. This work will be paid for at the contract unit price per foot for LIGHT POLE FOUNDATION, 24" DIAMETER, OFFSET, which shall be payment in full for the work as shown on the Plans and as described herein.

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.**”

UNIT DUCT

Effective: January 1, 2012

Revise the first paragraph of Article 810.04 to read:

“The unit duct shall be installed at a minimum depth of 30-inches (760 mm) unless otherwise directed by the Engineer.”

Revise Article 1088.01(c) to read:

“(c) Coilable Nonmetallic Conduit.

General:

The duct shall be a plastic duct which is intended for underground use and which can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance. The duct shall be a plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be made of high density polyethylene which shall meet the requirements of ASTM D 2447, for schedule 40. The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade P33. The wall thickness shall be in accordance with Table 2 for ASTM D 2447.

The duct shall be UL Listed per 651-B for continuous length HDPE coiled conduit. The duct shall also comply with NEC Article 354.100 and 354.120.

Submittal information shall demonstrate compliance with the details of these requirements.

Dimensions:

Duct dimensions shall conform to the standards listed in ASTM D2447. Submittal information shall demonstrate compliance with these requirements.

Nominal Size		Nominal I.D.		Nominal O.D.		Minimum Wall	
mm	in	mm	in	mm	in	mm	in
31.75	1.25	35.05	1.380	42.16	1.660	3.556 +0.51	0.140 +0.020
38.1	1.50	40.89	1.610	48.26	1.900	3.683 +0.51	0.145 +0.020

Nominal Size		Pulled Tensile	
mm	in	N	lbs
31.75	1.25	3322	747
38.1	1.50	3972	893

Marking:

As specified in NEMA Standard Publication No. TC-7, the duct shall be clearly and durably marked at least every 3.05 meters (10 feet) with the material designation (HDPE for high density polyethylene), nominal size of the duct and the name and/or trademark of the manufacturer.

Performance Tests:

Polyethylene Duct testing procedures and test results shall meet the requirements of UL 651. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct. Duct crush test results shall meet or exceed the following requirements:

Duct Diameter		Min. force required to deform sample 50%	
mm	in	N	lbs
35	1.25	4937	1110
41	1.5	4559	1025

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.”

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:

1. 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
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 (l/w).
4. Initial delivered lumens at the specified color temperature, drive current, and ambient temperature.
5. IES file associated with each submitted luminaire in the IES LM-63 format.
6. Computer photometric calculation reports as specified and in the luminaire performance table.
7. TM-15 BUG rating report.
8. Isofootcandle chart with max candela point and half candela trace indicated.
9. Documentation of manufacturers experience and verification that luminaires were assembled in the U.S.A. as specified.
10. 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	_____	Ft
	Number of Lanes Left of Median	_____	
	Number of Lanes Right of Median	_____	
	Lane Width	_____	Ft
	Median Width	_____	Ft
	IES Surface Classification	_____ R3	
	Q-Zero Value	_____ 0.07	
Mounting Data	Mounting Height	_____	Ft
	Mast Arm Length	_____	Ft
	Pole Set-Back from Edge of Pavement	_____	Ft
Luminaire Data	Source	_____ LED	
	Color Temperature	_____ 4000	°K
	Lumens	_____	Min
	Pay Item Lumen Designation	_____ Choose an item.	
	BUG Rating	_____	
	IES Vertical Distribution	_____	
	IES Control of Distribution	_____	
	IES Lateral Distribution	_____	
Pole Layout Data	Total Light Loss Factor	_____ 0.75	
	Spacing	_____	Ft
	Configuration	_____ Choose an item.	
	Luminaire Overhang over E.O.P.	_____	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

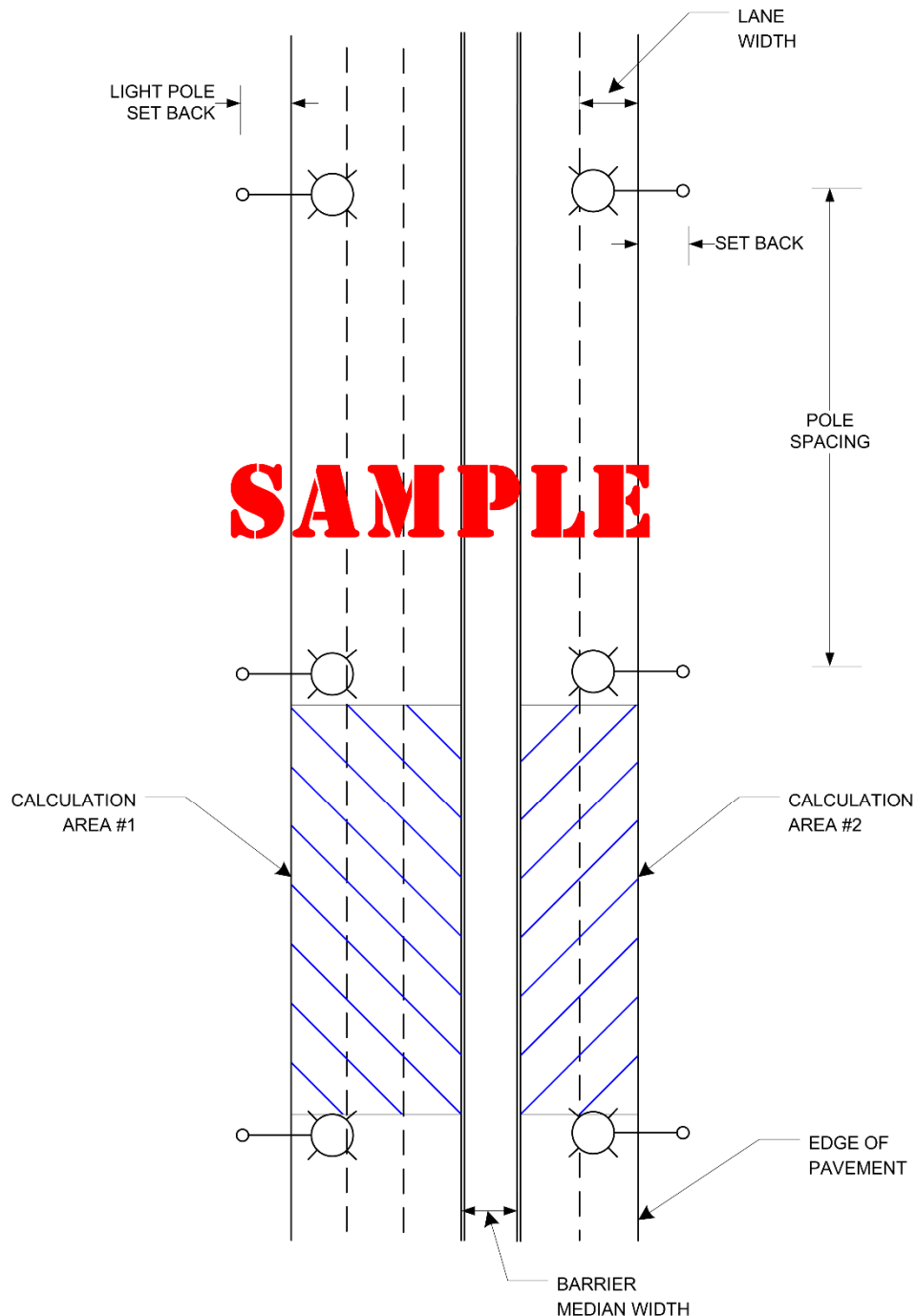
NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

Roadway Luminance	Average Luminance, L_{AVE} (Max)	_____	Cd/m ²
	Average Luminance, L_{AVE} (Min)	_____	Cd/m ²
	Uniformity Ratio, L_{AVE}/L_{MIN}	_____	Max
	Uniformity Ratio, L_{MAX}/L_{MIN}	_____	Max
	Veiling Luminance Ratio, L_V/L_{AVE}	_____	Max

INSERT DRAWING OF POLE LAYOUT. THIS IS A SAMPLE DIAGRAM.

ALL DIAGRAMS MUST BE PROJECT SPECIFIC COORDINATED WITH THE LUMINAIRE PERFORMANCE TABLES.

INTERSECTIONS OR CURVES CANNOT BE USED.



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, LED

Effective: July 1, 2021

Description.

This work shall consist of furnishing and installing an underpass 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. 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 the following manufacturer's product data for each type of luminaire:

11. 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
12. 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.
13. LED efficacy per luminaire expressed in lumens per watt (l/w).
14. Initial delivered lumens at the specified color temperature, drive current, and ambient temperature.
15. IES file associated with each submitted luminaire in the IES LM-63 format.
16. Computer photometric calculation reports as specified and in the luminaire performance table.
17. TM-15 BUG rating report.
18. Isofootcandle chart with max candela point and half candela trace indicated.
19. Documentation of manufacturers experience and verification that luminaires were assembled in the U.S.A. as specified.
20. Written warranty.

Upon request by the Engineer, submittals shall also include any or all the following:

- n. 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).
- o. 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.
- p. 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.
- q. AGi32 calculation file matching the submittal package.
- r. In Situ Temperature Measurement Test (ISTMT) report for the specified luminaire or luminaire family in PDF format.
- s. Vibration test report in accordance with ANSI C136.31 in PDF format.
- t. ASTM B117/ASTM D1654 (neutral salt spray) test and sample evaluation report in PDF format.
- u. ASTM G154 (ASTM D523) gloss test report in PDF format.
- v. LED drive current, total luminaire input wattage, and current over the operating voltage range at an ambient temperature of 77 °F (25 °C).
- w. 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.
- x. Ingress protection (IP) test reports, conducted according to ANSI C136.25 requirements, for the driver and optical assembly in PDF format.
- y. Installation, maintenance, and cleaning instructions in PDF format, including recommendations on periodic cleaning methods.
- z. 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 33 years' experience manufacturing HID roadway luminaires and shall have a minimum of seven (7) years'

experience manufacturing LED roadway luminaires. The manufacturer shall have a minimum of 25,000 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 power supply for the luminaire shall be integral to the unit. The housing shall be either stainless-steel or cast aluminum.

Aluminum Housing.

The housing shall be extruded or cast aluminum; or a combination of both and shall have a copper content of less than 1.0%.

The housing shall be painted grey or silver unless specified otherwise. A epoxy base coat shall applied to the aluminum after the aluminum is properly treated with a conversion coating. The finish coat shall be polyester powder coat with a minimum thickness of 2.0 mil.

The luminaire surfaces exposed to the environment shall exceed a rating of six, according to ASTM D1654, after 1000 hours of ASTM B117 testing. The coating shall exhibit no greater than 30% reduction of gloss, according to ASTM D523, after 500 hours of ASTM G154 Cycle 6 QUV® accelerated weathering testing.

Stainless-Steel Housing.

The housing shall be constructed from 16-gauge minimum, 304 stainless steel.

The stainless-steel housing does not need to be painted. The manufacturer may paint the luminaire at no additional cost.

The luminaire shall be optically sealed, mechanically strong and easy to maintain. The luminaire shall be designed for wall mounting to a pier or abutment. It shall be provided with a suitable mounting bracket which allows for +90° adjustment from horizontal in 5° increments.

The luminaire shall be gasketed and sealed and shall be UL listed for wet locations. The luminaire optical assembly shall have a minimum IEC ingress penetration rating of IP66. When furnished with a lens and frame, the lens shall be made of crystal clear, impact and heat resistant flat glass. The lens and frame shall be securely attached to the main housing and be readily removable for servicing the LED optical assembly.

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 total weight including accessories, shall not exceed 75 lbs.

A passive cooling method with no moving, rotating parts, or liquids shall be employed for heat management.

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.

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.

The power connection to the luminaire shall be via liquid tight metallic conduit or an armored flexible cable assembly. The power connection, including any external shielding, must be secured to the luminaire and connected source. The location of the opening shall be coordinated with the installation to minimize the length of flexible conduit required. The length of the cable or flexible conduit shall not exceed six (6) feet.

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.

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 IP66 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.

The luminaire may have an initial lumen value lower than the specified lumen range in the performance tables provided that the resulting calculations demonstrate that the performance requirements are being met.

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE 1
 ROADWAY UNDERPASS LIGHTING**

1 LANE

GIVEN CONDITIONS			
ROADWAY DATA	Pavement Width	16	(ft)
	Number of Lanes	1	
	I.E.S. Surface Classification	R3	
	Q-Zero Value	.07	
MOUNTING DATA	Mounting Height	15	(ft)
	Tilt	0-30	(degrees)
	Orientation	Perpendicular to roadway	
	Set-Back from Edge Of Pavement	12	(ft)
LUMINAIRE DATA	Lumens	10,000 – 13,500	
	Total Light Loss Factor	0.65	
LAYOUT DATA	Spacing	40	(ft)
	Configuration	Single Sided	
	Luminaire Overhang over EOP	-12	(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	Average Luminance, L_{AVE}	1.6	Cd/m ² (Max)
		1.2	Cd/m ² (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1	(Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1	(Max)

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE 2 ROADWAY UNDERPASS LIGHTING

2 LANE

GIVEN CONDITIONS			
ROADWAY DATA	Pavement Width	24	(ft)
	Number of Lanes	2	
	I.E.S. Surface Classification	R3	
	Q-Zero Value	.07	
MOUNTING DATA	Mounting Height	15	(ft)
	Tilt	0-30	(degrees)
	Orientation	Perpendicular to roadway	
	Set-Back from Edge Of Pavement	12	(ft)
LUMINAIRE DATA	Lumens	10,000 – 13,500	
	Total Light Loss Factor	0.65	
LAYOUT DATA	Spacing	35	(ft)
	Configuration	Single Sided	
	Luminaire Overhang over EOP	-12	(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	Average Luminance, L_{AVE}	1.6	Cd/m ² (Max)
		1.2	Cd/m ² (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1	(Max)
	Veiling Luminance Ratio, L_v/L_{AVE}	0.30:1	(Max)

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE 3 ROADWAY UNDERPASS LIGHTING

3 LANE

GIVEN CONDITIONS			
ROADWAY DATA	Pavement Width	36	(ft)
	Number of Lanes	3	
	I.E.S. Surface Classification	R3	
	Q-Zero Value	.07	
MOUNTING DATA	Mounting Height	15	(ft)
	Tilt	0-30	(degrees)
	Orientation	Perpendicular to roadway	
	Set-Back from Edge Of Pavement	12	(ft)
LUMINAIRE DATA	Lumens	10,000 – 13,500	
	Total Light Loss Factor	0.65	
LAYOUT DATA	Spacing	50	(ft)
	Configuration	Opposite	
	Luminaire Overhang over EOP	-12	(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	Average Luminance, L_{AVE}	1.6	Cd/m ² (Max)
		1.2	Cd/m ² (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1	(Max)
	Veiling Luminance Ratio, L_v/L_{AVE}	0.30:1	(Max)

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE 4
 ROADWAY UNDERPASS LIGHTING**

4 LANE

GIVEN CONDITIONS			
ROADWAY DATA	Pavement Width	48	(ft)
	Number of Lanes	4	
	I.E.S. Surface Classification	R3	
	Q-Zero Value	.07	
MOUNTING DATA	Mounting Height	15	(ft)
	Tilt	0-15	(degrees)
	Orientation	Perpendicular to roadway	
	Set-Back from Edge Of Pavement	12	(ft)
LUMINAIRE DATA	Lumens	10,000 – 13,500	
	Total Light Loss Factor	0.65	
LAYOUT DATA	Spacing	45	(ft)
	Configuration	Opposite	
	Luminaire Overhang over EOP	-12	(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	Average Luminance, L_{AVE}	1.6	Cd/m ² (Max)
		1.2	Cd/m ² (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1	(Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.30:1	(Max)

**IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE 5
 ROADWAY UNDERPASS LIGHTING**

5 LANE

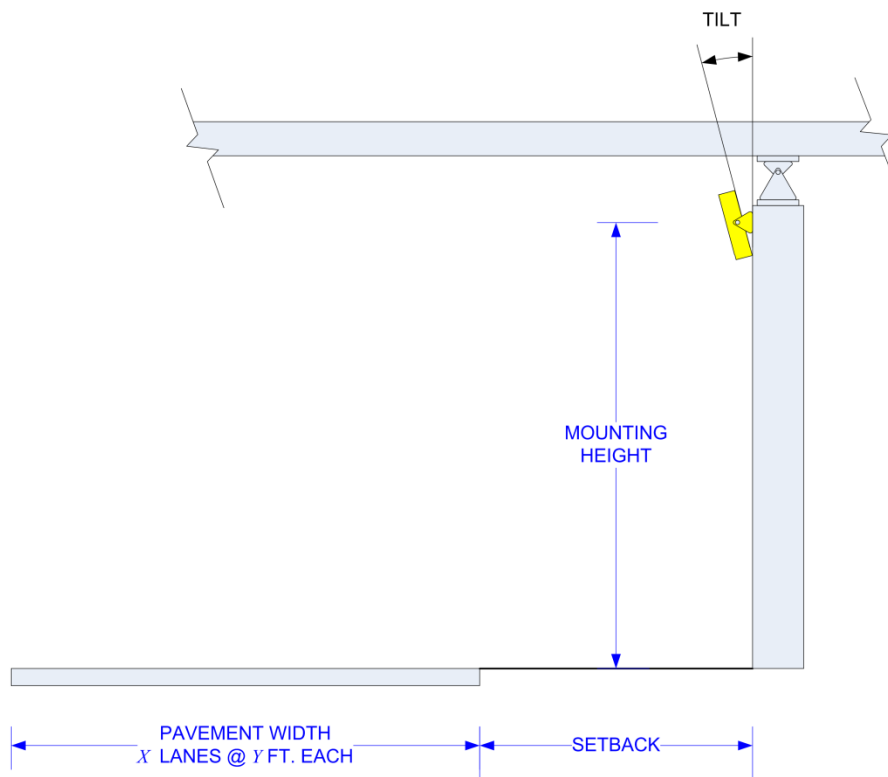
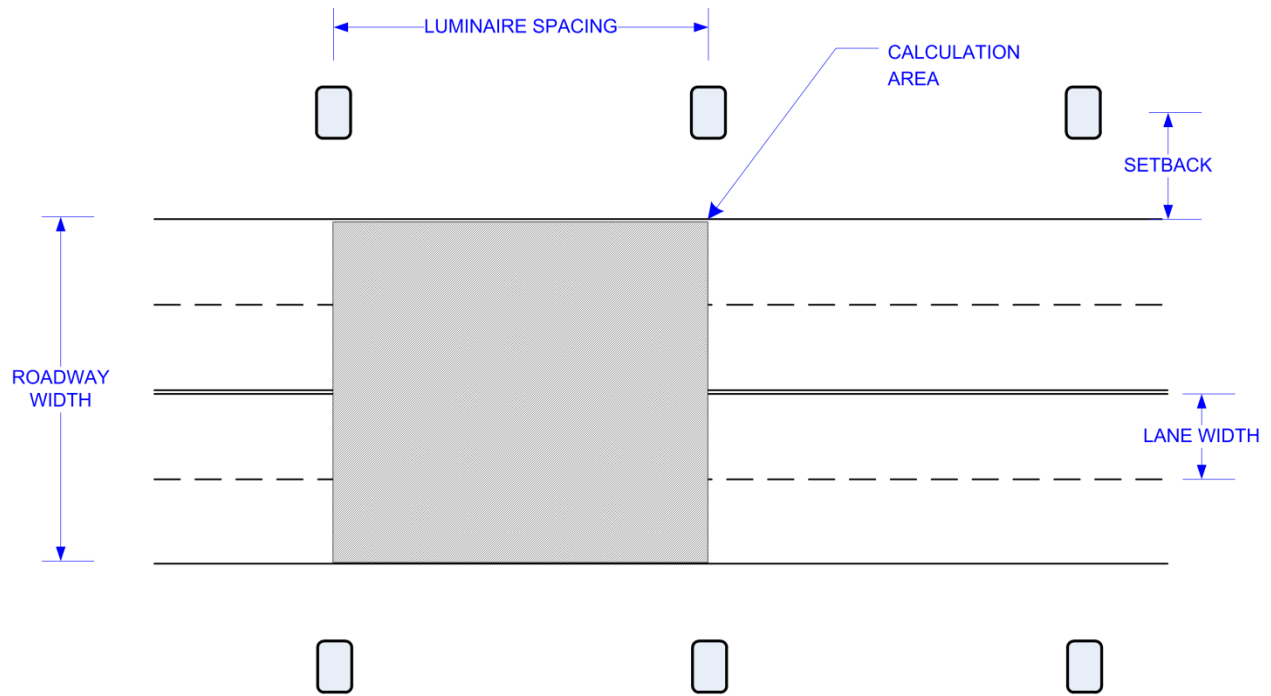
GIVEN CONDITIONS			
ROADWAY DATA	Pavement Width	60	(ft)
	Number of Lanes	5	
	I.E.S. Surface Classification	R3	
	Q-Zero Value	.07	
MOUNTING DATA	Mounting Height	15	(ft)
	Tilt	0-15	(degrees)
	Orientation	Perpendicular to roadway	
	Set-Back from Edge Of Pavement	12	(ft)
LUMINAIRE DATA	Lumens	10,000 – 13,500	
	Total Light Loss Factor	0.65	
LAYOUT DATA	Spacing	40	(ft)
	Configuration	Opposite	
	Luminaire Overhang over EOP	-12	(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	Average Luminance, L_{AVE}	1.6	Cd/m ² (Max)
		1.2	Cd/m ² (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3:1	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5:1	(Max)
	Veiling Luminance Ratio, L_v/L_{AVE}	0.30:1	(Max)



Independent Testing

When a contract has 30 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

Testing is not required for temporary lighting luminaires.

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.

Two copies of the summary report and the test results including IES photometric files (including CDRom) shall be certified by the test laboratory and shall be sent by certified mail directly to the Engineer.

To: District Engineer
Attn: Bureau Chief of Traffic Operations
Illinois Department of transportation
201 West center Ct.
Schaumburg, IL 60196

The package shall state "luminaire test reports" and the contract number clearly.

A copy of this material shall be sent to the Contractor and the Resident Engineer at the same time.

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.

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 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.

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
A	2,200
B	3,150
C	4,400
D	6,300
E	9,450
F	12,500
G	15,500
H	25,200
I	47,250

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, UNDERPASS**, of the mount type and output designation specified.

DIVISION 1 – PUMP STATION GENERAL REQUIREMENTS
SECTION 1A - SUMMARY OF WORK

1. GENERAL:

1.1 Description: General

1.1.1 The work under this Contract for the construction of the North Aurora Road Pump Station shall include all labor, materials, tools, equipment and incidentals and for performing all work required for the construction of a new pump station for a complete operational facility, as included in all Contract Documents and shall be as measured and paid for as described hereinafter. The requirements of Division 1, General Requirements, shall apply to all Pump Station Work.

1.1.2 Any pay items that are not otherwise described in this Division or in the Special Provisions for Civil and Drainage shall be in accordance with the Standard Specifications. The following Sections of the Standard Specifications required in the Contract.

1.1.2.1	Tree Removal	Section 201
1.1.2.2	Earth Excavation	Section 202
1.1.2.3	Trench Backfill	Section 208
1.1.2.4	Topsoil and Compost	Section 211
1.1.2.5	Seeding	Section 250
1.1.2.6	Mulch	Section 251
1.1.2.7	Perimeter Erosion Control	Section 280
1.1.2.8	Riprap	Section 281
1.1.2.9	Aggregate Base Course	Section 351
1.1.2.10	Aggregate Surface Course	
	Section 402	
1.1.2.11	Hot-Mix Asphalt Binder and Surface Course	
	Section 406	
1.1.2.12	Bituminous Materials (Tack Coat)	Section 406
1.1.2.13	Portland Cement Concrete Sidewalk	
	Section 424	
1.1.2.14	Removal of Existing Pavement Appurtenances	Section 440
1.1.2.15	Excavation for Structures	Section 502
1.1.2.16	Concrete Structures	
	Section 503	
1.1.2.17	Reinforcement Bars	
	Section 508	
1.1.2.18	Piling	Section 512
1.1.2.19	Storm Sewer	Section 550
1.1.2.20	Storm Sewer Removal and Installation	Section 551
1.1.2.21	Storm Sewer Jacked in Place	
	Section 552	
1.1.2.22	Manholes	Section 602
1.1.2.23	Concrete Curb and Gutter	Section 606

1.1.2.24	Removal and Disposal of Regulated Substances Section 669	
1.1.2.25	Engineer's Field Office and Laboratory	Section 670
1.1.2.26	Mobilization	Section 671
1.1.2.27	Work Zone, Traffic Control and Protection, Signing, and Pavement Marking	Section 701
1.1.2.28	Work Zone Pavement Marking	Section 703
1.1.2.29	Temporary Concrete Barrier Section 704	
1.1.2.30	Pavement Stripping Section 780	
1.1.2.31	Raised Reflective Pavement Markers Section 781	
1.1.2.32	Prismatic Reflectors Section 782	
1.1.2.33	Handhole	Section 814
1.1.2.34	Fiber Optic Cable	Section 871

1.1.3 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 and will be paid for at the contract lump sum price as specified in the Special Provisions; Division 1, General Requirements; and the applicable requirements under the following: Division 2, Site Work; Section 3A, Grout; Division 5, Metals; Division 7, Thermal and Moisture Protection; and Division 9A, Painting. The Pump Station General Work shall include, but not be limited to, the following and shall be paid under pay item PUMP STATION GENERAL WORK:

- (a) Site work as indicated on the Drawings and as specified in Section 2A, Site Work.
- (b) All grout as indicated on the Drawings and as specified in Section 3A, Grout.
- (c) All miscellaneous metal work as indicated on the Drawings and as specified in Division 5, Metals.
- (d) All sealant work as indicated on the Drawings and as specified in Section 7A, Joint Sealers.
- (e) All painting as indicated on the Drawings and as specified in Section 9A, Painting.

1.2 Description: Mechanical

1.2.1 The requirements of Division 1, General Requirements, shall apply to all Pump Station Mechanical Work.

1.2.2 The Pump Station Mechanical Work shall be as shown on the Drawings and as specified and include, but not be limited to, furnishing and installing the following and shall be paid for at the contract lump sum under pay item PUMP STATION MECHANICAL WORK:

- (a) Piping and appurtenances as indicated on the Drawings and as specified in all Contract Documents.
- (b) Valves with all appurtenances.

1.2.4 The pumps shall be paid for at the contract unit price per each under pay item MAIN PUMPS and shall be in accordance with Section 15D, Pumping Equipment.

1.3 Description: Electrical

1.3.1 The requirements of Division 1, General Requirements, shall apply to all Pump Station Electrical Work.

1.3.2 The pump Station Electrical Work shall include, but not be limited to, furnishing and installing the following and shall be paid for at the contract lump sum under pay item PUMP STATION ELECTRICAL WORK:

- (a) Disconnect switches and motor starters.
- (b) Electrical Power System Studies.
- (c) Lighting fixtures, lighting panel board, lighting transformer and wiring devices.
- (d) Power, lighting, control and signal wires and cables.
- (e) Conduit and raceway system.
- (f) Lightning protection.
- (g) Ultrasonic and hydrostatic level system. Float type level sensing control system.
- (h) Branch wiring and conduit for main pumps, low flow pumps, unit heaters, slide gate actuators, ventilation system, SCADA panel and other electrical equipment as shown on the Drawings.
- (i) Testing.

1.3.5 Supervisory, Control and Data Acquisition (SCADA) equipment and programming shall be paid for at the contract lump sum under pay item PUMP STATION SCADA EQUIPMENT and shall be in accordance with Section 16D, Supervisory Control and Data Acquisition (SCADA) Equipment. Systems Integrator shall be in accordance with Section 16D.

- 1.3.6 Electric service connection shall consist of charges of the electric utility for both the temporary service during construction and permanent electrical service and shall be paid for at the contract lump sum under pay item ELECTRICAL SERVICE CONNECTION and shall be in accordance with Section 16A, General Electrical Provisions.
- 1.3.7 Electric service installation shall be paid for at the contract unit price per each under pay item ELECTRIC SERVICE INSTALLATION and shall be in accordance with Section 16A, General Electrical Provisions.
- 1.4 Scope of Work
 - 1.4.1 It is the intent of the Contract Documents and referenced Standard Specifications, to define the work required for the construction of the new North Aurora Road Pump Station and to maintain operations of the existing pump station facility during construction. No portion of the work required to provide a coordinated complete installation shall be omitted even though not expressly specified or indicated.
 - 1.4.2 These Contract Specifications for work on North Aurora Road Pump Station are presented as various listed Divisions. In general, these Divisions address the requirements for work items which are listed as pay items and as described under the various Divisions.
- 1.5 Existing Pump Station Maintenance during Construction – Not Used
- 1.6 Continuous Operation – Not Used
- 1.7 Protection of Drainage Facilities during Construction – Not Used
- 1.8 Submittals
 - 1.8.1 Except as specified elsewhere herein, materials and equipment shall be in conformance with the requirements of Section 106 of the Standard Specifications.
 - 1.8.2 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. The Contractor is obligated to conduct his own search into the timely availability of the specified equipment and materials to ensure 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.

1.8.3 All equipment, products and materials incorporated in the work shall be submitted for approval.

1.8.4 Specific submittals required for individual elements of work are specified in the individual Specification sections. Except as otherwise indicated in Specification sections, requirements specified herein shall be complied with for each indicated type of submittal. Procedures concerning items such as listing of manufacturers, suppliers, subcontractors, construction progress schedule, schedule of Shop Drawing submissions, bonds, payment applications, insurance certificates, and schedule of values are specified elsewhere.

1.8.5 Work-Related Submittals

- (a) Substitution or "Or Equal" Items include material or equipment Contractor requests Engineer to approve, after Bids are received, as substitute for items specified or described in Specifications by using name of a proprietary item or name of particular supplier.
- (b) Shop Drawings include technical data and drawings specially prepared for this Project, including fabrication and installation drawings, diagrams, actual performance curves, data sheets, schedules, templates, patterns, reports, instructions, design mix formulas, measurements, and similar information not in standard printed form. Standard information prepared without specific reference to the Project is not considered a Shop Drawing.
- (c) Product Data include standard printed information on manufactured products and systems that has not been specially prepared for this Project, including manufacturer's product specifications and installation instructions, catalog cuts, standard wiring diagrams, printed performance curves, mill reports, and standard color charts.
- (d) Samples include both fabricated and manufactured physical examples of materials, products, and units of work, partial cuts of manufactured or fabricated work, swatches showing color, texture, and pattern, and units of work to be used for independent inspection and testing. Mock-ups are special forms of samples which are too large or otherwise inconvenient for handling in manner specified for transmittal of sample submittals.
- (e) Miscellaneous Submittals are work-related submittals that do not fit in the previous categories, such as warranties, certifications, experience records, maintenance agreements, Operating and Maintenance Manuals, workmanship bonds, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, and similar information, devices, and materials applicable to the Work.

- 1.8.6 The contractor shall thoroughly review submittal and ensure that the submittal complete and meets contract documents. Any shop drawing submitted more than two times requires the contractor to be charged for all costs incurred by the Department.
- 1.8.7 Contractor shall deliver submittals for review, pickup reviewed submittals and distribute as directed by the Engineer.
- 1.8.8 Scheduling
- (a) A preliminary schedule of shop drawings and samples submittals shall be submitted for approval, in duplicate.
 - (b) Each submittal shall be prepared and transmitted to Engineer sufficiently in advance of scheduled performance of related work and other applicable activities.
 - (c) Within 60 days of the contract award, the Contractor shall submit, for approval, complete manufacturer's product data (for standard products and components) and detailed shop drawings (for fabricated equipment). Submittals need not include all project equipment and materials in one submittal, however, the submittals for the equipment and materials for each individual pay item shall be complete in every respect. Partial submittals may be returned without review. The Contractor may request, in writing, permission to make a partial submittal; the Engineer will evaluate the circumstances of the request and may accept to review such partial submittal. However, no additional compensation or extension of time will be allowed for extra costs or delays incurred due to partial or late submittals.
- 1.8.9 Each submittal shall be accompanied by a transmittal containing the following information:
- (a) Contractor's Name
 - (b) Supplier's Name
 - (c) Manufacturer's Name
 - (d) Date of submittal and dates of previous submittals containing the same material
 - (e) Project Route/Name
 - (f) Section
 - (g) Submittal and transmittal number
 - (h) Contract identification
 - (i) 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
 - (j) Variations from Contract Documents and any limitations which may impact the Work.

- (k) 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.
- (l) 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.
- (m) 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.

1.8.10 Exceptions, Deviations, and Substitutions

- (a) 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.
- (b) Data for items to be submitted for review as substitution shall be collected into one submittal for each item of material or equipment.
- (c) 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.

1.8.11 Shop Drawings

- (a) Shop drawing information shall be newly prepared and submitted with graphic information at accurate scale. The name of manufacturer or supplier (firm name) shall be indicated. Dimensions shall be shown and clearly noted which are based on field measurement; materials and products which are included in the Work shall be identified; revision shall be identified. Compliance with standards and notation of coordination requirements with other work shall be indicated. Variations from Contract Documents or previous submittals shall be highlighted, encircled or otherwise indicated.
- (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) List all shop drawings that are required for each discipline.
- (e) Each major equipment submittal shall have a detailed bill of material list.
- (f) The following information shall be included on each drawing or page:
 - 1) Submittal date and revision dates.
 - 2) Project name, division number and descriptions.
 - 3) Detailed specifications section number and page number.
 - 4) Identification of equipment, product or material.
 - 5) Name of Contractor and Subcontractor.
 - 6) Name of Supplier and Manufacturer.
 - 7) Relation to adjacent structure or material.
 - 8) Field dimensions, clearly identified.
 - 9) Standards or Industry Specification references.
 - 10) Identification of deviations from the Contract Documents.
 - 11) Contractor's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
 - 12) Physical location and location relative to other connected or attached material at which the equipment or materials are to be installed.
- (g) An 8-inch by 3-inch blank space shall be provided for Contractor and Engineer stamps.
- (h) Five (5) submittal copies shall be submitted to the Engineer for review.
- (h) 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.
- (i) Shop drawing submittal shall include pump control schematics, SCADA panel drawings, and detailed control system descriptions for auto/manual controls and operation and monitoring of main and low flow pumps from the SCADA Panel and from the float control mode and also remote monitoring system descriptions.

1.8.12 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 identify not applicable and project specific information.
 - (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 shall be final when returned by Engineer marked "Approved".
- (d) Five submittal copies 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.

1.8.13 Samples

- (a) Where possible, samples shall be physically identical with proposed materials or products to be incorporated into the Work. Where variations in color, pattern or texture are inherent in material or product represented by sample, multiple units (not less than 3 units) shall be submitted showing approximate limits of variations.
- (b) A full set of optional samples shall be provided where Engineer's selection required. Samples shall be prepared to match Engineer's selection where so indicated.
- (c) Each sample shall include generic description, source or product name and manufacturer, limitations, and compliance with standards.
- (d) Samples for Engineer's visual review and final check of coordination of these characteristics with other related elements of work shall be of general generic kind, color, pattern, texture.
- (e) At Contractor's option, and depending upon nature of anticipated response from Engineer, initial submittal of samples may be either preliminary or final submittal.

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, 1 set will be returned.

- (f) 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.

- 1.8.14 Mock-ups and similar samples specified in Specification sections are recognized as special type of samples. Requirements for samples submittal shall be complied with to greatest extent possible. Transmittal forms shall be processed to provide record of activity.

1.8.15 Miscellaneous Submittals

- (a) Inspection and Test Reports

- 1) Inspection and factory test reports shall be submitted for pumps, SCADA panel, generator and MCC.

- (b) Submittals for detailed factory and field test procedures for pumps. Submittals for detailed field test procedures for SCADA, generator and MCC.

- (c) Warranties, Maintenance Agreements, and Workmanship Bonds

- 1) Refer to Specification sections and section Warranties of this Division for specific requirements. Submittal is final when returned by Engineer marked "Approved" or "Approved as Noted".
 - 2) 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.

- (d) Certifications

- 1) Refer to Specification sections for specific requirements on submittal of certifications. Five 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".

- 2) 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 of intent to furnish the certification after equipment approval and manufacture.
- 3) 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) There should be a section in the report analyzing results and test data that meets the requirements of the contract and also list the items that fall short of contract requirements with conclusive remarks for acceptance/rejection of the equipment.

(d) Tools

- 1) Spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units shall be submitted.
- 2) 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.
- 3) 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.

1.8.16 Contractor's Stamp

- (a) Prior to submittal, the 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 the Contractor shall not be submitted to the Engineer. The 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.
- (b) The receipt of submittal information from the Contractor will be construed as the 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.

- 1.8.17 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.
- 1.8.18 Unless required elsewhere, submittals shall be distributed to subcontractors, suppliers, governing authorities, and others as necessary for proper performance of work.
- 1.8.19 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.
- 1.8.20 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.
- 1.8.21 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 "Re-submittal is not required" which shall only be exercised for minor comments.
- 1.8.22 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.

- 1.8.23 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.
- 1.8.24 Coordination
- (a) 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.
 - (b) 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.
- 1.8.25 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. The 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 the Contractor's expense.

1.9. Re-submittal Preparation

- 1.9.1 Re-submittal Preparation shall comply with the requirements described in subsection 1.8, Submittal, of this section. In addition, it shall be identified on the transmittal form that the submittal is a resubmission. Re-submittal shall have previous comments and detailed point by point response to each previous comments.
- 1.9.2 Any corrections or changes in submittals required by Engineer's notations shall be made on returned submittal.
- 1.9.3 On the transmittal or on a separate page attached to Contractor's resubmission transmittal, all notations or questions indicated by Engineer on Engineer's transmittal form shall be answered or acknowledged in writing. Each response shall be identified by question or notation number established by Engineer. If Contractor does not respond to each notation or question, resubmission will be returned without action by Engineer until Contractor provides a written response to all Engineer's notations or questions.
- 1.9.4 Variations or revisions from previously reviewed submittal, other than those called for by Engineer, shall be identified on transmittal form.

1.10 Record Drawings

- 1.10.1 One record copy of all Contract Documents, reference documents and all technical documents submitted in good order shall be kept and maintained at the site. On bond media, and using drafting symbols and standards consistent with the original documents, Contract Drawings shall be annotated in red to show all changes made during the construction period. Annotated drawings are to be made available to Engineer for reference at all times.
- 1.10.2 At completion of the Contract and before final payment is made, four (4) sets of clearly legible 11"x 17" bond media Contract Drawings reflecting all changes made during construction shall be delivered to the Engineer. The drawings shall each be stamped "Record Drawings", and shall be marked with the contractor's stamp, the date, and the signature of the contractor's representative.
- 1.10.3 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.
- 1.10.4 The Record Drawings must be submitted and must be acceptable to the Engineer prior to final acceptance.
- 1.10.5 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.
- 1.10.6 In addition to the specified record drawings, the Contactor shall record GPS coordinates of the following electrical components:
- Last light pole on each circuit
 - Handholes
 - Conduit crossings
 - Controllers
 - Buildings
 - Structures with electrical connections, i.e. DMS, lighted signs.
 - Electric Service locations"

1.11 Warranties

- 1.11.1 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.
- 1.11.2 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 the Engineer.
- 1.11.3 The warranties shall include parts and labor and shall begin from the date of final acceptance.

1.12 Operation and Maintenance Manuals

- 1.12.1 Five (5) copies of an Operation and Maintenance Manual shall be furnished to the Engineer for all equipment and associated control systems furnished and installed for review and approval. Four hard copies of approved O&M manuals and four scanned O&M Manuals CD's shall be submitted for Engineer's use.
- 1.12.2 The contractor shall submit four manuals for engineer, Department O&M and Department engineer's independent review when construction is at 75% 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 the 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 the contractor for corrective action until the manuals are approved by the Engineer.
- 1.12.3 The manual shall consist of the following and shall be prepared and arranged subject wise and chronological order as follows:
 - (a) Table of Contents broken down per discipline.
 - (b) A section of a pump station data sheet (see sample form at end of section).
 - (c) A section of an equipment data summary (see sample form at end of section) for each item of equipment.
 - (d) A section of an equipment preventive maintenance data summary (see sample form at end of section) for each item of equipment.
 - (e) 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.

- (f) Approved power systems study including list of electrical relay settings and control, alarm contact, an timer settings with applicable ranges.
- (g) Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems.
- (h) One valve schedule giving valve number and location for each valve installed.
- (i) 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.
- (j) Comprehensive equipment technical data sheets for pumps , motors, equipment within switchgear, MCC, switchgear, transformers, breakers, valves, SCADA and control panel.
- (k) Details of equipment nameplates and technical ratings.
- (l) Detailed summary of quantities and bill of material with technical descriptions for major equipment such as MCC, switchgear, SCADA, and control panels, etc.
- (m) The manuals shall contain catalog cuts highlighting features and selected options of the equipment.
- (n) Legible 11 inch x 17 inch shop drawing and each shop drawing shall have "Record" stamp, signatures and date.
- (o) The catalog cuts of each device/equipment shall have engineer's "Approved" stamp, signature and date.
- (p) 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.
- (q) The manual shall have CAD produced contract drawings having changes identified by red ink and contract documents shall have "Record" stamp, signature and date.
- (r) The manual shall include all approved pump factory witness test reports with corresponding data and records from the pump field tests.
- (s) The manual shall include control schematic shop drawings for pumps and discharge/recirculation gate valves.
- (t) Mechanical and HVAC equipment schedules.
- (u) The manual shall include floor and roof hatch product data and shop drawings including roofing product data, glass and glazing and doors product data, and specialty items product data including but not limited to fiberglass handrails and ladders product data, HVAC louver and grilles product data. Provide associated shop drawings with the product data.
- (v) 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.
- (w) All documents shall be legible.

- (x) The manual shall include shop drawings having engineer's approved stamp, signature and date.
- (y) The manual shall include section for field test reports for all major equipment including the MCC, generator, grounding system, SCADA, and all other monitoring and control equipment.
- (z) Four copies of Record Drawings shall be submitted to the Engineer for review.
- (aa) Successful bidder will be provided with MicroStation drawings upon receipt of acceptable release.

- 1.12.4 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"x17" 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 the Engineer shall be printed on the cover and binding edge of each manual.
- 1.12.5 All operating and maintenance material that comes bound by the equipment manufacturer shall be left in its original bound state. The appropriate sections of the Contractor's O&M manual shall be cross-referenced to the manufacturers' bound manuals.
- 1.12.6 The O&M Manuals must be submitted and must be acceptable to the Engineer prior to equipment start-up. Substantial completion is not achieved until O&M Manuals are approved by the Engineer.

Pump Station Data Sheet

Location: Describe Location and Address

Telephone:

Voice & AEGIS Phone #:

Main Pumps: Total XX @ XXXX GPM

Standby Pump: X @ XXXX GPM

Pump: Describe complete model # and manufacturer's name

Motor: Describe complete model #, motor HP, amps, voltage and manufacturer's name

Low Flow Pumps: XX @ XXXX GPM.

Pump: Describe complete model # and manufacturer's name

Motor: Describe complete model #, motor HP, amps, voltage and manufacturer's name

Pump Station Capacity: XXXX GPM

Pit Type: Wet Pit

Outlet: XX" and XX" Diameter Sewer

Electrical Service:

1) Normal Power: Describe amps, cable and conduit size

2) Emergency Power: Describe amps, cable and conduit size

Generator: Describe complete model # and manufacturer's name, and technical rating

MCC:

1) MCC: Describe tech ratings, model # and manufacturer's name

Pump Station Control Elevations

Pumping Operation Ranges With Rising Water			
SCADA Function	Level Above Sump Pit Floor	Level EL.	Float Function
	(FT)	(EL)	
High Water Alarm			High Water Alarm
No Function			Start Main Pump 3 (If 1 or 2 has failed)
Start Lag Main Pump			Start Main Pump 2
Start Lead Main pump and Stop Low Flow Pump			Start Main Pump 1 Stop Low Flow Pump
Start Low Flow Pump			Start Low Flow Pump
Pavement Flood Alarm			Pavement Flood Alarm
Pumping Operation Ranges With Falling Water			
SCADA Function	Level Above Sump Pit Floor	Level EL.	Float Function
	(FT)	(EL)	
Stop Main Pumps & Start Low Flow Pump			Stop main pumps and Start Low Flow Pump
Stop Low Flow Pump			Stop Low Flow Pump
Low Water Alarm			Low Water Alarm

Maps, Photos, and Driving Directions

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

NORTH AURORA ROAD PUMP STATION

Operation and Maintenance Manual

Equipment Data Summary

Equipment Name: Specification Reference:

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:

NORTH AURORA ROAD PUMP STATION

Operation and Maintenance Manual

Preventive Maintenance Summary

- 1.12.7 Binders shall be labeled Volume 1 of X, 2 of X, and so on, where more than one binder is required. The table of contents for the entire set, identified by volume number, shall be included in each binder.

1.13 Storage of Equipment and Materials

- 1.13.1 All materials and equipment shall be protected from wear and damage both before and after delivery to the job site.
- 1.13.2 Unless specifically permitted by the Engineer, all equipment such as pumps, fans, electrical apparatus, valve operators, SCADA equipment, and the like shall be stored indoors out of exposure to the weather. Items having electrical parts, such as motors, electronic panels, and the like, shall be kept in heated storage, at a temperature to prohibit the accumulation of condensation on the equipment. Where equipment is provided with integral space/strip heaters, (such as the motor control center), these heaters shall be energized as soon as the equipment is present at the job site and they shall remain energized from temporary circuits until final permanent energization is attained.
- 1.13.3 Unless otherwise specifically permitted by these specifications or as allowed by the Engineer, all materials for use on the project shall be stored indoors out of exposure to the weather. Such materials would include ductwork, doors and frames, louvers, grating, slate roofing, building hardware, windows and glass block, wire and cable, conduit, and piping. Certain materials such as building steel, exterior hatch covers, fencing, and the like which will be applied exposed to the weather, may be stored outdoors in a safe manner as approved. Note the specified requirements for the storage of building masonry in Section 4A.

1.14 Protection of the Work

- 1.14.1 All work shall be protected from damage by vandals, the weather, or other sources until final acceptance by the Engineer. Such protection shall include temporary fencing or other barriers, if necessary, to restrict access to the work. Open pits, doors, hatches, etc. shall be covered, closed and locked. No additional compensation will be granted and no additional time will be allowed due to delays caused by failure to adequately protect the work from damage. In addition, the Contractor shall make the worksite safe at the end of each work day, leaving no attractive nuisance hazards and no open electrical boxes and the like.
- 1.14.2 **Clean-Up and Public Safety**
The work site shall be maintained in a clean condition, free of hazards to the work force and the public, all in conformance with the requirements of Article 107 of the Standard Specifications. Special care shall be taken to see that electrical systems are not 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 have their cover in place and shall be locked when possible, during off-work hours.

1.15 Standards of Workmanship

- 1.15.1 All work shall be performed to the highest standard of each respective trade. The work shall demonstrate all due care and attention so that all specified requirements are met and that the end product is a first-rate installation.
- 1.15.2 The Contractor shall comply with the requirements of Sections 105 and 108 of the Standard Specifications, and any Supplements thereto shall, in addition, comply with the requirements for control of work specified herein.

1.16 Quality Control

1.16.1 Submittals

All submittals, including the following, shall be provided as specified in this Section.

Authoritative evidence in the form of Certificates of Manufacture shall be furnished to the Engineer to show that the materials and equipment to be used in the Work have been manufactured and tested in conformity with the Contract Documents. Copies of the results of physical tests that have been made directly on the product or on similar products of the manufacturer shall be included where necessary.

- 1.16.2 At all times during the progress of the Work and until the date of final completion, afford the Engineer every reasonable, safe, and proper facility for inspecting the Work at the site. The observation and inspection of any work will not relieve the 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 with satisfactory work 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 directed even though such work may have been previously approved and payment made therefore.
- 1.16.3 Failure or neglect on the part of the 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 the 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.

- 1.16.4 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.
- 1.16.5 Personnel shall be provided to assist the Engineer in performing the following periodic observation and associated services.
- (a) Soils: Observe and test excavations, placement and compaction of soils. Determine suitability of excavated material. Observe sub-grade soils and foundations.
 - (b) Concrete: Observe forms and reinforcement; observe concrete placement; witness air entrainment tests, facilitate concrete cylinder preparation and assist with other tests performed by Engineer.
 - (c) Masonry: Sample and test mortar, bricks, blocks and grout; inspect brick and block samples and sample panels; inspect placement of reinforcement and grouting.
- 1.16.6 When specified in Divisions 2 through 16 of the Contract Documents, an independent laboratory testing facility shall be provided to perform required testing. The laboratory shall be qualified as having performed previous satisfactory work. Prior to use, such qualifications shall be submitted to the Engineer for approval.
- 1.16.7 Cooperate with the 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 the Contractor at the site as required by the Engineer and the testing laboratory.
- 1.16.8 Equipment test procedures shall be coordinated and demonstrated as specified in the Contract Documents or as otherwise required during the formal tests.
- 1.16.9 Where transcripts or certified test reports are required by the Contract Documents, the following requirements shall be met:

For all required transcripts, certified test reports, certified copies of the reports of all tests required in referenced specifications or specified in the Contract Documents, submit and obtain approval of the Engineer before delivery of materials or equipment. All testing shall be performed in an approved independent laboratory or the manufacturer's laboratory. Reports of shop equipment tests shall be submitted for approval within thirty days of testing. Transcripts or test reports are to be accompanied by a notarized certificate in the form of a letter from the manufacturer or supplier certifying that tested material or equipment meets the specified requirements and the same type, quality, manufacture and make as specified. The certificate shall be signed by an officer of the manufacturer or the manufacturer's plant manager.

- 1.16.10 At the option of the Engineer, or where not otherwise specified, a notarized Certificate of Compliance shall be submitted for approval. The Certificates may be in the form of a letter stating the following:
- (a) Manufacturer has performed all required tests
 - (b) Materials to be supplied meet all test requirements
 - (c) Tests were performed not more than one year prior to submittal of the certificate
 - (d) Materials and equipment subjected to the tests are of the same quality, manufacture and make as those specified
 - (e) Identification of the materials
- 1.16.11 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.
- 1.16.12 Materials and equipment submitted by the Contractor as the equivalent to those specifically named in the Contract may be tested by the Engineer for compliance. The Owner shall be reimbursed for expenditures incurred in making such tests on materials and equipment which are rejected for noncompliance.
- 1.16.13 The Contractor shall coordinate work such that inspections are not required outside of the hours of 7:00 a.m. and 5:00 a.m. Monday-Friday, non-holiday.
- 1.16.14 The Contractor shall provide transportation and reasonable expenses including lodging and meals to and from all factory pump testing for two Engineer representatives. The Contractor shall notify the 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.
- 1.16.15 As soon as conditions permit, all labor and materials and services to perform preliminary field tests of all equipment shall be furnished as provided under this Contract. If the preliminary field tests disclose that any equipment furnished and installed under this Contract does not meet the requirements of the Contract Documents, all changes, adjustments and replacements required shall be made prior to the acceptance tests.
- 1.16.16 Upon completion of the Work and prior to final payment, all equipment, piping and appliances installed under this Contract shall be subjected to specified acceptance tests to demonstrate compliance with the Contract Documents.
- 1.16.17 All labor, fuel, energy, water and other materials, equipment, instruments and services necessary for all acceptance tests shall be furnished by the Contractor.

- 1.16.18 Field tests shall be conducted in the presence of the Engineer. The field tests shall demonstrate that under all conditions of operation each equipment item:
- (a) Has not been damaged by transportation or installation
 - (b) Has been properly installed
 - (c) Has no mechanical defects
 - (d) Is in proper alignment
 - (e) Has been properly connected
 - (f) Is free of overheating of any parts
 - (g) Is free of all objectionable vibration
 - (h) Is free of overloading of any parts
 - (i) Operates as intended
- 1.16.19 Each pump and generator shall be operated for a minimum of 30 minutes continuous service.
- 1.16.20 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, the Engineer, notwithstanding its partial payment for work and materials or equipment, may reject said materials or equipment and may order the Contractor to 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.

1.17 Cutting and Patching

- 1.17.1 No structural members shall be removed, cut or otherwise modified without approval and any such work shall be done in a manner as directed by the Engineer.
- 1.17.2 Cutting of concrete slabs, walls and members shall be performed without over-cutting at corners or elsewhere.
- 1.17.3 Cutting and patching shall be performed in a neat and workmanlike manner, consistent with the best practices of the appropriate trade. All patching shall be done in a manner consistent with the building material being patched.
- 1.17.4 All cutting, fitting or patching of the Work that may be required to make the several parts thereof join shall be provided in accordance with the Contract Documents. Restoration shall be performed by competent workmen skilled in the trade.
- 1.17.5 All cutting and patching required to install improperly timed work or to remove samples of installed materials for testing shall be provided.

- 1.17.6 Except when the cutting or removal of existing construction is specified or indicated, any cutting or demolition which may affect the structural stability of the Work or existing facilities shall not be undertaken without the Engineer's concurrence.
- 1.17.7 Shoring, bracing, supports, and protective devices necessary to safeguard all work during cutting and patching operations shall be provided.
- 1.17.8 All materials shall be cut and removed to the extent shown or as required to complete the Work. Materials shall be removed in a careful manner with no damage to adjacent facilities. Materials which are not salvageable from the site shall be removed.
- 1.17.9 All work affected by demolition, cutting operations, and equipment removal shall be patched, repaired or restored with new materials or with salvaged materials acceptable to the Engineer to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished. Affected surfaces shall match adjacent surfaces and provide uniform appearance. Unnecessary gaps, holes, openings and depressions shall be filled with suitable patching material.

1.18 Definition of Terms

1.18.1 Abbreviations

Wherever the following abbreviations are used in these Special Provisions or on the Plans, they are to be construed the same as the respective expressions represented:

AASHTO American Association of State Highways and Transportation Officials

ANSI American National Standards Institute

ASME American Society of Mechanical Engineers

ASTM American Society for Testing and Materials

AWG American Wire Gauge

ICEA Insulated Power Cable Engineers Association

IEEE Institute of Electrical and Electronic Engineers

IES Illuminating Engineering Society of North America

IBC International Building Code

NEC National Electrical Code

NEMA National Electrical Manufacturer's Association

NESC National Electrical Safety Code

NETA ATS International Electrical Testing Agency, Acceptance Testing Specifications

UL Underwriter's Laboratories

ACI American Concrete Institute

FM Factory Mutual

SSPC Steel Structures Painting Council

HI Hydraulic Institute Standard

NFPA 72 National fire Alarm and Signaling Code

NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities

OSHA Confined Space Regulations and Electrical Systems Code Regulations

IDOT Drainage Manuals

IDOT General Guidelines for Pump Station Design

IDOT Bureau of Design and Environment BDE Manuals

Illinois Professional Engineering Practice Act

1.18.2 Standard Specifications

Where used in these Special Provisions, this term shall mean the latest "Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016", published by the Illinois Department of Transportation.

1.18.3 Specifications

Where used in these Special Provisions, this term shall mean the complete body of specifications, including the Standard Specifications, these Special Provisions, and referenced specifications and standards. See also latest IDOT "Standard Specifications for Road and Bridge Construction" for definition of terms.

1.18.4 Supplements

Where used in these Special Provisions, this term shall mean the latest "Supplemental Specifications and Recurring Special Provisions" published by the Illinois Department of Transportation.

1.18.5 Contract Documents

The complete body of agreements, specifications and drawings which define the contract work.

1.18.6 Provide

Where used in these Special Provisions, this term shall mean "furnish and install, complete functional, including any required connection and testing".

1.19 Referenced Specifications and Standards

1.19.1 The referenced specifications and standards shall be latest version and are incorporated, by reference, in these Special Provisions and shall apply to the work as though fully written herein:

- (a) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, a publication of the Illinois Department of Transportation.
- (b) SUPPLEMENTAL SPECIFICATIONS AND RECURRING SPECIAL PROVISIONS, a publication of the Illinois Department of Transportation.
- (c) NATIONAL ELECTRICAL SAFETY CODE, a publication of American National Standards Institute.
- (d) SAFETY CODE, a publication of the Illinois Department of Transportation.
- (e) AMERICAN NATIONAL STANDARD PRACTICE FOR ROADWAY LIGHTING, ANSI/IES RP-8, published by Illuminating Engineering Society, approved by National Standards Institute.
- (f) ELECTRICAL MAINTENANCE CONTRACT, State of Illinois. Department of Transportation, Division of Highways, District 1.

1.20 Schedule of Values, Payment and Invoices

1.20.1 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.

1.20.2 The Contractor shall submit a Schedule of Values, as specified herein, at least fifteen (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.

1.20.3 The Schedule of Values shall be approved by the Engineer prior to any project payments.

1.20.4 Complete Schedule of Values

(a) The Schedule of Values shall be typewritten on 8-1/2 inch by 11 inch paper in a format approved by the Engineer.

(b) The Schedule of Values shall be used to determine the value of work completed for payment purposes. After review by the Engineer, the Contractor shall revise and resubmit the Schedule of Values as required.

(c) The Schedule of Values shall have each pay item further itemized by Specification Division as listed in the Specification index.

(d) 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 ten (10) dollars. The "value" for each pay item listed shall be the supplied, installed and operational start-up cost incurred to the 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.

1.20.5 Unit Price for Change Order

(a) If there is no bid unit prices for change order, Article 109.04 of the Standard Specifications will be used for the change order.

1.21 Start-Up

1.21.1 Items to be checked on start-up include, but not limited to, the following:

(a) Field test procedures shall be approved by the 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, influent slide gate, HVAC system and electrical system. Control system down time shall not exceed 4 hours, see Section 16D.

(b) Demonstration of back-up float controls.

(c) Gas detection calibration kit shall be always stored on site.

- (d) Demonstration of generator and transfer switch operation and maintenance.
- (e) Check pump operation in manual, bump and auto mode.
- (f) Check alarm operation SCADA and AEGIS system and verify at remote location (EMC contractor's facility, District 1, and IDOT TSC).
- (g) SCADA panel operation
- (h) Network Equipment Rack operation
- (i) Level system operation
- (j) Fire alarm system operation
- (k) HVAC system operation
- (l) Discharge slide gate and recirculation valve operation

- 1.21.2 The contractor shall prepare to demonstrate operation and maintenance procedures for all equipment installed.

1.22 Method of Measurement

- 1.22.1 Progress payments will be accordance with Section 109 of the Standard Specifications.

- 1.22.2 Mechanical equipment specified under Section 15D and electrical equipment specified under Sections 16D, 16E, 16F will be considered 80% complete once substantially complete and corresponding O&M Manuals have been approved by the 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 the 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 the 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 the Engineer.

2. PRODUCTS:

Not Used

3. EXECUTION:

Not Used

END OF THIS SECTION

DIVISION 2 – PUMP STATION SITE WORK

SECTION 2A – MANHOLES, SPECIAL

1. GENERAL:

1.1 Description

- 1.1.1 The work shall include requirements for special manholes (12' ID), as shown and specified herein.
- 1.1.2 Unless otherwise indicated, material and work shall be in conformance with the requirements of the Standard Specifications for Road and Bridge Construction, Section 602, adopted January 1, 2022, a publication of the Illinois Department of Transportation.

1.2 Submittals

- 1.2.1 Submit under provisions of Section 1A and Standard Specifications.

1.3 Quality Assurance

- 1.3.1 Under provisions of Standard Specifications.

1.4 Basis of Payment

1.4.1 Measurement

- (a) The work specified for special manholes shall be measured as specified in Article 602.16 of the Standard Specifications.

1.4.2 Payment

- (a) The work specified under this Section shall be paid for at the contract unit price per each manhole for MANHOLE, SPECIAL, which price shall be considered as payment in full for this Item.

2 PRODUCT:

None

3 EXECUTION:

None

END OF THIS SECTION

DIVISION 3 – PUMP STATION CONCRETE

SECTION 3A - GROUT

1. GENERAL:

1.1 Section Includes

- 1.1.1 Grout for equipment bases.
- 1.1.2 Grout for pipe and conduit penetrations.
- 1.1.3 Grout for anchor bolts.

1.2 Related Sections

- 1.2.1 Section 5B – Bolts, Anchor Bolts, Concrete Anchors, and Concrete Inserts.

1.3 References

- 1.3.1 ASTM C109 - Compressive Strength of Hydraulic Cement Mortars (using 2" or 50 mm. Cube Specimens).
- 1.3.2 ASTM C150 - Portland Cement.
- 1.3.3 ASTM C191 - Time of Setting of Hydraulic Cement by Vicat Needle.
- 1.3.4 ASTM C827 - Early Volume Change of Cementitious Mixtures.
- 1.3.5 CRD-C-588 - Specifications for Non-Shrink Grout.
- 1.3.6 CRD-C-619 - Specification for Grout Fluidifier.
- 1.3.7 CRD-C-621 - Specification for Non-Shrink Grout.

1.4 Submittals

- 1.4.1 Reports: Submit reports on grout indicating conformance of component grout materials to requirements of ASTM C476 and test and evaluation reports to ASTM C1019.
- 1.4.2 Submit manufacturer's installation instructions.

1.5 Tests

- 1.5.1 Testing of grout will be performed.

1.6 Delivery, Storage and Handling

1.6.1 Grout materials from manufacturers shall be delivered in unopened containers.

1.6.2 Maintain packaged materials clean, dry and protected against dampness, freezing and foreign matter.

1.7 Environmental Requirements

1.7.1 Maintain materials and surrounding air temperatures to a minimum of 50°F prior to, during and 48 hours after completion of the Work.

1.7.2 If manufacturer's requirements are more stringent, such requirements shall govern.

1.8 Basis of Payment

1.8.1 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.

1.8.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

2.1 Materials

2.1.1 Each required material shall have one manufacturer throughout the use of that material on the Work.

2.2 Manufacturers - Non-Shrink, Non-Metallic, 100% Solid, High Strength Epoxy Grout

2.2.1 Sikadur 42, Grout-Pak by Sika Chemical Company.

2.2.2 Five Star Epoxy Grout by U.S. Grout Corporation.

2.3 Materials- Non-Shrink, Non-Metallic, Cementitious Grout

2.3.1 Pre-mixed, non-staining, cementitious grout requiring only the addition of water at the job site; conforming to the following:

- (a) Non-shrink: No shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.
- (b) Compressive Strength: A minimum 28-day compressive strength of 7,000 psi when tested in accordance with ASTM C109.
- (c) Setting Time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C191.

- (d) Composition: Shall not contain metallic particles, chlorides or expansive cement.

2.3.2 Manufacturers - Non-Shrink, Non-Metallic, Cementitious Grout

- (a) Sika Grout 212 by Sika Chemical Company.
- (b) Masterflow 928 by Master Builders Company.
- (c) Sealtight 588 grout by W. R. Meadows, Inc.

2.4 Materials - Cement-Sand Grout

- 2.4.1 Use 1 part cement to 3 parts sand. Keep the water cement ratio below 0.45 and achieve a minimum 28-day compressive strength of 4,000 psi.
- 2.4.2 Cement: ASTM C150, Type I or Type II.
- 2.4.3 Sand: ASTM C33.
- 2.4.4 Water: Clean, fresh, potable water free from injurious amounts of vegetable matter and mineral salts.

3. EXECUTION:

3.1 Inspection

- 3.1.1 Examine conditions under which grout is to be installed and notify Engineer in writing of unsatisfactory conditions or deficiencies that have been corrected.

3.2 Installation

- 3.2.1 Place grout as shown and in accordance with manufacturer's instructions. If manufacturer's instructions conflict with the Specifications, do not proceed until Engineer provides clarification.
- 3.2.2 Drypacking for vertical grouting behind vertical base plates.
- 3.2.3 Manufacturers of proprietary products shall make available upon 72 hours' notification the services of a qualified, full-time employee to aid in assuring proper use of the product under job conditions.
- 3.2.4 Temperature control for grout placement shall comply with the provisions of Section 1020 of the Standard Specifications.
- 3.2.5 Equipment Bases
 - (a) After shimming and equipment to proper grade, securely tighten anchor bolts. Properly form around the base plates allowing sufficient

room around the edges for placing the grout. Adequate depth between the bottom of the base plate and the top of concrete base must be provided to assure that the void is completely filled with grout. Use non-metallic cementitious grout unless another type of grout is recommended by equipment manufacturer.

- (b) Non-shrink, non-metallic epoxy grout may be used with Engineer's specific review.

3.3 Schedule

- 3.3.1 Non-Shrink, Non-Metallic Cementitious Grout: anchor bolts, equipment bases, pipe supports, pipe and conduit penetration, slide gate frame, and pipe thrust support structures.
- 3.3.2 Cement-Sand Grout: Pipe and conduit penetrations for non-water containing structure, and repair of exposed concrete.

END OF THIS SECTION

DIVISION 5 – PUMP STATION METALS

SECTION 5A - METAL FABRICATIONS

1. GENERAL:

1.1 Section Includes

1.1.1 Provide miscellaneous metal work shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

- (a) Floor access hatches.
- (b) Miscellaneous items.

1.2 Related Sections

- 1.2.1 Section 5B - Bolts, Anchor Bolts, Expansion Anchors and Concrete Inserts.
- 1.2.2 Section 9A - Painting.

1.3 References

All reference standards shall be the latest edition.

- 1.3.1 ASTM A36 - Structural Steel.
- 1.3.2 ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- 1.3.3 ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip.
- 1.3.4 ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- 1.3.5 ASTM A276, Type 316L - Stainless Steel.
- 1.3.6 ASTM A283 - Carbon Steel Plates, Shapes, and Bars.
- 1.3.7 ASTM A325 - High Strength Bolts for Structural Steel Joints.
- 1.3.8 ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.
- 1.3.9 ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
- 1.3.10 ASTM A501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- 1.3.11 ASTM A992 – Structural Steel Shapes.

- 1.3.12 AWS A2.0 - Standard Welding Symbols.
- 1.3.13 AWS D1.1 - Structural Welding Code.
- 1.3.14 AISI - Standard for Stainless Steel.
- 1.3.15 SSPC - Steel Structures Painting Council.
- 1.3.16 ANSI A14.3: Safety requirements for fixed ladders.
- 1.3.17 Specifications for Aluminum Structures, The Aluminum Association.
- 1.4 Submittals
 - 1.4.1 Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1.4.2 Submit Product Data.
 - 1.4.3 Shop drawings shall be approved prior to fabrication.
 - 1.4.4 Indicate all revisions on resubmissions.
 - 1.4.5 Provide supporting information confirming that required loads for access hatches are met.
 - 1.4.6 Include provisions for separations of dissimilar metals.
- 1.5 Quality Assurance
 - 1.5.1 Perform shop and/or field welding required in connection with the work of this Section in strict accordance with pertinent recommendations of the American Welding Society (AWS).
 - 1.5.2 Conform to AISC and AA standards.
- 1.6 Field Measurements
 - 1.6.1 Verify that field measurements are as indicated on shop drawings and in accordance with manufacturers' recommendations.
- 1.7 Basis of Payment
 - 1.7.1 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.
 - 1.7.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

2.1 Materials

- 2.1.1 In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, and roughness.
- 2.1.2 Comply with following standards, as pertinent.
 - (a) Square or rectangular tubing: ASTM A500, Grade B.
 - (c) Round tubing or pipe: ASTM A53, Type E or S, Grade B.
 - (d) Stainless Steel:
 - 1) Exterior and submerged uses: AISI, Type 316.
 - 2) Interior uses: AISI, Type 304 or Type 316.
 - (e) Aluminum shapes and plates: Alloy 6061-T6 or 6063-T6.
 - (f) Connection Bolts:
 - 1) For steel members: ASTM F3125 Grade A325.
 - 2) For aluminum members: Stainless steel.
 - (g) Cast-in-place Anchor Bolts:
 - 1) 1/2 in. min dia.
 - 2) 316 Stainless steel.

2.2 Fabrication

- 2.2.1 Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.
- 2.2.2 Provide clips, lugs, brackets, straps, plates, bolts, nuts, washers, and similar items, as required for fabrication and erection.
- 2.2.3 Fabricate with accurate angles and surfaces which are true to the required lines and levels, with projecting corners clipped, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.
- 2.2.7 Prior to shop painting or priming, properly clean metal surfaces as required for the applied finish and for the proposed use of the item. Conform to Section 9A.
 - (a) Do not coat ferrous metal surfaces embedded in concrete.
 - (b) Coating of cast iron or ductile iron floor access hatches and pressure relief valves not required.

- (c) On surfaces inaccessible after assembly or erection, apply two coats of the specified primer. Change color of second coat to distinguish it from the first.
- (d) Coat aluminum surfaces in contact with concrete with bituminous coating. Under no circumstances shall aluminum contact dissimilar metal.

2.2.8 Galvanizing:

- (a) Galvanize after fabrication.
- (b) Galvanize by hot-dip process conforming to ASTM A123 and AHDGA specifications.

2.3 Finishes

- 2.3.1 Prepare structural component surfaces in accordance with SSPC-SP6 - Commercial Blast Cleaning.
- 2.3.2 Shop prime structural steel members except members to be galvanized. Do not prime surfaces that will be field welded, contact surface for friction bolts, welded studs, deformed bar anchors and steel encased in concrete.
- 2.3.3 Zinc used for hot-dip galvanizing coating shall conform to the Standard Specifications for Slab Zinc (Spelter) ASTM Designation B6 and shall be at least equal to the grade designated as "Prime Western". Thickness of coatings shall conform to ASTM Specifications A123, A153, and A385, as applicable for items coated.
- 2.3.4 Quality of galvanizing shall be rigidly controlled and it shall be understood that any defects as mentioned below shall be just grounds for rejection.
- 2.3.5 Galvanized steel shall have no bare spots unless small and suitable for patching, pimples showing excessive contamination, flux, ash inclusions, or blisters.
- 2.3.7 Structural and miscellaneous metal Work shall be galvanized when located on the exterior and on the interior where so indicated and/or specified.
- 2.3.8 Prime paint items in accordance with finish coat requirements.
- 2.3.9 Repair all damage to field-primed surfaces.

2.5 Floor Access Hatches

- 2.4.1 Prefabricated Drainage Channel Type: All materials exposed to the elements shall be corrosion resistant.
 - (a) Manufacturers: subject to compliance with requirements:

- 1) Bilco Type JAL-H20 or JDAL-H20.
 - 2) Halliday Type H1R or H2R.
 - 3) Nystrom FDDHA SFL or FDDHA DFL.
- (b) Provide aluminum access hatches and frames with stainless steel hardware of size as shown on Drawings.
- (c) Door leaves shall be 1/4 in. min. aluminum diamond pattern plate reinforced to support AASHTO H-20 loads with max deflection of 1/150 span.
- (d) Frame: Channel frame shall be extruded aluminum with bend down anchor tabs around the perimeter.
- (e) Hinges: Shall be specifically designed for horizontal installation and shall be through bolted to covers with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and locknuts.
- (f) Drain Coupling: Provide a 1-1/2" (38mm) drain coupling located in the right front corner of the channel frame.
- (g) Lifting mechanisms: Manufacturer shall provide the required number and size of compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and to act as a check in retarding downward motion of the covers when closing.
- (h) Exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected.
- (i) Hardware:
- 1) Hinges: Heavy forged Type 316 stainless steel hinges, each having a minimum 1/4" diameter Type 316 stainless steel pin, shall be provided.
 - 2) Covers shall be equipped with a hold open arm which automatically locks each cover in the open position.
 - 3) A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of one cover.
 - 4) Hardware: Shall be Type 316 stainless steel throughout.
- (j) Finishes: Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.
- 1) Dissimilar metals shall be separated by means of factory applied bituminous coating. Shop drawings shall indicate this requirement.

3. EXECUTION:

3.1 Examination

3.1.1 Verify that field conditions are acceptable and are ready to receive Work.

3.1.2 Preparation

(a) Clean and strip primed steel items to bare metal where site welding is required.

(b) Supply items required to be cast into concrete or embedded in masonry with setting templates, to appropriate Sections.

3.1.3 Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 Installation

3.2.1 Install items plumb and level, accurately fitted, free from distortion or defects.

3.2.2 Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

3.2.3 Perform field welding in accordance with AWS D1.1.

3.2.4 Obtain Engineer approval prior to site cutting or making adjustments not scheduled.

3.2.5 Perform cutting, drilling, and fitting required for installation of metal fabrications. Set the work accurately. Provide temporary bracing and anchors in formwork for items to be built into masonry or concrete. Field weld joints not shop welded because of size limitations. Grind welds smooth and touch-up shop paint coat. Do not weld, cut or abrade surfaces that have been galvanized.

3.2.6 Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.2.7 Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

3.2.8 Protect aluminum in contact with dissimilar material with asphalt paint to provide 2 mil dry thickness. Paint miscellaneous metal work which is to be in contact with but not fully embedded in concrete or masonry with a heavy coat of asphalt paint. Coating shall not extend onto surfaces which will be exposed.

- 3.2.9 Install hatches and manufactured items in accordance with manufacturer's instruction.
 - 3.2.10 Touch-Up Painting: 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. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
 - 3.2.11 Touch up damaged galvanizing with cold galvanizing compound.
 - 3.2.12 Install products in strict accordance with manufacturer's instructions and approved submittals. Locate units level, plumb, and in proper alignment with adjacent work.
 - 3.2.13 Test units for proper function and adjust until proper operation is achieved
 - 3.2.14 Repair finishes damaged during installation.
 - 3.2.15 Restore finishes so no evidence remains of corrective work.
- 3.3 Adjusting and Cleaning
- 3.3.1 Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

END OF THIS SECTION

SECTION 5B - BOLTS, ANCHOR BOLTS, CONCRETE ANCHORS, AND CONCRETE INSERTS

1. GENERAL:

1.1 Section Includes

1.1.1 Furnishing and installing all bolts, anchors and inserts, anchor bolts, expansion anchors and concrete inserts for:

- (a) Piping.
- (b) Hangers and brackets.
- (c) Equipment.
- (d) Electrical work
- (e) Pump base.
- (f) Miscellaneous fasteners.

1.2 Related Sections

1.2.1 Section 5A - Metal Fabrication.

1.2.2 Section 15A - Piping and Appurtenances.

1.3 References

- 1.3.1 Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown and specified.
- 1.3.2 ACI 349 - Appendix B - Code Requirements for Nuclear Safety Related Concrete Structures.
- 1.3.3 AISC - American Institute of Steel Construction, Structural Steel Detailing.
- 1.3.4 ANSI B1.1 - Screw Threads, Coarse Thread Series.
- 1.3.5 ANSI B18.2 - Square and Hex Bolts and Nuts.
- 1.3.6 ASTM A36 - Structural Steel.
- 1.3.7 ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- 1.3.8 ASTM A193 - Alloy-Steel & Stainless Steel Bolting Materials for High-Temperature Service.
- 1.3.9 ASTM A194 - Carbon & Alloy Steel Nuts for Bolts for High Pressure & High Temp. Service.
- 1.3.10 ASTM A242 - High Strength Low-Alloy Structural Steel.
- 1.3.11 ASTM A307 - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- 1.3.12 ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum tensile Strength.
- 1.3.13 ASTM A354 - Quenched & Tempered Alloy Steel Bolts, Studs & Other Externally Threaded Fasteners.
- 1.3.14 ASTM A563 - Carbon and Alloy Steel Nuts.
- 1.3.15 ASTM A588 - High Strength Low-Alloy Structural Steel With 50 KSI Minimum Yield Point.
- 1.3.16 ASTM B98 - Copper Silicon Alloy Rods, Bars, and Shapes.
- 1.3.17 AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

1.4 Submittals

1.4.1 Shop Drawings: Submit for approval the following:

- (a) Setting drawings and templates for location and installation of anchorage devices.
- (b) Copies of manufacturer's specifications, load tables, dimension diagrams and installation instructions for the devices.

1.4.2 Contractor shall submit calculations stamped by a licensed structural engineer.

1.5 Quality Assurance

1.5.1 Bolts, anchor bolts, expansion anchors and concrete inserts shall conform to applicable Section 1006, METALS, of the Standard Specifications.

1.6 Basis of Payment

1.6.1 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.

1.6.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

2.1 Design Criteria

2.1.1 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.

2.1.2 Bolt 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. Nut dimensions shall conform to ANSI Standard B18.2.2 for heavy hex nuts.

2.1.3 Allowable tensile design stress for threaded fasteners shall not be greater than 0.33 times minimum tensile strength of threaded fastener on tensile stress area.

2.1.4 Concrete Fasteners: When the size, length and load carrying capacity of concrete fasteners is not Specified or shown on the Drawings, provide the size, length and capacity required to satisfy all of the following. Concrete fasteners include anchor bolts, expansion anchors, or concrete inserts:

- (a) Working load shall be a minimum of the design load times a safety factor of four, and shall be based on a concrete compressive strength not exceeding 3000 psi.
- (b) Shall satisfy all requirements and recommendations of ACI 349, Appendix B.
- (c) Shall satisfy all minimum recommendations and requirements of Manufacturer.
- (d) Allowances for vibration are not included in the safety factor specified above.

2.1.5 Determine design loads as follows:

- (a) For equipment anchors, use the design load recommended by the manufacturer and approved by the Engineer.
- (b) For pipe hangers and supports, use one half the total weight of pipe, fittings, valves, accessories and water contained in pipe, between the hanger or support in question and adjacent hangers and supports on both sides. Load shall be increased where required to allow for thrust and temperature induced forces.

2.1.6 Anchors and inserts shall be located and sized so as not to impair the integrity of the supporting structure.

2.2 Materials

2.2.1 Bolts and Anchor Bolts:

(a) Stainless Steel Bolts and Nuts:

- 1) In buried, outdoor, high humidity or submerged locations, provide stainless steel bolts, nuts and washers. Stainless steel bolts and nuts shall be in conformity with the current ASTM A193, Grade B8 (AISI 304) 75 KSI Min. Tensile Strength), Class 1 and ASTM A194, Grade 8 (AISI 304), AISI 316.
- 2) For high strength applications, stainless steel bolts and nuts shall be in conformity with the current ASTM A193, Grade B8 (AISI 304) (Tensile Strength 100/125 KSI, Class 2 and ASTM A194, Grade 8 Strained Hardened (AISI 304).

(b) Bronze Bolts and Nuts:

- 1) Where shown on Drawings or specified under other Sections, bronze anchor bolts, flange bolts, studs, and nuts shall be in conformity with the current ASTM Designation B98, "Copper-

Silicon Alloy Rods, Bars, and Shapes." made of Alloy B12, Hard. Bolts, studs, and nuts machined from bar stock shall be made of Alloy A7, Hard.

- (c) Other types, if shown on drawings or specified under other Sections.

2.3 Pipe Joints

2.3.1 Stainless Steel Bolts and Nuts (Where Specified):

- (a) Stainless steel flange bolts and nuts shall be in conformity with the current ASTM A193, Grade B8 (AISI 304) 75 KSI Min. Tensile Strength), Class 1 & ASTM A194, Grade 8 (AISI 304).
- (b) Stainless steel bolts and nuts for harness flanges and connecting restrained harnesses to flange shall be in conformity with the current ASTM A193, Grade B8 (AISI 304) (Tensile Strength 100/125 KSI, Class 2 and ASTM A194, Grade 8 Strained Hardened (AISI 304).

2.3.2 Corrosion resistant steel (CRS) (For BURIED Piping Installations):

- (a) CRS anchor bolts, flange bolts, studs and nuts shall be "Cor-Ten" type steel in conformity with the material characteristics listed in Sec.11-8 of AWWA C111 "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings", and also in conformity with the ASTM: A242 "High Strength Low-Alloy Structural Steel" Type 1, A588 "High Strength Low-Alloy Structural Steel With 50 KSI Minimum Yield Point" Grade A.
- (b) At buried mechanical joints, bolts and nuts shall be in conformity with all of AWWA C111 dimensions and requirements.
- (c) Above specified bolts and nuts shall be tension tested for a minimum ultimate tensile stress of 65 ksi using testing procedures corresponding to ASTM A307 requirements, and shall be proof load tested based on 45 ksi stress to AWWA C111 standards.
- (d) Bolt heads shall be marked with manufacturer, ASTM material designation/grade, and country where manufactured. Markings shall be raised or depressed.
- (e) At buried joint harnesses and restrained harnesses connected to flange, the tie bolts and studs, flange bolts and nuts shall be "Cor-Ten" type steel in conformity with the current ASTM: A325, "Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Tensile Strength", Type 3.
- (f) Bolt strength shall be adequate to provide compression needed for water tightness of the gasket material used.

2.4 Concrete Anchors

2.4.1 Wedge Anchors:

(a) Manufacturers:

- 1) Power-Stud by Powers Fasteners (Rawl).
- 2) Kwik Bolt TZ by Hilti Corp.
- 3) Liebig Wedge Anchor by Liebig.
- 4) Ankr-Tite Wedge Anchor by Ankr-Tite Fastening Systems.
- 5) Wedge-All by Simpson Strong-Tie Co., Inc.

(b) Usage: In concrete:

- 1) 316 stainless steel.
- 2) Do not use when submerged or subjected to dynamic loads.

2.4.2 Expansion Anchors:

(a) Manufacturers:

- 1) Power-Bolt by Powers Fasteners (Rawl).
- 2) HSL Heavy Duty Sleeve Anchor by Hilti Corp.
- 3) Liebig Anchor by Liebig.

(b) Usage: In concrete:

- 1) 316 stainless steel.
- 2) Do not use when submerged, in overhead applications, or subjected to dynamic loads.

2.4.3 Undercut Anchors:

(a) Manufacturers:

- 1) Maxi-Bolt by Drillco Devices Ltd.
- 2) HDA Undercut Anchor by Hilti Corp.
- 3) Liebig Ultraplus by Liebig.

(b) Usage: In concrete, overhead applications, and for dynamic loads:

- 1) 316 stainless steel.
- 2) Do not use when submerged.

2.4.4 Adhesive Anchors (Concrete):

(a) Manufacturers:

- 1) HIT RE 500 or HIT HY 200 Epoxy Adhesive Anchor by Hilti Corp.
- 2) AC100 Plus or Power-Fast + by Powers Fasteners (Rawl).

- 3) Inject-Tite Two-Part Epoxy by Ankr-Tite Fastening Systems.
- 4) ET, SET or ETF Epoxy Adhesive System by Simpson Strong-Tie Co., Inc.

- (b) Epoxy adhesive with 316 stainless steel stud assembly.
- (c) Usage:

- 1) In concrete, submerged.
- 2) Do not use in overhead applications.

3. EXECUTION:

3.1 Inspection

- 3.1.1 Examine conditions under which bolts, anchors, or inserts are to be installed, and notify Engineer in writing of unsatisfactory conditions existing.
- 3.1.2 Do not proceed with the Work until unsatisfactory conditions or deficiencies have been corrected in a manner acceptable to Engineer.

3.2 Installation of Expansion Anchors and Undercut Anchors

- 3.2.1 Drilling equipment used and installation of expansion anchors shall be in accordance with manufacturer's instructions.
- 3.2.2 Torque anchor as specified by manufacturer recommendation. Do not cut reinforcing bars.
- 3.2.3 Provide embedded items for placement in concrete form work and assure that embedded items are protected from damage and are not filled in with concrete.
- 3.2.4 Expansion anchors may be used for hanging or supporting pipe 2 inches diameter and smaller.
- 3.2.5 Expansion anchors shall not be used for larger pipe or supporting vibrating equipment unless otherwise shown or approved by the Engineer.
- 3.2.6 Unless otherwise shown, anchor design shall be in accordance with ACI 349, Appendix B and approved by Engineer, and in no case shall be less than:

- | | |
|--|---------------|
| (a) Embedment depth in concrete | 8 diameters |
| (b) Anchor spacing on centers | 10 diameters |
| (c) Distance to edge of concrete | 1.5 embedment |
| (d) Distance to edge of concrete where anchor is loaded in direction of edge | 2.5 embedment |

- 3.2.7 Undercut Anchors shall be installed in accordance with manufacturer's instructions.
- 3.3 Cleaning
 - 3.3.1 After embedding concrete is placed, remove protection and clean bolts and inserts.

END OF THIS SECTION

DIVISION 7 – PUMP STATION THERMAL MOISTURE PROTECTION

SECTION 7A – JOINT SEALERS

1. GENERAL:

1.1 Section Includes

1.1.1 Preparing sealant substrate surfaces.

1.1.2 Sealant and accessories.

1.2 Related Sections

1.2.1 Divisions 5, 15 and 16

1.3 References

1.3.1 ASTM C804 – Use of Solvent-Release Type Sealants.

1.3.2 ASTM C920 - Elastomeric Joint Sealants.

1.3.3 ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.

1.3.4 ASTM D1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction.

1.3.5 FS HH-F-341 - Fillers, Expansion Joint: Bituminous

1.3.6 FS TT-S-00227 - Sealing Compound: Elastomeric Type, Multi-Component.

1.3.7 FS TT-S-001543 - Sealing Compound, Silicone Rubber Base.

1.3.8 SWRI (Sealing, Waterproofing, and Restoration Institute) - Sealant and Caulking Guide Specification.

1.4 Submittals

1.4.1 Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

1.4.2 Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, and perimeter conditions requiring special attention.

1.4.3 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.5 Quality Assurance

- 1.5.1 Perform work in accordance with SWRI requirements for materials and installation.
- 1.5.2 Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.
- 1.5.3 Single Source Responsibility for Joint Sealer Materials: Obtain joint sealer materials from a single manufacturer for each different product required.

1.6 Qualifications

- 1.6.1 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.
- 1.6.2 Applicator: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.7 Environmental Requirements

- 1.7.1 Do not install solvent curing sealants in enclosed building spaces without providing adequate ventilation.
- 1.7.2 Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 Coordination

- 1.8.1 Coordinate the work with all sections referencing this section.

1.9 Basis of Payment

- 1.9.1 Payment for the work specified under this Section and as required shall be included in the Contract lump sum price for the Item, PUMP STATION GENERAL WORK.
- 1.9.2 Refer to 1.22 of Section 1A for Payment Withheld.

2. PRODUCTS:

2.1 General:

2.1.1 Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2.1.2 Colors: Provide color of exposed joint sealers indicated or, if not otherwise indicated, as selected by the Architect from manufacturer's standard colors.

2.2 Sealants

2.2.1 Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25 (100/50), Use NT, M, G, A, O; single component, moisture curing, low modulus type; colors to be selected by Engineer from manufacturer's standard color selection (see schedule below).

Color Schedule:

- (a) Exterior equipment: match equipment color(s)
- (b) Other surfaces: match substrate color as approved by Engineer/Architect

2.3 Accessories

2.3.1 Primer: Non-staining type, recommended by sealant manufacturer to suit application.

2.3.2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

2.3.3 Joint Backing: ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width.

2.3.4 Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

2.3.5 Bituminous and Fiber Joint Filler: ASTM D1751 or FS HH-F-341.

3. EXECUTION:

3.1 Examination

3.1.1 Verify that substrate surfaces and joint openings are ready to receive work. Proceed with installation only after unsatisfactory conditions have been corrected. Install work as shown on Drawings and recommended by sealant manufacturer.

- 3.1.2 Verify that joint backing and release tapes are compatible with sealant.

3.2 Preparation

- 3.2.1 Remove loose materials and foreign matter which might impair adhesion of sealant.
- 3.2.2 Clean and prime joints in accordance with manufacturer's instructions.
- 3.2.3 Perform preparation in accordance with ASTM C804 for solvent release sealants.
- 3.2.4 Protect elements surrounding the work of this section from damage or disfiguration.

3.3 Installation

- 3.3.1 Install sealant in accordance with manufacturer's instructions.
- 3.3.2 Measure joint dimensions and size materials to achieve required width/depth ratios.
- 3.3.3 Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
- 3.3.4 Install bond breaker where joint backing is not used.
- 3.3.5 Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- 3.3.6 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- 3.3.7 Tool joints concave.

3.4 Cleaning and Repairing

- 3.4.1 Clean work as required.
- 3.4.2 Clean adjacent stained/soiled surfaces caused by work of this section.
- 3.4.3 Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 Protection of Finished Work

3.5.1 Protect finished installation.

3.5.2 Protect sealants until cured.

END OF THIS SECTION

DIVISION 9 – PUMP STATION PAINTING

SECTION 9A – PAINTING

1. GENERAL:

1.1 Description

1.1.1 This portion of work includes the furnishing, preparation and application of coating/painting and related items to complete the work indicated on drawings and described in these specifications.

1.1.2 All work under this Section shall be subject to the applicable provisions of Section 100 of the Standard Specifications.

1.1.3 Terms used in this Section shall be as defined in ANSI/ASTM DIG.

1.2 Reference Standards

1.2.1 The work shall be in conformance with the applicable standards/regulations of:

- (a) Society of Protective Coatings.
- (b) National Fire Protection Association (NFPA).
- (c) American National Standards Institute (ANSI).
- (d) Occupational Safety and Health Act (OSHA)
- (e) SSPC SP10 "Near White Metal Blast Cleaning", Society of Protective Coatings.
- (f) Military Specification MIL-L-81352A.
- (g) Illinois Department of Transportation, Standard Specifications for Road and Bridge Construction.

1.2.2 The term "finishes" as used herein means all painting and coating systems materials, including primers, emulsions, enamels, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

1.2.3 Consult the specifications for work and materials of other trades to determine the provisions regarding their finishing. Surfaces left unfinished by the requirements of other specifications shall be painted or finished as part of this work. Work requiring finish and not specified shall be finished same as specified for similar work. Finishing specified

hereinafter shall be in addition to shop and prime coats specified in other sections.

- 1.2.4 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.

1.3 Quality Assurance

- 1.3.1 Painting shall conform to applicable Section 1008, PAINT MATERIALS and MIXED PAINTS, of the IDOT Standard Specifications.
- 1.3.2 The types of paint products to be used in the work shall be identified by the manufacturer's name and number.
- 1.3.3 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.
- 1.3.4 All paints and painting materials shall be delivered to the work in the original and unopened containers plainly marked with the name, brand, shelf life, and analysis of the product, and the name of the manufacturer.
- 1.3.5 Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.4 Delivery and Storage of Materials

- 1.4.1 Deliver materials in original containers with seals unbroken and labels intact. Do not deliver or store on the site materials other than those approved for use. Empty containers shall have labels canceled.
- 1.4.2 Store materials outside the building. Keep storage place neat and clean and correct all damage thereto or to its surroundings.
- 1.4.3 Materials shall not be mixed or applied in any room having finished floor installed without providing adequate protection. Only materials used during the course of one day may be kept within the building. Remove oily rags and waste from building every night and take every precaution to avoid danger of fire.

1.5 Submittals

1.5.1 Submit product data and safety data under provisions of Section 1A.

1.5.2 Shop Drawings

- (a) Copies of manufacturer's technical information, including paint label analysis and application instructions, certification of coating, primer and finish coat for the material and service for each coating system proposed for use.
- (b) Copies of Contractor's proposed surface preparation and work area protection procedures in each area of the work.
- (c) List each material and cross-reference to the specific paint and finish system and application. Identify by manufacturer's catalog number and general classification.

1.5.3 Copies of manufacturer's complete color charts for each coating system.

1.5.4 The coating manufacturer shall submit certification that the products in a multi-layer coating system are of the same manufacturer, appropriate for the intended use, are compatible with each other and with project substrates, and are compatible with any existing coatings.

1.7 Basis of Payment

1.7.1 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.

1.7.2 Refer to 1.22 of Section 1A for Payment Withheld.

2. PRODUCTS:

2.1 Manufacturers: (First named manufacturer products listed in sections and schedule below. Contractor is responsible for selecting the appropriate equal system based on manufacturer selected.)

2.1.1 Tnemec Co., Inc.

2.1.2 Sherwin Williams

2.1.3 Carboline.

2.2 Colors

2.2.1 Unless otherwise indicated, colors will be selected by the Engineer during the submitted review process.

2.2.2 Complete color charts shall be submitted of proposed paint manufacturers to the Engineer for final paint color selections.

2.2.3 Unless otherwise indicated, all surfaces without a final finish color shall be painted. In general, colors will be differentiated as follows:

- (a) Natural or anodized aluminum surfaces shall not be painted. Surfaces and equipment which are provided with a factory final finish shall not be painted.
- (b) Stainless steel surfaces shall not be painted unless noted otherwise.
- (c) Safety items as necessary (bollards, hoist beams/trolley, etc.).

Notes:

- 1. Concrete shall not be painted.
- 2. All piping shall be shop finish painted.

2.3 Color Coding

2.3.1 Piping and electrical conduit shall be color coded with colors as selected by the Engineer. Electrical conduits shall be painted the color of the wall/ceiling against which it is run. Conduits are not required to be painted if they are not running against a wall or ceiling.

3. EXECUTION:

3.1 Preparation

3.1.1 Inspect surfaces with regard to their suitability to receive a finish after preparatory work. The application of finish shall be an indication of the Contractor's acceptance of the surface.

3.1.2 Surfaces to be cleaned of loose dirt and dust before painting is started. Adjacent surfaces shall also be clean before starting painting. Do preparatory work necessary to produce a surface suitable to receive the specified finish.

3.1.3 Wash uncoated metal surfaces with mineral spirits to remove dirt and grease before applying paint materials. Blast profile shall not exceed 30% of total film thickness of coating. Preparation shall conform to primer manufacturer's requirements. Prime surfaces as soon as practical after preparation. Do not leave prepared, uncoated surfaces overnight. Touch up shop coats damaged by welding or abrasion.

3.1.4 Prior to painting, all surfaces shall be prepared and cleaned as specified and required. Surfaces shall be dry before any paint is applied. Special surface preparation work shall be as directed by the manufacturer of the paint specified to be applied to the surface. Paint shall not be applied before the prepared surfaces are approved.

- 3.1.5 Prior to painting steel, all welds, beads, blisters or protuberances, other than identification markings, shall be ground smooth. Pits and dents shall be filled, and other imperfections shall be removed. All rust, mill scale, oil, grease and dirt shall be removed by sandblasting in the shop in accordance with Society of Protective Coatings Specification No. SP-10, Near White (SSPC-SP-10). Cleaned metal shall be primed the same day immediately after sandblasting to prevent rusting.
- 3.1.6 Prior to painting other metals, all welds, beads, blisters or protuberances, other than identification markings, shall be ground smooth and other imperfections shall be removed. All nonferrous metals, galvanized steel and stainless steel whether shop primed or field primed, shall be solvent-cleaned in accordance with SSPC-SP-1 prior to the application of the primer.
- 3.1.7 Pipe covering and duct covering shall have all adhering debris removed and indentations or unsightly spots smoothed out to an even surface and shall be brushed clean.
- 3.1.8 Concrete surfaces and concrete masonry shall be brushed and washed. All loose dirt, free lime, form oil, curing compounds and other foreign matter shall be removed by approved methods. Concrete surfaces requiring repair shall be patched and surfaces to receive paint shall be spackled and repaired. Concrete surfaces to be painted shall be acid-etched as recommended by the manufacturer of the coating to be applied to produce a slightly granular surface required for adherence of the paint to the concrete unless otherwise indicated. Concrete and concrete masonry shall be thoroughly dry prior to painting.

3.2 Protection of Non-Finish Items

- 3.2.1 Furnish and lay drop cloths or other means of protection for finished surfaces during the work.
- 3.2.2 Before painting, remove hardware, accessories, plates, lighting fixtures and similar items or provide ample protection of such items. Upon completion of work in each area, replace above items. Use only skilled mechanics for removing and replacing items.
- 3.2.3 If finished surfaces are damaged, entirely remove the stains or replace the damaged material, making good any damage to other work in connection therewith, without additional cost to the Owner.

3.3 Application

- 3.3.1 The following items shall not be painted, unless otherwise specified: ducts, covering over ducts, registers, grilles, dampers and linkage, name and identification plates and tags, floor gratings, brass valves, stainless steel, wood, cast-iron piping installed underground.

- (a) The following items shall be furnished with the manufacturer's standard prime and finish coats applied in the shop: pumps, motors, air compressors, wall fans, control and SCADA panels, panelboards, transformers, unit heaters, aluminum fascia, motor control centers, hoisting equipment.
- (b) The following items shall be shop primed and field painted: structural steel and wrought metals, pipelines, hangers and supports, valves, valve operators and stands, guard housings, steel lintels, hollow metal doors and frames.
- (c) All items not shop primed or shop finished shall be field primed and finished where exposed to view. The work shall generally include, but not be limited to, the following: interior concrete block, interior concrete walls, columns, beams and ceilings, covering over insulation on piping, electrical conduit, small piping and copper tubing, exterior PVC piping.

3.3.2 The work shall include all touch-up and remedial painting as required until the completion and acceptance of the final work.

3.3.3 Spray painting shall not be allowed.

3.4 Installation

3.4.1 Furnish equipment for the proper execution of the work. Erect and place same in such a way as not to interfere with work of other trades. Upon completion, dismantle and remove same from the job site.

3.4.2 Employ skilled mechanics to ensure good workmanship. Thoroughly mix materials immediately before application of paint. Surfaces shall be clean, dust free, dry and adequately illuminated. Each coat shall be thoroughly dry before applying succeeding coat.

3.4.3 Finished work shall be uniform and of approved color, smooth and free from runs, sags, and defective application. Edges of paint adjoining other materials or colors shall be sharp and clean, without overlapping. Before applying succeeding coats, primers and undercoats shall be completely integral and performing the function for which they are specified. Prepare and touch up scratches, abrasions, or other disfigurement and remove any foreign matter between successive coats.

3.4.4 Blast cleaned metal surfaces shall be coated immediately after cleaning, before any rusting or other deterioration or contamination of the surface occurs. Blast cleaned surfaces shall be coated not later than eight hours after cleaning under ideal conditions or sooner if conditions are not ideal.

3.4.5 Avoid degradation and contamination of blasted surfaces and avoid intercoat contamination. Clean contaminated surfaces before

applying next coat. Ensure method of cleaning contaminated surface follows manufacturer's recommendations.

3.4.6 Primers and undercoats of paint and enamel shall be tinted or shaded different colors than the finish coats. Each coat of material shall be inspected and approved by the Engineer before application of the succeeding coat. Otherwise, no credit for the coat applied will be given and the work in question shall be recoated. Inform the Engineer when each coat is ready for inspection and approval.

3.4.7 Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance.

3.4.8 Painting shall not be done when the temperature is below 10 degrees C (50 degrees F) and when satisfactory results cannot be obtained due to high humidity or excessive temperatures. Paints or other finishes shall not be applied to wet or damp surfaces.

3.4.9 All painting shall be done in accordance with the paint manufacturer's recommendations.

3.4.10 All wall surfaces which will be concealed by equipment shall be painted before equipment installation.

3.5 Cleaning

3.5.1 Upon completion of painting work, clean paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

3.5.2 Rubbish, debris, empty paint cans and discarded materials shall be placed in metal containers and removed from the site.

3.6 Schedule

3.6.1 Material Painting Schedule

Class of Work Primer Field or Shop Finish Coats
Shop Coat 1st 2nd 3rd

Nonferrous Metal and Galvanized Steel: Exterior		A	A	C
Steel and Iron: Interior	B	B*	A	A
Exterior	B	B*	A	C
Submerged or Constantly Wetted	B	B*	D	D
Wrapped in Insulation				
Exterior, Exposed to Process Wetting and Drying	B	B*		
	B	B*	D	D
Pipe and Duct Insulation: Exposed		A	A	
PVC		A	A	

*Touch-up bare metal with primer.

3.6.2 Paint Schedule

- (a) Alphabetical designations in the following list are given solely for the purpose of indicating the type and quality of materials desired.

<u>Symbol</u>	<u>Product</u> <u>Number</u>	<u>Name</u> <u>and</u>	<u>Volume</u> <u>Solids %</u>	<u>Dry Film Thickness</u>	
				<u>Micrometers</u>	<u>Mils Per Coat</u>
A	Tnemec Series 66HS, Sherwin-Williams Macropoxy 646, or Carboline Carboguard 890		69	51-76 um	(2.0-3.0 mils)
B	Tnemec Series 1, Sherwin-Williams Corothan I Mio-Zinc, or Carboline Carbozinc		69	102-152	(4.0-6.0)
C	Tnemec Series 1074 Endura-Shield, Sherwin- Williams Hi-Solids polyurethane gloss, or Carbothane 134 HG		54	51-76	(2.0-3.0)
D	Tnemec Series 66HS, Sherwin-Williams Macropoxy 646, or Carboline Carboguard 890		69	76-127	(3.0-5.0)

3.6.3 Notes

- (a) Where aluminum surfaces come in contact with incompatible metals, lime, mortar, concrete or other masonry materials, these areas shall be given one field coat of polyamide epoxy coal tar.
- (b) Stainless steel, where indicated shall be protected by two coats of clear acrylic lacquer conforming to the requirements of Military Specification MIL-L-81352A. Surface preparation shall consist of removing all oil and foreign matter by wiping clean with cloth and lacquer thinner.
- (c) Applicable to insulated and uninsulated pipes: Steel pipe not available with a shop coat shall be prime coated in the field immediately after installation.
- (d) Piping shall be painted up to and including the flanges attached to mechanical equipment. Electrical conduit shall be painted up to and including the flexible conduit connected to equipment.
- (e) All steel pipes, ductile iron fitting and flanges located at the wet well shall be painted before shipment. Provide field touch-up paint as required.

3.6.4 General Color Scheme

General color scheme shall be as follows:

- (a) Exterior piping and appurtenances – Turbine Blue.
- (b) Interior piping – Turbine blue.
- (c) Electrical Conduits – light gray.
- (d) Bollards (Guard Posts) – Safety yellow.

Note: Contractor to submit manufacturer's color chart for Engineer's selection.

END OF THIS SECTION

DIVISION 15 – PUMP STATION MECHANICAL

SECTION 15A – GENERAL MECHANICAL PROVISIONS

1. GENERAL:

1.1 Section Includes

1.1.1 The scope of work under this Division shall be all mechanical work required for the project work as shown or specified.

1.1.2 The mechanical work shall include the furnishing and installing of various items of mechanical equipment and appurtenances. Unless otherwise specifically indicated, electrical work shown on the electrical drawings shall be provided under Division 16. Any additions or modifications to the work shown on the electrical drawings required for the proper installation or operation of work under this Division shall be provided under this Division, at no additional cost to the City, in conformance with the requirements of Division 16. The Contractor shall be responsible for ascertaining the extent of electrical connections required for items furnished under this Division, for ascertaining the extent of electrical work shown on the electrical drawings and for coordinating the electrical work accordingly.

1.1.3 The specifications and drawings are intended to generally define the work required, but they do not include every equipment and installation detail. The work shall include all items and appurtenances required to fully complete the work and provide functional pump station conforming to the current operation philosophy, whether specifically identified or not, such that the systems are complete and operational.

1.1.4 Furnishing and installing of work under this Division shall comply with Division 1 requirements relating to the furnishing and installing of work.

1.2 Code Compliance

1.2.1 Unless otherwise indicated, in the absence of more stringent requirements in the Specifications or on the Drawings, the work shall be in compliance with the requirements of applicable codes, as a minimum.

1.3 Standards

1.3.1 Wherever the following abbreviations are used in these Specifications, or on the Drawings, they are to be construed the same as the respective expressions represented:

MHSWPS	<u>Manual for Highway Storm Water Pumping Station</u>
AASHTO	<u>American Association of State Highways and Transportation Officials</u>

ANSI	<u>American National Standards Institute</u>
ASME	<u>American Society of Mechanical Engineers</u>
ASTM	<u>American Society for Testing and Materials</u>
AWG	<u>American Wire Gauge</u>
AWWA	<u>American Water Works Association</u>
IPCEA	<u>Insulated Power Cable Engineers Association</u>
IES	<u>Illuminating Engineering Society of North America</u> <u>Illinois Plumbing Code</u>
NEC	<u>National Electrical Code</u>
NEMA	<u>National Electrical Manufacturers Association</u>
NESC	<u>National Electrical Safety Code</u>
OSHA	<u>Occupational Safety and Health Administration</u>
UL	<u>Underwriter's Laboratories</u>
HIS	<u>Hydraulic Institute Standard</u>
FM	<u>Factory Mutual</u>
ASHRAE	<u>American Society of Heating, Refrigerating and Air Conditioning Engineers</u>
SMACNA	<u>Sheet Metal and Air Conditioning Contractors' National Association</u>

- 1.3.2 Wherever a reference is made to a standard or standard specification, the reference shall be to the edition current at the time of bidding, including any revisions or amendments.

1.4 Verification of Contract Drawings

- 1.4.1 The 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.

1.4.3 Prior to installation, the Engineer may make reasonable minor changes in the locations of the installation without additional cost to the City.

1.4.4 The electrical work shown on the electrical drawings (or on electrical portions of multi-trade drawings) shall be provided under Division 16. Any changes in the electrical installation required for the proper installation or operation of items provided under this Division shall be provided under this Division in full conformance with the requirements of Division 16. In other words, if a change to the electrical work is required to accommodate equipment provided under Division 15, that electrical change shall be the responsibility of Division 15 and it must be in full compliance with the requirements of Division 16.

1.5 Coordination

1.5.1 The Contractor shall coordinate the work under this Division with the work of other trades. This shall include an orderly exchange of information and shall be accomplished such that the total work is not delayed and that interferences are avoided.

1.6 Workmanship

1.6.1 The mechanical work shall be performed in a neat and workmanlike manner in accordance with the best practices of the trade.

1.6.2 Unless otherwise indicated, all materials and equipment shall be installed in accordance with the codes, contract requirements and manufacturer's recommendations.

1.7 Protection of Work

1.7.1 All mechanical work, including equipment and appurtenances, shall be protected from damage until final acceptance. 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.

1.7.2 Prior to final acceptance, protective measures shall be removed and equipment and items shall be cleaned as required to deliver the installation to the City in clean, undamaged condition.

1.8 Clean-up and Safety

1.8.1 The work site shall be maintained in a clean condition, free of hazards, all in conformance with the requirements of Article 104.06 of the Standard Specifications. Special care shall be taken to assure that systems are not left in a hazardous condition.

1.9 Materials and Equipment

1.9.1 Quality

- (a) All materials, equipment and appurtenances shall be new, shall be suitable for the application and shall be the product of established, reputable manufacturers.

1.9.2 Standards

- (a) The construction, sizes, ratings and capacities of items shall be in conformance with the requirements of the codes and with ASTM and ASME standards, as applicable.

1.9.3 UL and/or FM Label

- (a) Unless otherwise indicated, materials and equipment shall bear the UL and/or FM label whenever such labeling is available for the type of material or equipment being furnished.

1.9.4 Other Requirements

- (a) Refer to Division 1 for other requirements relating to materials and equipment.

1.10 Erecting and Jointing Interior Piping

1.10.1 Description

- (a) This section includes furnishing of supports and hangers and installation of all interior piping and supports.
- (b) Piping materials, coatings and linings shown or specified shall be installed and supported at the locations specified or where shown.

1.10.2 Delivery, Storage and Handling

- (a) All products and materials shall be delivered, stored and handled as specified in Division 1.
- (b) Extreme care shall be taken in loading and unloading the pipe and fittings. The work shall be done slowly using skids or suitable power equipment keeping the pipe under control at all times.
- (c) Under no condition is the pipe to be dropped, bumped, dragged, pushed or moved in any way which will cause damage to the pipe, lining or coating.

- (d) When handling the pipe with a crane, a suitable pipe hook or sling shall be used around the pipe. Under no condition is the sling to be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends, lining and coating.
- (e) Any piping or fittings damaged in the process of delivery, storing, handling, or laying shall be replaced or repaired as approved.

1.10.3 The interior of pipelines shall be cleaned of all dirt and superfluous material of every description in an approved manner.

1.10.4 All bolts shall be primed by dipping with a bituminous coating, except the threads, which are coated immediately prior to installation of the nuts.

1.10.5 All threads shall be coated with a suitable pipe dope, Masters Metallic Compound, Loctite, before jointing.

1.10.6 Installed piping shall be free of sags or bends.

1.10.7 Piping shall be installed to allow for expansion and contraction without stressing pipe, joints or connected equipment.

1.10.8 The fire rated integrity shall be maintained where pipes pass through fire rated walls, partitions, ceilings, and floors.

1.10.9 Pipelines shall be fitted and installed in a neat and workmanlike manner in accordance with approved shop drawings.

1.10.10 Flanged joints shall be made with bolts or bolt studs with a nut on each end.

1.10.11 Anchors and stands shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment.

Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller shall be supported on cast-iron, malleable iron, or steel hooks, hook plates, rings or ring plates.

1.10.12 Hangers and Supports

- (a) Pipe hangers shall be provided at each change in pipe direction at minimum spacing recommended by manufacturer or reference standards, on both sides of pipe mounted valves and equipment and on both sides of pipe loops and expansion absorbing devices.
- (b) Brackets shall be used for the support of piping from vertical surfaces.

- (c) Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment.
- (d) Hangers and supports shall be installed to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.
- (e) Hangers shall be adjusted to distribute loads equally on the attachment and to achieve any indicated slope of the pipe.
- (f) Hangers and Supports shall be hot dipped galvanized or of stainless steel construction unless otherwise noted.

1.10.13 For sleeve type couplings, equally tighten diametrically opposite bolts on the coupling to bring the gaskets up evenly all around the pipe. Final tightening shall be done with torque wrenches set for the torque recommended by the coupling manufacturer.

1.10.14 All piping shall be installed in accordance with the manufacturer's recommendations and approved Shop Drawings and as specified in Division 1.

1.10.15 After installation of the interior piping and supports, control equipment and all appurtenances, the units shall be subjected to a field running test, as specified in Division 1, under actual operating conditions. Where field welding of pipe joints shown, specified, permitted, or required meet the requirements of ASME/ANSI B31.1 -Power Piping, Chapter VI Section 137.4 Hydrostatic Testing. Testing of pipelines shall be in accordance with the requirements of Division 15A Section 12.

1.11 Leakage Tests

1.11.1 Leakage tests shall be performed for any signs of leakage in all pipelines and structures required to be watertight.

1.11.2 Leaks shall be repaired by replacing broken pipe or joint assemblies found to leak at no addition to the Contract Price.

1.12 Testing

1.12.1 All mechanical equipment and systems provided under this Division shall be adjusted and tested. The Contractor shall adjust, repair or replace faulty or improper Division 15 work or equipment discovered during testing.

1.12.2 Tests may be made progressively as portions of the work are complete.

- 1.12.3 Tests shall be made in the presence of the Engineer.
- 1.12.4 A written record of tests shall be maintained by the Contractor and, when complete, it shall be submitted for the record.
- 1.12.5 The Contractor shall perform all tests necessary to assure proper functioning of materials and equipment. Specific special required tests shall be as described in individual equipment specifications, however, the absence of a specific test requirement does not relieve the Contractor from responsibility to adequately test the equipment and systems for proper operation.
- 1.12.6 Except where otherwise specifically indicated, testing must be complete prior to final inspection. All instruments, tools, etc., required for the tests shall be provided by the Contractor. Additional testing may be requested by the Engineer during final inspection to spot-check test results or to demonstrate proper functioning of the systems. These tests shall be performed by the Contractor at no additional cost to the City.

1.13 O&M Manuals and Data to be Filed with the Engineer

- 1.13.1 Legible 11"x17" shop drawings and searchable PDF O&M manuals, as specified in Section 1A and herein, shall be furnished to the Engineer when installation is complete, before testing and final acceptance.
- 1.13.2 As a minimum, the O&M manuals shall include:
 - (a) A table of contents.
 - (b) Approved, final shop drawings and product data for all equipment and materials incorporated in the work under this Division.
 - (c) Tabulation of motor & equipment name plate data.
 - (d) Manufacturer's maintenance manuals for all equipment furnished under this Division for which maintenance is recommended by the manufacturer.
- 1.13.3 All data shall be neat and clearly legible. The table of contents and tabulations of set points and other recorded test data shall be typed. Sloppy, illegible, inaccurate, or incomplete data and title block without drawing numbers shall not be accepted.
- 1.13.4 See Division 1 for further requirements.

1.15 Record Drawings

1.15.1 Record drawings shall be prepared and submitted in accordance with Division 1.

1.15.2 Alterations and additions to the mechanical installation depicted on the contract drawings which are made during the execution of the work shall be neatly and plainly marked in red on a set of Record Drawings kept at the contractor's field office for the project. These drawings shall be updated as the work progresses and shall be available for inspection by the Engineer at all times during the course of the work.

1.16 Final Acceptance Inspection

1.16.1 When the work is complete, tested and fully operational, and only after the Record Drawings have been reviewed and accepted, the Contractor shall schedule a Final Acceptance Inspection with the Engineer.

1.16.2 The Final Acceptance Inspection shall be made for the complete work at the facility as a whole and shall be as further described in Section 105 of the Standard Specifications.

1.17 Warranty

1.17.1 Warranty shall be provided for equipment, materials and work provided under this Division as specified in Division 1.

1.18 Maintenance

1.18.1 During the course of the construction work and until final acceptance, the Contractor shall be responsible for maintenance and operational integrity of the facility as specified in Division 1.

1.19 Basis of Payment

1.19.1 Work required to comply with this Division shall be paid as specified under each individual Section, which shall be payment in full for the work described.

1.19.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

Not Used

3. EXECUTION:

Not Used

END OF THIS SECTION

SECTION 15B - BASIC MECHANICAL MATERIALS AND METHODS

1. GENERAL:

1.1 Description

1.1.1 Basic materials and methods specified herein shall be incorporated in the work wherever applicable unless specifically indicated otherwise.

1.1.2 The basic materials and methods specified herein are intended to define a minimum standard of quality and workmanship.

1.2 Concrete

1.2.1 Concrete for equipment bases and other work under this Section shall be provided under the Standard Specifications.

1.3 Cutting and Patching

1.3.1 All cutting and patching of building materials required for work under this Section shall be provided under this Section.

1.3.2 Cutting and patching shall be provided under this Section in conformance with Division 1.

1.4 Fasteners

1.4.1 Fasteners used to mount pipe supports and other items attached to the structure shall be suitable for the weight supported and shall be compatible with the structure material, i.e. wood screws shall be used for wood, toggle bolts shall be used for hollow masonry, expansion bolts or power-set studs shall be used for solid masonry or concrete and clamps shall be used for structural steel.

1.4.2 Installation shall conform to requirements of Division 5 - Metals.

1.5 Support and Anchors

1.5.1 This section includes requirements for designing and providing all hanging and supporting devices of construction shown, specified, or required for pipelines, apparatus, HVAC system, plumbing, miscellaneous system, and equipment other than electrical equipment. Installation shall conform to requirements of Division 5 - Metals.

1.5.2 Submittals

(a) All submittals, including the following, shall be provided as specified in Division 1.

- (b) Shop drawings shall be submitted to show the quantity, type, design and location of all supports, hangers and anchors required.

- 1.5.3 Supporting devices adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating and testing conditions with due allowance for expansion and contraction shall be provided. Installation shall conform to requirements of Division 5 - Metals.
- 1.5.4 Supporting devices shall be designed by the Contractor in accordance with the best practice and shall not be unnecessarily heavy. Supporting devices shall accommodate loads imposed during leakage tests for the test pressures specified. The required strength of supporting devices shall be based on the combined weight of the piping and connected equipment, the weight of the denser of the fluids used in operations or testing and the weight of insulation where applicable. Supports shall be installed with a working safety factor of not less than 5. Installation shall conform to requirements of Division 5 - Metals.
- 1.5.5 Springs shall be provided where necessary. Hangers and supports shall be of standard design where possible and shall be best suited for the service required. Proper pipe protection saddles shall be included for hangers and supports on pipes which are covered with insulation. Where required, supports shall be screw adjustable after installation unless approved otherwise. Installation shall conform to requirements of Division 5 - Metals.
- 1.5.6 All supporting devices shall be designed to minimize interference with access and movement. Eliminate the potential for injuries due to protruding supporting devices. Installation shall conform to requirements of Division 5 - Metals.
- 1.5.7 All piping supports, hanger rod size, brackets and spacing shall meet the requirements of ANSI/ASME B31.1, MSS SP-58, SP-69, SP-89 and SP-90 except as modified herein. Installation shall conform to requirements of Division 5 - Metals.
- 1.5.8 All products and materials shall be delivered, stored and handled as specified in Division 1.
- 1.5.9 Structural and miscellaneous steel, metal castings, ductile iron pipe and fittings, steel pipe and fittings, and supports meeting the requirements of Division 5 - Metals shall be used.
- 1.5.10 Overhead hangers shall be supported using threaded rods properly fastened in place by suitable screws, clamps, inserts, or bolts, or by welding. Hangers shall be subjected to tensile loading only. Where lateral or axial movement may occur, suitable linkage shall be provided

to permit sway. Installation shall conform to requirements of Division 5 - Metals.

1.5.11 Suspended piping shall be supported by adjustable ring or clevis hangers and threaded rods from heavy duty concrete inserts or other fastening devices, except as otherwise specified or noted. Installation shall conform to requirements of Division 5 - Metals.

1.5.12 Brackets shall be of welded steel and designed for the following load classifications:

<u>Load Classification</u>	<u>Maximum Load per Bracket</u>
Light	750 pounds
Medium	1,500 pounds
Heavy	3,000 pounds

When medium or heavy brackets are bolted to vertical surfaces, backplates of adequate size and thickness shall be furnished and installed to distribute the load against the vertical surfaces. When the use of backplates is not practicable, the brackets shall be fastened to the vertical surfaces in such a manner that the safe bearing strength of the vertical surfaces will not be exceeded.

1.5.13 Piping shall be connected, supported and guided to permit and control pipe expansion and contraction and to accommodate building expansion, contraction and settling without damage to the piping or support system.

(a) Anchors shall be furnished and installed when specified, shown, or required for holding the pipelines and equipment in position or alignment. Anchors shall be designed for rigid fastening to the structures, either directly or through brackets.

(b) Anchors shall be cast-iron chair type anchors for piping with steel straps, except where anchors form an integral part of pipe fittings or where an anchor of special design is required.

(c) Insert material shall be stainless steel. Inserts shall be designed to permit the rods to be adjusted horizontally in one plane and to lock the rod nut or head automatically. Inserts shall be recessed near the upper flange to receive reinforcing rods. Inserts shall be designed so that they may be held in position during concrete placing operations. Inserts shall be designed to carry safely the maximum load that can be imposed by the rod which they engage.

1.5.14 Hanger and supports shall be installed in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1 and Section 15A.

1.5.15 Hangers and Supports shall be hot dipped galvanized or of stainless steel construction unless otherwise noted.

1.5.16 Hangers, supports, anchors, and similar devices shall be painted as specified in Division 9.

1.5.17 Field welds, bolted connections and abraded areas shall be cleaned and painted as specified in Division 9.

1.6 Basis of Payment

1.6.1 The work required to comply with this Division shall be paid as specified under each individual Section, which shall be payment in full for the work described.

1.6.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

Not Used

3. EXECUTION:

Not Used

END OF THIS SECTION

SECTION 15C - PIPING AND APPURTENANCES

1. GENERAL:

1.1 Section Includes

- 1.1.1 The work specified herein includes furnishing and installing all piping, fittings, valves, and accessories, required for a complete and satisfactorily working installation as shown and specified.

1.2 Related Sections

- 1.2.1 Section 5B - Bolts, Anchor Bolts, Expansion Anchors, and Concrete Inserts.
- 1.2.2 Section 9A – Painting.
- 1.2.3 Section 15A - General Mechanical Provisions.
- 1.2.4 Section 15B - Basic Mechanical Materials and Methods.
- 1.2.5 Section 15D - Pumping Equipment.

1.3 Submittals

- 1.3.1 Submit shop drawings and product data under provisions of Sections 1A and 15A.
- 1.3.2 Submit detailed drawings and data on pipe fittings, valves, slide gate, actuators and appurtenances and as specified under individual subsection.
- 1.3.3 Pipe and equipment manufactures' submittals as specified under individual subsection.
- 1.3.4 A certification of the welder's qualification, in conformity with the requirement of the code, shall be submitted to the engineer.

1.4 Delivery, Storage and Handling

- 1.4.1 Delivery, storage and handling shall be as specified under Section 1A.

1.5 Warranty

- 1.5.1 Provide warranty under provisions of Section 1A.
- 1.5.2 Provide 1 year non-prorated guarantee or warranty from the date of final acceptance of the Pump Station.

1.6 Basis of Payment

- 1.6.1 The piping and appurtenances work shall be paid as part of the contract lump sum price for

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which shall be payment in full for the work described herein.

- 1.6.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

2.1 Water Piping

2.1.1 General

- (a) All piping shall be generally arranged and aligned as shown and specified. Where special conditions are encountered in the field, the arrangement and alignment of piping shall be as directed by the ENGINEER.
- (b) Piping shall be installed as directly as possible between connecting points insofar as the work of other trades permit. Where interference occurs with another trade whose work is more difficult to reroute, the Contractor shall revise the routing as required to avoid subject interferences. Piping shall be carefully installed to provide for proper alignment, slope and expansion.
- (c) To allow for expansion and contraction, pipe shall be guided and supported in such manner that pipe lines shall not creep, sag or buckle. Anchors and supports shall be provided wherever necessary to prevent any misalignment of piping. Pipe support shall not be limited to support indicated on the drawings.
- (d) Small tubing to gauges, controls, or other equipment, installed on any apparatus shall not be coiled nor excessive in length but shall be installed neatly, carefully, bent at all changes in direction, secured in place and properly fastened to equipment at intervals to prevent sagging.
- (e) Prior to the start of any piping installation work, the Contractor shall prepare and submit for approval detailed piping installation drawings. These shall be prepared on the basis of actual equipment being furnished and actual dimensions of walls, openings and other significant elements.
- (f) Piping and appurtenances shall conform to applicable Section 1006, METALS, of the Standard Specifications.

2.1.2 Ductile Iron Pipe and Fittings

- (a) Ductile iron pipe shall meet the requirements of AWWA C151, Class 53 for exposed interior piping and buried piping.
- (b) Ductile iron fittings shall have flanged joints or mechanical joints as shown or specified.
- (c) Fittings shall be provided as shown and specified and shall be ductile iron meeting the requirements of AWWA C110 and AWWA C153.
- (d) Pipe shall be installed in maximum lengths of 10 feet.
- (e) Buried piping shall have restrained mechanical joints. Anchor bolts and nuts shall meet the requirements of Section 5B – Bolts, Anchor Bolts, Concrete Anchors, and Concrete Inserts.

2.1.3 Flanged Connections

- (a) Flanged connections shall be made as shown and specified. All flanges shall be drilled in conformance with the 125/150 ANSI Standard template.
- (b) Class 150 pound steel flanges shall be smoothed finished (flat faced) for connection to dissimilar metals such as cast iron.
- (c) Flanged joints shall be made with bolts or bolt studs with a nut on each end. Bolts, stud bolts, and nuts shall meet the requirements of Section 5B – Bolts, Anchor Bolts, Concrete Anchors, and Concrete Inserts.
- (d) Rubber gaskets for flanged joints shall meet the requirements of AWWA C207 as modified and supplemented herein. Gaskets shall be 1/8-inch thick. Gaskets shall be full face.

2.1.4 Wall Pipe

- (a) Wall pipe shall be furnished and installed for all storm water piping passing through walls, as shown. Wall pipe material, thickness and coatings shall be the same as the connected piping.
- (b) Wall pipe shall meet the requirements of AWWA C110.
- (c) Wall pipe shall have an integrally cast intermediate collar located at the center of the wall.

- 2.1.5 Temporary bulkheads shall be provided at the ends of pipeline sections where adjoining pipelines have not been completed and are not ready to connect. Temporary bulkheads shall be removed when they are no longer needed.

2.1.6 Submittals

- (a) All submittals, including the following, shall be provided as specified in Division 1 with the following stipulations.
- (b) The following shop drawings shall be submitted.
 - 1) Flanged, screwed, welding and mechanical coupling fittings and pipe, couplings, harnessing and special fittings. When special designs or fittings are required, the Work shall be shown in large detail and the special or fitting shall be completely described and dimensioned.
 - 2) Fully Dimensioned layout of pipe, fittings, couplings, sleeves, expansion joints, supports, anchors, harnessing, valves and equipment. Pipe size, type and materials shall be labeled on drawing and a schedule shall be included.
 - 3) Cross sections showing elevation of pipe, fittings, sleeves, couplings, supports, anchors, harnessing, valves and equipment.
 - 4) Catalog data for pipe, couplings, harnessing and fittings.
- (c) The following certifications shall be submitted:
 - 1) Certificate of compliance for pipe, fittings, restrained flange adapter, gaskets, specials, and coatings in accordance with this Division.
 - 2) A certification of the welder's qualifications.

2.1.7 Quality Assurance

- (a) Certified welders, having current certifications conforming to the requirements of the ANSI code shall perform all welding on steel pipelines.

2.1.8 Painting and Coating

- (a) All pipe and fittings shall be lined and coated in accordance with the piping schedule. All bolts, nuts, couplings and the like shall be coated after the joint has been made.
- (b) Ductile-iron pipe and fittings shall be shop coated on the outside with one coat of liquid epoxy primer Symbol B as specified in Section 9A, 4.0 mils minimum dry thickness, for use in exposed locations, such as inside buildings, where finish painting or insulating is required.

- (c) Pipe for use not exposed to view shall also be coated with liquid epoxy primer Symbol B as specified in Section 9A.
- (d) Immediately after facing and drilling, the back of the flanges and bolt holes shall be coated with liquid epoxy primer coating meeting the requirements of AWWA C210.
- (e) The weight and class designation shall be conspicuously painted in white on the outside of each pipe, fitting, and special casting after the shop coat has hardened.
- (f) Painting shall be in accordance with Section 9A and meeting the requirements of AWWA C210.
- (g) Galvanizing: Provide galvanizing in accordance with ASTM A 53 where shown or specified.
- (a) Sleeve –type Couplings
 - 1) Couplings shall be shop coated with liquid epoxy primer in accordance with Section 9A and meeting the requirements of AWWA C210.

2.2 Pipe Supports and Anchors

- 2.2.1 Pipe supports and anchors shall be furnished and installed as shown on the Drawings or as specified in Sections 15A and 15B.

2.4 Flanged Duckbill Check Valve

- 2.4.1 “Duckbill” type check valve.
- 2.4.1 Two piece split configuration.
- 2.4.1 Iron body.
- 2.4.1 Rubber construction with Neoprene exterior wrap.
- 2.4.1 Flanged connections with steel back-up rings drilled to conform to ANSI B16.1 standards.
- 2.4.2 Port area equal to 100 percent of mating pipe port area.
- 2.4.3 Body shall be drilled and tapped for supplied clean out plug on top and flushing connections with plugs on bottom.
- 2.4.4 Maximum opening head required of 6-inch water column (w.c.) against no backpressure.

2.4.5 Designed to resist 20 feet of head back pressure.

2.4.6 Valve size per line size shown on Drawings.

3. EXECUTION:

3.1 Transportation and Delivery

3.1.1 Every precaution shall be taken to prevent damage to the pipe during transportation and delivery to the site. Extreme care shall be taken in loading and unloading the pipe and fittings. Such Work shall be done slowly with skids or suitable power equipment, and the pipe shall be under perfect control at all times. Under no condition shall the pipe be dropped, bumped, dragged, pushed, or moved in any way which will cause damage to the pipe or coating. When handling the pipe with a crane, a suitable pipe hook or sling around the pipe shall be used. Under no condition shall the sling be allowed to pass through the pipe unless adequate measures are taken to prevent damage to the pipe ends.

3.1.2 If any pipe or special is damaged in the process of transportation, handling or laying, such pipe or pipes shall be replaced or repaired by the Contractor at its own expense.

3.1.3 The Contractor shall furnish and install suitable blocking and stakes to prevent the pipe from rolling. The type of blocking and stakes, and the method of installation, shall be approved by the Engineer.

3.2 Piping Installation General

3.2.1 The dimensions shown on the Drawings for the location of pipelines have been established with the intent that there will be no interferences. The Contractor shall check all dimensions shown on the Contract Drawings prior to the installation of Work and shall notify the Engineer promptly of any interferences or errors discovered. If interferences are found to exist prior to or during construction, changes in the location of pipelines to avoid such interferences shall be made at no extra cost to the City and in a manner as reviewed by the Engineer.

3.2.2 Elevations and dimensions locating pipelines are shown on the Drawings to the centerlines of the pipe unless otherwise indicated.

3.2.3 Piping connections and dimensions to equipment are subject to changes as reviewed by the Engineer to suit the types of equipment furnished.

3.2.4 Piping suspended from ceilings shall be installed to provide maximum head room consistent with good installation.

3.2.5 The layout of the piping and fittings shall be carefully checked to determine that the related equipment can be properly assembled to

produce a workable arrangement. Defective or improperly fabricated Work shall be rejected and replaced with Work which, when completely assembled, shall result in an arrangement which shall function as intended and as shown on the Drawings.

3.2.6 All pipelines shall be straight and true in alignment, grade and location indicated, designated or required, and all installation shall be made in a workmanlike manner to the satisfaction of the Engineer. The pipe and fittings shall be adequately braced and blocked or tied, hung or supported for satisfactory installation.

3.2.7 As soon as pipes are in place, all open ends shall be capped until permanent connections are made. All pipelines shall be securely supported when required either by hanging from beams with suitable pipe hangers or supported on walls by suitable wall brackets. Where it is necessary, install hangers or supports after concrete is poured or other masonry Work finished. Anchor bolts with expansion shields shall be used.

3.2.8 Where pipes pass through masonry walls, floors and partitions, the juncture shall be made as shown on Plans. Where no details are shown, the Contractor shall either rough in the piping before the concrete is poured or the masonry completed, or shall provide suitable plugs, sleeves or forms for piping. After the pipes have been installed, the openings shall be filled solid; suitable allowance being made, however, for the expansion and contraction of the piping. The cutting of concrete for pipe shall be avoided wherever possible, and in no case where such cutting is necessary shall reinforcing rods be cut or disturbed, and no such cutting shall be done without the permission of the Engineer. All openings made for pipe Work shall be neatly patched in a workmanlike manner.

3.2.9 Horizontal runs shall be given as steep a pitch with even grade toward the outlet as conditions will permit, and care shall be taken in laying out piping that there is no interference with the proper location of piping for other purposes or other equipment. No change shall be made in the general location shown for piping, or in the method of running and connecting same, except with the written approval of the Engineer. When any change is made, a record of the location of all pipes so changed shall be kept by the Contractor and a copy of such record shall be given to the Engineer showing the location of all piping.

3.3 Protection of Piping System

3.3.1 Install and maintain pipe and equipment which is clean and free from rust, dirt, scale, etc.

3.3.2 Install temporary airtight covers at all pipe and equipment openings. Special attention shall be given to vacuum and air piping and each pipe section shall be individually inspected prior to placing. No

piping shall be placed when wet, nor shall any free moisture be present inside any air piping during installation.

3.4 Pipe Supports and Hangers

- 3.4.1 Pipe supports and hangers shall be in accordance with Sections 15A and 15B.

3.5 Welding

- 3.5.1 All welding of piping and/or special fittings shall be done in conformity with the current ANSI B31.1, "Pressure Piping".
- 3.5.2 Tee connections in welded piping shall be made with a factory fabricated butt welding tee or with weld-o-let of butt, socket or threaded type. When weld-o-lets are used, the branch connection shall be one-half the diameter of the main or less. Scarf welding or direct butt welding of side connections shall not be permitted. Tees fabricated from pipe shall not be permitted.
- 3.5.3 Long radius welding elbows shall, whenever possible, be used for changing direction of welded pipelines. Mitered joints shall be subject to approval by the Engineer.

3.6 Flanged Joints

- 3.6.1 All flanged joints shall be made temporarily with gaskets in place using a minimum number of bolts to support the piping. Any misalignment of the assembled piping shall be adjusted or corrected in a manner approved by the Engineer.
- 3.6.2 Tightening of flange bolts to "pull up" misaligned flanges will not be permitted and shall not be done. The misaligned flanges shall be machined to fit, or approved spacer pieces and gaskets shall be installed if necessary and directed by the Engineer. The temporary assembly of the flanged piping shall demonstrate that there will be no undue stresses in the piping or at the connections to the equipment. The temporary assembly shall be approved by the Engineer before the joints are tightened. Flanged joints shall then be completed and made watertight and the tension in the flange bolts, when tightened, shall not exceed 15,000 psi at the minor diameter of the bolt threads.

3.7 Sleeve Type Couplings

- 3.7.1 For sleeve type couplings, diametrically opposite bolts shall be equally tightened on the connection so that the gaskets will be brought up evenly all around the pipe. Final tightening shall be done with torque wrenches set for the torque recommended by the coupling manufacturer.

3.8 Testing

- 3.8.1 Pipes shall be flushed clean and tested and any leaks shall be made tight. Perform hydrostatic pressure testing for piping systems. After section of piping to be tested has been filled with water, apply test pressure by means of force pump of such design and capacity that required pressure can be applied and maintained without interruption for duration of test. Measure test pressure by means of tested and properly calibrated pressure gauge acceptable to Engineer. Maintain test pressure for sufficient length of time to permit Engineer to observe piping under test but not less than 2 hours. Piping systems shall show no visual evidence of weeping or leaking. If leakage is evident, make appropriate repairs and retest.

3.9 Painting

- 3.9.1 Piping, fittings and appurtenances shall be painted in accordance with Section 9A - Painting.

3.10 Supports for Present Piping

- 3.10.1 Wherever Contractor is required to expose, suspend or reroute present piping, supports for such piping shall be provided as is required for new piping in accordance with paragraph 3.4 Pipe Supports, this Section.

3.11 Installation of Pipe and Fittings

- 3.11.1 All pipe and fittings shall be installed in accordance with the specifications contained herein and in Division 15A and 15B and in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.

3.12 Schedule

- 3.12.1 Valve Schedule

<u>Service</u>	<u>Valve Type</u>	<u>Opening</u>		<u>Joint Type</u>	<u>Actuator Type</u>	<u>Remarks</u>
		<u>Size</u> <u>Inches</u>				
Discharge	Duckbill Check	16		F		

Note: Opening size above is internal diameter piping.

- (1) Abbreviations used in the schedule are as follows:

Joins

F Flanged

3.15.2 Piping Schedule

<u>Service</u> Remarks	<u>Size</u> (Inches)	Pipe Material ⁽¹⁾	<u>Protective</u> <u>Coatings</u> ⁽³⁾		Joints ⁽²⁾	<u>Test</u> <u>Pressure</u> (psig)
			Int.	Ext.		
Pump Discharge	16	DI	P	P	F	20

Notes:

- (1) DI Ductile Iron
- (2) F Flanged
- (3) P Shop Finish Painted
- 4) NA = Not Applicable

END OF THIS SECTION

SECTION 15D – PUMPING EQUIPMENT

1. GENERAL:

1.1 Description

- 1.1.1 This section includes requirements for furnishing and installing submersible motor pumping units, together with base elbows, guide rail or cable system, chain and cable holders and all appurtenances necessary for a complete installation.
- 1.1.2 Pump shall be of the vertical, centrifugal, heavy duty, non-clog, close-coupled, submersible type, with bottom suction and side discharge, each driven by submersible electric motor mounted as an integral part of the pump. The pumping unit shall be designed to pump at the capacities specified. The pumping units shall be designed for continuous and intermittent duty.
- 1.1.3 All pumps of a specified type shall be identical, the product of the same manufacturer. Refer to Division 15A. All main pumps within the pump station shall be interchangeable at any location without requiring piping and flange modification, and all main pumps shall be identical with respect to its technical rating, dimensions and flange connections.

1.2 Operating Conditions

- 1.2.1 The main pumps shall be capable of a draw down to a low water level at El. 695.00 without cavitation occurring. Manufacturer's certification of the preceding shall be provided as part of the submittal data.
- 1.2.2 The main 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:

<u>Items</u>	<u>Main Pump</u>
	<u>(100-P-0101 and -0102)</u>
Capacity at primary rating point	4,400 gpm
Total head at primary rating point	31.4 ft
Overall efficiency, wire to water, at rating point, minimum, percent	73
Shutoff head:	
Maximum	65 ft
Capacity at secondary rating point	2,700 gpm
Total head at secondary rating point	43 ft

Overall efficiency, wire to water, at secondary head, minimum, percent	65
Diameter of compressible sphere that will pass through pump, minimum	3 inch
Pump inlet diameter, minimum	12 inch
Pump discharge diameter, minimum	12 inch
Pump speed, maximum, rpm	1,170
Motor horsepower, maximum	45 hp
Motor efficiency at full load, minimum, percent	89.5
Motor power factor at full load, minimum	0.85
Locked rotor kVa/hp, maximum, NEMA code letter	G
Maximum overall pump height including lifting eye 6'-5 1/4"	
Minimum pump start per hour	15
Minimum Service Factor	1.15

1.2.3 Each pump shall have a continuously rising characteristic curve from the rating point to shutoff which passes through the rating point, and which meets or exceeds the specified heads and capacities, all within the Hydraulic Institute tolerances per 1.5.5(a) of this section.

1.2.4 Submersible units shall be capable of sustaining full reverse runaway speed without damage.

1.2.5 Motors shall be capable of operating pumps over entire range of pump curves operating conditions without overloading and without using the service factor.

1.2.6 The entire pumping equipment including power supply system shall meet the NEC requirement for Class 1, Div. 2, Group D hazardous locations.

1.3 Related Sections

- 1.3.1 Section 3A - Grout
- 1.3.2 Section 5B - Bolts, Anchor Bolts, Expansion Anchors and Concrete Inserts
- 1.3.3 Section 9A - Painting
- 1.3.4 Section 15A - General Mechanical Provisions
- 1.3.5 Section 15B - Basic Mechanical Materials and Methods

- 1.3.6 Section 15C - Piping and Appurtenances
- 1.3.7 Section 16A - General Electrical Provisions
- 1.3.8 Section 16C – Basic Electrical Materials and Methods
- 1.3.9 Section 16D - Supervisory Control and Data Acquisition
(SCADA) Equipment
- 1.3.10 Section 16E - Major Electrical Equipment
- 1.4 Submittals
 - 1.4.1 All submittals, including the following, shall be provided as specified in Division 1.
 - 1.4.2 Submit a list of not less than five (5) installations where pumping equipment of the type and approximate size specified herein have been in successful operation for at least five (5) years.
 - 1.4.3 Submit location where pumps and motor are manufactured and the nearest permanent service headquarters of the pump and motor manufacturers.
 - 1.4.4 Submittal data shall include:
 - (a) 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.
 - (b) Detailed control description, illustrations, wiring diagrams of manual-off-automatic controls and starting equipment.
 - (c) Complete motor and manufacturer supplied cables and cable support data.
 - (d) Pump performance curves for the specified conditions including head, input kilowatts, and overall efficiency, as a function of capacity from zero to maximum capacity.
 - (e) 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.
 - (f) General arrangement drawing of pumping unit, suction elbow and pump stand. Include equipment weight and anchor methods and materials.
 - (g) Cross section drawing of pumping unit.
 - (h) Factory and field testing procedures shall be submitted prior to factory testing.
 - (i) Parts list with materials of construction technical descriptions and complete model number and quantity

- (j) Motor performance characteristics. Information shall include data specific for the impeller used on project to provide efficiency and power factor values at the actual expecting loading of the motor. Submitted values may be based on a pump prototype. Submitting efficiency and power factor values for a pump assuming it operates at full load is not acceptable.
- (k) Spare parts list with technical description, complete model number and quantity.
- (l) Painting procedure, details of finish color and ANSI numbers.
- (m) Six certified copies of the Shop Test results including analysis of test results and recommendations.
- (n) Explosion proof UL or FM Certification for all proposed pumps.

1.4.5 Submit copies of all manufacturers' guarantees and warranties obtained by the contractor to be transferred to the City, at the time of final acceptance of this project by the City.

1.4.6 Motor data shall include:

- (a) Manufacturer
- (b) Nameplate rated kilowatts (horsepower)
- (c) Rated voltage
- (d) Full load rpm
- (e) Efficiency
- (f) Full load current
- (g) No load current
- (h) Full load power factor
- (i) NEMA design letter
- (j) Locked rotor motor starting inrush current and NEC code letter
- (k) Insulation class
- (l) Service factor
- (m) Recommended starting restrictions, including allowable starts per hour
- (n) Recommended maximum KVAR rating of power factor correction capacitors.
- (o) Class 1, Division 2, Group D rating showing UL or FM approval
- (p) Weight of the pump/motor unit

1.4.7 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.

1.5 Quality Assurance

1.5.1 General

- (a) Pumping equipment shall be produced by a manufacturer who regularly engages in the design, manufacture, assembly and production of submersible sewage pumping equipment of the size and type as specified for not less than five years.
- (b) Motor wiring shall be rated for service in hazardous Class I, Division 2, Group D location.
- (c) All materials used in the construction of the equipment herein specified shall be new and of the highest available grade and of properties best suited to the Work required.
- (d) One manufacturer shall be responsible for providing pumping equipment, including pump motor and all accessories.
- (e) Unless otherwise indicated, all pumps of a specified type under this Section shall be identical, the product of the same manufacturer.
- (f) To ensure that all equipment is properly coordinated and will function in accordance with the intent of these Specifications, the Contractor shall obtain all the equipment specified herein from the pump manufacturer in whom shall be vested unit responsibility for the proper function of the complete system, including pumps, motors, electrical, control equipment and accessories as shown and specified. Contractor, however, shall retain overall responsibility for equipment coordination, installation, testing, commissioning and operation.

1.5.2 Contractor's Responsibility

- (a) 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 the Contractor's sole responsibility, without additional cost to the City, 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.

1.5.3 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 the Engineer.

- (c) Submit manufacturer's certification that they have reviewed the location and discharge piping design, the discharge valve locations and types, the loads imposed on the pumping units from the connections, 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 1000 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.

1.5.4 Data to be filed with the Engineer

- (a) Record Drawings: The Contractor shall keep one record copy of all Specifications, Plans, Addenda, Supplementary Drawings, Working Drawings, Change Orders and Clarifications at the site in good order. Specifications, Plans, Supplementary Drawings and Working Drawings shall be annotated to show all changes made during the construction process. These shall be available to the Engineer at all times and shall be delivered to the Engineer upon completion of the work.
- (b) Four bound copies and searchable PDF of operating and maintenance instructions, diagrams, parts, lists, requirements and other information pertinent to the operation of the various systems and equipment including bill of material with technical description, detailed technical data sheets, record shop drawings, catalog cuts highlighting applicable data shall be furnished to the Engineer. Refer to Division 1.

1.5.5 Source Quality Control

- (a) Factory tests shall be performed on each pumping unit including spare pumps in accordance with the test code of the current Hydraulic Institute, except as modified herein. The pumps shall be tested in the position that they will be installed for all test parameters in Table 11.6.5.4 below. Main Pumps shall demonstrate compliance with Grade 1U from Hydraulic Institute Standard 11.6 at Primary Rating Point including power and efficiency and Grade 2B from Hydraulic Institute Standard 11.6 at Secondary and Tertiary Rating Points.

Table 11.6.5.4 — Pump test acceptance grades and corresponding tolerance band

Test parameter	Guarantee requirement	Grade	Grade 1			Grade 2		Grade 3	
		Δt_Q	10%			16%		18%	
		Δt_H	6%			10%		14%	
		Symbol	Acceptance grade						
			1B	1E	1U	2B	2U	3B	
Rate of flow	Mandatory	t_Q (%)	± 5%	± 5%	0% to + 10%	± 8%	0% to +16%	± 9%	
Total head	Mandatory	t_H (%)	± 3%	± 3%	0% to + 6%	± 5%	0% to +10%	± 7%	
Power ^a	Optional (either/or)	t_P (%)	+ 4%	+ 4%	+ 10%	+ 8%	+ 16%	+ 9%	
Efficiency ^a		t_n (%)	- 3%	- 0%	- 0%	- 5%	- 5%	- 7%	

^a The power and efficiency tolerances are not the result of an exact calculation using the maximum values of a related column. They are instead reflecting real life experience. For grade 1E and 1U, no negative tolerance on efficiency is allowed.

NOTE: All tolerances are percentages of values guaranteed.

- (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 City's 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 as described in 1.5.5. c and the insulation test 1.5.5. f 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) The Contractor shall provide transportation and reasonable expenses to and from all factory pump testing for two (2) representatives of the City to witness such testing. The City shall designate these individuals. The Contractor shall notify the 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 the Contractor to coordinate with the manufacturer and ensure 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 the 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 the Contractor shall re-arrange for the test on a different date that fits with the

Engineer's schedule. Any delay to the project due to the cancellation of the test shall be the Contractor's responsibility and shall not be allowed any extension or compensation.

- 3) The Contractor shall credit the City all expenses for any additional trips that the Engineer and Engineer's representatives have to make to the testing facility due to tests cancelation.

1.6 Warranty

1.6.1 Refer to Division 1.

1.6.2 Provide 5 years non-prorated guarantee or warranty from the date of final acceptance of the Pump Station.

1.7 Delivery, Storage and Handling

1.7.1 Products and materials shall be delivered, stored and handled as specified in Division 1.

1.8 Spare Parts

1.8.1 The following spare parts shall be provided; two sets for the main pump and two sets for the low flow pump:

- (a) Two sets of mechanical seals - upper and lower
- (b) Two sets of cable entry grommets
- (c) Two sets of Motor Bearings
- (d) Two sets of Wear Rings

1.8.2 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.

1.9 Basis of Payment

1.9.1 The pumping equipment shall be paid for per contract unit price each for

MAIN PUMPS

which shall be payment in full for the work described herein unless otherwise noted.

1.9.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

2.1 Pump Specifics

2.1.1 Manufacturer and Model

- (a) Flygt, NP 3202 LT 3 ~ 616

No substitutes allowed.

2.1.1 Design

- (a) The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars or cable system extending from the station floor to the discharge connection.
- (b) Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.
- (c) No portion of the pump/motor unit shall bear directly on the sump floor.

2.1.2 Cooling System

- (a) Each pump/motor unit shall be cooled by a self supplying cooling system. A motor water jacket is required. The water jacket shall thus provide heat dissipation for the motor regardless of whether the motor is submerged in the pumped media or submerged by air.

2.1.3 Casing

- (a) Pump casing shall be of the centerline discharge type.
- (b) Pump casing shall be ASTM A48 Class 35B cast iron, with smooth surfaces devoid of blow holes or other casting irregularities.

2.1.4 Impellers

- (a) The impeller shall be of Duplex Stainless Steel (ASTM CD-4MCuN) or hardened ductile iron, dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog 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 leading edges of the impeller shall be capable of handling solids, fibrous materials, sludge and other matter normally found in wastewater. The required impeller shall be factory trimmed to meet the specific pumping head and capacity ranges.
- (b) The impeller shall be secured to the shaft with a stainless steel key and lock nut in such a way that it cannot unscrew or become loosened due to rotation in either direction.
- (c) Each pump shall be equipped with a stainless steel renewable impeller wear ring.

2.1.5 Oil Chamber

- (a) The pumps shall be equipped with an oil chamber to function as a buffer between the pumped liquid in the casing and the motor. The oil chamber shall be arranged to accommodate thermal expansion of the oil and furnished with an oil chamber drain plug that is accessible from outside the pump unit and permits changing oil without dismantling pump components. The oil chamber shall be ASTM A48 cast iron. The oil sample shall be taken from the oil chamber in place and without the need to pull the pump out of the wet well.

2.1.6 Mechanical Seal

- (a) Pumps shall have a double or tandem mechanical seals. The upper seal unit, between the oil chamber and motor housing, shall have one stationary ceramic or tungsten-carbide ring and one positively driven rotating tungsten-carbide or carbide seal ring. The lower seal unit, between the pump casing and oil chamber, shall have one stationary ring and one positively driven rotating ring. The rings shall be tungsten-carbide or ceramic. Metal parts shall be stainless steel. The spring element of the lower seal shall be protected from solids contained in the pumped liquid. Do not rely upon the pumped liquid for lubrication.
- (b) Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

2.1.7 Motor

- (a) Submersible pump motors shall be of 460-volt, 3-phase, 60-hertz squirrel cage induction type conforming to the latest applicable requirements of NEMA and NEC standards and suitable for application in Class 1, Division 2, Group D hazardous location. Motor shall be UL or FM approved.
- (b) Motors shall have suitable output torque and speed characteristic to start and operate the pump over the range of specified conditions. Nameplate horsepower rating shall not be exceeded under maximum load conditions for constant speed pumping units. The motors shall be for continuous load operation and shall be capable of sustaining continuous on-off cycling of fifteen (15) starts per hour minimum without exceeding the 80 degree C temperature rise.
- (c) The stator windings and stator leads shall have a minimum of NEMA Class H (180 degrees C) moisture resistant insulation. The stator coils shall be dipped and baked in Class F varnish and shall be heat-shrink fitted into the stator housing. Impregnation resin shall be applied to stator assembly in three dip and bake steps.
- (d) Motors shall have an ASTM A48 cast iron stator housing. For motors that employ cooling water jackets, the water jacket passages shall preclude clogging by solids contained in the pumped liquid.

- (e) The motor cables shall be multi-conductor flexible cables designed specifically for use with submersible pumps and shall be of stranded, tinned copper conductors with 600V ethylene-propylene insulation, cabled with non-hygroscopic vulcanized rubber fillers and binder tape, covered with water & oil resistant chloroprene rubber jacket, rated 90° C in 40° C ambient. Separate cables shall be provided for power and control. The power and control cables shall have sufficient length to reach the termination boxes as shown on Plans without splices.
- (f) Motor cable entries shall have a mechanical locking ring or compression type cord grip to protect the cable jacket from being pulled out of the motor. Do not use epoxy for this purpose. Cable entries shall have watertight seals. Cable entry leads shall be isolated from the internal motor leads to prevent entry of water into the motor chamber by leakage or wicking. One cable for power and one cable for controls shall be provided. Cables shall be suitable for submersible pump application and shall conform to NEC specifications for cable sizing. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter.
- (g) The motor shall be designed for operating under completely submerged or unsubmerged conditions without damage while pumping under load.
- (h) The combined service factor (combined effect of voltage, frequency and specific gravity) shall not be less than 1.15.
- (i) The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.
- (j) The rated motor horsepower shall not be less than the brake horse power of the pump throughout the range of operating conditions specified.
- (l) 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

2.1.8 Shaft

- (a) Shafts shall be one piece, fully machined pump and motor shafts. Maximum shaft deflection under maximum pumping load to shall be 0.002 inches at the lower mechanical seal face.
- (b) Shafts material shall be stainless steel ASTM A 479 S43100-T and adequately designed to meet the maximum torque required at any start-up condition or operating point in the system.

2.1.9 Bearings

- (a) The pump shaft shall rotate on permanently lubricated bearings. One assembly shall carry only radial loads and be free to float axially within the frame. The other assembly shall carry both radial and axial loads and be restrained from axial movement.
- (b) Bearings shall be of sufficient size and properly spaced to transfer all radial and axial loads to the pump housing and minimize deflection.
- (c) Bearings shall conform with ANSI B3.15 and B3.16, Load Ratings and Fatigue Life for Ball and Roller Bearings, and have 20,000 hour minimum L_{10} bearing life at the maximum pumping load that occurs under the specified operating conditions.

2.1.10 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.
- (a) 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.

- (b) 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.
- (c) 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

2.1.11 Guide Rail and Base Elbow

- (a) Each pump shall have a base elbow and guide rail or cable system to permit installation and removal of the pump from its base elbow discharge connection without requiring personnel to enter the wet well.
- (b) The guide rail or cable system shall include a stainless steel non-sparking guide bracket which is an integral part of the pump casing and permits sliding the pumping unit along two unthreaded stainless steel guide rails or cable. Guide system shall be Schedule 40 stainless steel pipe or cable connected to the base elbow at the bottom. Guide rails shall be supported at intermediate locations and at the top with stainless steel brackets bolted to the wall of the wet well or concrete slab. Each pump lifting eye shall be suitable for electric hoist hook.
- (c) Each pump shall have a cast iron base elbow arranged for automatic pump connection. The pump casing shall have a machined discharge flange with a stainless steel non-sparking liner arranged to be non-sparking which, when the pump is lowered into the pumping position, will automatically align and mate with the plain-end of the base elbow. The discharge connection shall require no motion other than vertical to seat the mating flange of the casing to the base elbow. Sealing of the pump connection shall be accomplished by metal to metal watertight contact. The base elbow shall support the weight of the pumping unit and prevent it from bearing directly on the wet well floor.
- (d) Anchor bolts, nuts, washers, and accessories and other adapter equipment necessary for mounting the pumping equipment and appurtenances shall be provided. Anchor bolts, nuts, washers, accessories and adaptor equipment shall be ANSI TYPE Series 304 stainless steel.

2.1.12 Power Cable Holder or Cable Support Tray

- (a) Contractor shall coordinate the installation of the cable holder or Cable Support Tray with the aluminum hatch cover supplier.
- (b) Provide all stainless steel cable support grip, cable pull line, snap hook and anchor as required or as shown on the drawing.

2.2 Operation and Control

2.2.1 Pump controls shall be provided in accordance with Division 16.

2.2.2 Pumps shall function in rising water and in falling water as shown on the drawings.

2.2.3 Float Level Detectors

- (a) The float level detecting devices shall be located in the wet well as shown and as specified in Section 16D.

2.3 Bolts, Studs and Nuts

2.3.1 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.

2.3.2 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.

2.3.3 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), or AISI 316.

3. EXECUTION:

3.1 General

3.1.1 All equipment shall be installed in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Divisions 1 and 15A. The manufacturer shall inspect the pump installation and shall certify that the pumps have been installed properly. Information submitted for approval shall include a letter of intent to provide this certification. All wiring and piping shall be completed and all necessary adjustments to equipment shall be made to provide a complete operational pumping system.

3.1.2 The manufacturer shall have joint responsibility with the Contractor for the proper installation and operation of the equipment, and jointly with the Contractor shall furnish a written statement to the Engineer certifying that the equipment as installed complies with the Plans and Specifications, will perform as specified, and is properly installed.

3.2 Field Quality Control

3.2.1 Representative of the Manufacturer

- (a) 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.

3.2.2 Field Testing

- (a) Written test procedures shall be submitted two weeks prior to field testing. The pumps shall be tested in accordance with the manufacturer's instructions and Hydraulic Institute Standards.
- (b) 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 the Contractor and adequate water supply shall be available for testing of two pumps concurrently. Field tests shall be performed in the presence of Engineer and City and as directed by the Engineer. Tests shall demonstrate that under all conditions of operation each unit:
 - 1) Has not been damaged during transportation or installation.
 - 2) Has been properly installed.
 - 3) Has no physical or mechanical defects.
 - 4) Has been properly connected.
 - 5) Is free of overheating of any parts.
 - 6) Is free of overloading of any parts.
 - 7) Verification of pump shaft rotation in proper direction.
 - 8) The pump shall be free of any vibration and cavitation.
- 1) Each pump shall be run momentarily against a closed discharge valve with the discharge pressure being monitored, to confirm that the Design Shut-off Head (and proper impeller size) have been furnished.
- (c) 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.
 - 1) Each Pump operates as expected at specified levels for on/off operation based on SCADA entered level variable data.
 - 2) Each Pump operates as expected at specified levels for on/off operation based on ball float level switches.
 - 3) Each pump shall be tested to verify rated flow.

- 4) Verify that each Pump does not operate from local control station and or from MCC when hand-off-auto switch is in off position.
 - 5) Each Pump start and stop operates as expected manually from MCC and from local control station located at grade elevation 725.50 ft.
 - 6) Each Pump is sequenced as expected for rising and falling water levels in the wet well (this shall be a real water test, and Pump operation may be simulated by not allowing pump to actually run in order to accomplish testing).
 - 7) 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.
 - 8) 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 control through float switches.
- (d) The following shall be checked on start-up:
- 1) Current draw and voltage on all legs of each pump shall be observed and recorded to see if there is any imbalance.
 - 2) Megga-ohm meter testing shall be performed and record reading on each pumps.
 - 3) Winding resistance test for each phase shall be performed and recorded for each pump.
 - 4) Pump controls and terminations shall be checked.
- 1) At a minimum, each pump including all spare pumps, shall be run in recirculation a minimum of 30 minutes or longer as directed by the Engineer. Engineer can extend the time of the test if any issue was observed and requires more time to verify.
 - 2) Moisture and temperature detector tests and record results on each pump.
 - 3) 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.
 - 4) Additional tested as described in Section 16D.

3.3 Painting

3.4.1 All pumping equipment shall be painted as specified in Division 9.

3.4 Equipment Schedule and Pumping Operating Elevations

3.5.1 Refer to Drawing sheet 208.

3.6 Start-up

- 3.6.1 The start-up services for the following equipment shall be coordinated with City and City shall be notified at least two weeks in advance:

Pumping Equipment

END OF THIS SECTION

DIVISION 16 – PUMP STATION ELECTRICAL

SECTION 16A – GENERAL ELECTRICAL PROVISIONS

1. GENERAL:

1.1 Description

- 1.1.1 The scope of work under this Section shall generally be all electrical work required for the project work as specified or as indicated on the drawings.
- 1.1.2 The electrical work shall include the furnishing and installing of various items of electrical equipment and, unless otherwise indicated, shall also include the electrical connection of various items such as electric pump motors, fan motors and similar items furnished under other Sections. The Contractor shall be responsible for ascertaining the extent of electrical connections required for items furnished under other Sections and for coordination the electrical work accordingly.
- 1.1.3 The specifications and drawings are intended to generally define the work required, but they do not include every equipment and installation detail. The work shall include all items and appurtenances required to fully complete the work, whether specifically identified or not, such that the electrical systems are complete and operational.
- 1.1.4 Refer to Division 1 for other requirements relating to the furnishing and installing of work, which shall apply to the work under this Division.

1.2 Code Compliance

Unless otherwise indicated, in the absence of more stringent requirements in the Specifications or on the Drawings, the work shall be in compliance with the requirements of the National Electrical Code.

1.3 Standards

- 1.3.1 Wherever the following abbreviations are used in these Specifications or on the Drawings, they are to be construed the same as the respective expressions represented:

AASHTO

American
an Association of State Highways and Transportation Officials

ANSI

American National Standards Institute

ASTM

American Society for Testing and Materials

AWG

American Wire Gauge

FM	Factory Mutual
ICEA	Insulated Power Cable Engineers Association
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society of North America
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Assoc.
NESC	National Electrical Safety Code
NETA ATS	InterNational Electrical Testing Agency, Acceptance Testing Specifications
UL	Underwriter's Laboratories

- 1.3.2 Wherever a reference is made to a standard or standard specification, the reference shall be to the edition current at the time of bidding, including any revisions or amendments.

1.4 Verification of Contract Drawings

- 1.4.1 The Contractor shall familiarize himself 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.
- 1.4.2 The contract drawings (Drawings) for electrical work are generally diagrammatic and do not necessarily depict all items to scale. The Drawings indicate the general locations of major elements of the electrical system, outlets, fixtures, pull boxes and the like, however, field conditions or interferences, may require changes in the installation. The Contractor shall coordinate his work to avoid interferences and shall obtain the approval of the Engineer prior to making any changes from the installation shown.
- 1.4.3 Prior to installation, the Engineer may make reasonable minor changes in the locations of the installation without additional cost to the City.

1.5 Coordination

- 1.5.1 The Contractor shall coordinate the work under this Division with the work of other trades. This shall include an orderly exchange of information and shall be accomplished such that the total work is not delayed and that

interferences are avoided. The Contractor shall coordinate all electrical systems into a complete operational package. The Contractor shall assign one contact person for all such coordination work, has an understanding and working knowledge of the electrical control systems on this project. This person shall oversee and assume proper operation of the complete electrical control system including all testing and calibration as outlined herein. The Contractor shall provide the name and phone numbers of this individual at the preconstruction inspection. This cost shall be incidental to Pump Station Electrical.

1.6 Workmanship

1.6.1 The electrical work shall be performed in a neat and workmanlike manner in accordance with the best practices of the trade.

1.6.2 Unless otherwise indicated, all materials and equipment shall be installed in accordance with the manufacturer's recommendations.

1.7 Testing

1.7.1 All electrical equipment and systems provided under this Division shall be adjusted and tested. The Contractor shall adjust, repair or replace faulty or improper Division 16 work or equipment discovered during testing.

1.7.2 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 the Engineer, at no additional cost to the City.

1.7.3 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.

1.7.4 Tests shall be made in the presence of the Engineer; Engineer and City shall be notified a minimum of 14 days prior to testing.

1.7.5 A written record of tests shall be maintained by the Contractor and, when complete, it shall be submitted to the Engineer for the record.

1.7.6 Contractor shall perform all tests necessary to assure proper functioning of materials and equipment. As a minimum, the tests shall include the following:

(a) Before making final connections check the insulation resistance of all cables of 3-phase circuits that operate above 150 volts.

(b) Check wiring for proper phase sequencing including buses, feeder cables and transformers and assure proper connection at motors for proper rotation.

- (c) 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 directed by the Engineer.
 - (d) Check and record the motor nameplate data for each motor. Check the ratings of motor circuit protective devices and assure compatibility of the devices for the connected motors. In particular, assure that the motor starter overload elements are proper for the motor nameplate full load amperes.
 - (e) Set control relays, protective relays and instruments in accordance with manufacturer's recommendations. Record the set points.
 - (f) 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.
 - (g) Check all alarm circuits for proper operation and proper set points, as applicable. Record any appropriate set points.
 - (h) Measure and record the line currents of each phase of each 3-phase motor under load.
 - (i) Align and adjust lighting fixtures and assure proper operation of all controls, ballasts and lamps.
 - (j) All equipment must be properly calibrated for proper operation of the system.
 - (k) 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.
 - (l) See Testing Electrical Systems under paragraph 3.8 of this Section for further testing requirements.
- 1.7.7 Testing must be complete prior to final inspection. All instruments, tools, etc., required for the tests shall be provided by the Contractor. All equipment shall be properly calibrated for proper operation of the complete system. Additional testing may be requested by the Engineer during final inspection to spot-check test results or to demonstrate proper functioning of the systems. These tests shall be performed by the Contractor at no additional cost to the City.
- 1.7.8 The Contractor shall simulate the automatic operation of the complete pump station to assure proper operation. After assurance of proper

operation, the Contractor shall demonstrate automatic operation including simulation to the Engineer's satisfaction.

- 1.7.9 Note that failure to test the equipment completely is not an allowance for an extension.

1.8 Data to be filed with the Engineer

- 1.8.1 Submit shop drawings and product data under provisions of Section 1A. Certain data, as specified herein, shall be furnished to the Engineer when installation and testing are complete, before final acceptance.

- 1.8.2 The data shall be compiled in 8-1/2 x 11 inch format in high-quality heavy-weight, hard cover binders with piano-style metal hinges or in an alternate format approved by the Engineer. Large 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.

- 1.8.3 Four sets of the data files shall be provided.

- 1.8.4 As a minimum, the data files shall include:

- (a) A table of contents.
- (b) Approved, final shop drawings and product data for all equipment and materials incorporated in the work under this Division.
- (c) Manufacturer's maintenance manuals for all equipment furnished under this Division for which maintenance is recommended by the manufacturer.
- (d) A tabulation of cable insulation tests.
- (e) A tabulation of motor nameplate data.
- (f) A tabulation of required voltage tests.
- (g) A tabulation of required motor current tests.
- (h) A tabulation of relay and control device set points.
- (i) A tabulation of alarm set points.
- (j) A tabulation of megger tests.

- (k) A tabulation of breaker settings, timer set points, and protection relay setpoints. Tabulation shall include complete model or catalog number of each breaker, protection relay and fuse.
- (l) A tabulation of motor winding resistance tests for pump motors.
- (m) A Study Report providing summary of results of power systems study under Section 16B including:
 - 1. Description, purpose, basis, and scope of study and single line diagram of power system.
 - 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short circuit duties and commentary regarding same.
 - 3. Protective device time versus current color coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
 - 4. Fault current calculations including definition of terms and guide for interpretation of computer printout.
 - 5. Tabulation of appropriate tap settings for relay units.
 - 6. Arc flash calculations and tabulation of incident energy level (calories/cm²) for each equipment location and recommended personal protective equipment (PPE).
- (n) Complete testing report for the testing of electrical systems under paragraph 3.8 of this Section utilizing NETA printed forms. Submit report no later than 30 days after testing is complete. Submit proof of testing agency qualification.

1.8.5 All data shall be neat and clearly legible. The table of contents and tabulations of set points and other recorded test data shall be typed. Sloppy, illegible, inaccurate, or incomplete data will not be accepted.

1.9 Record Drawings

1.9.1 Record Drawings shall be prepared and submitted in accordance with Division 1. Note that equipment wiring diagrams shall be project specific and cross reference terminal and wiring numbers to other equipment. Showing generic terminations and wiring numbers is not acceptable.

1.10 Warranty

1.10.1 Warranty shall be provided for equipment, materials and work provided under this Division as specified in Division 1.

1.11 Basis of Payment

1.11.1 The work shall be paid for at the Contract lump sum price for PUMP STATION ELECTRICAL WORK, which shall be payment in full for the work described herein unless otherwise noted.

1.11.2 The work for Electric Service specified under Subsection 3.4 shall be paid for at the Contract lump sum price under the pay item ELECTRICAL SERVICE CONNECTION. This work includes: Extension of underground conduit and conductors to new pad-mount transformers, electric meter, primary and secondary terminations on pad-mount transformers and pad-mount transformers.

1.11.3 The work for Electric Service Installation specified under Subsection 3.4 shall be paid for at the Contract lump sum price under the pay item ELECTRIC SERVICE INSTALLATION, SPECIAL and shall be paid for per Article 109.05 of the Standard Specifications.

1.11.4 Refer to 1.22 of Section 1A for Method of Measurement.

1.12 Classification of Electrical Enclosures and Installations in Project Locations

Unless otherwise specified in the individual Specification Section or shown on Plans, type of electrical enclosures and installations shall be in accordance with the following:

NEMA 7(CLASS I, Division 2, GROUP D): All spaces in the pump station including Discharge Chamber, Dry Pit, Pump Room, and Wet Well except otherwise indicated.

NEMA 1: Electrical Room.

NEMA 4X Stainless Steel: Outdoor and wet locations.

NEMA 12: Other area not defined.

1.13 Final Acceptance Inspection

1.13.1 When the work is complete, tested and fully operational, and only after the Record Drawings have been reviewed and accepted, the Contractor shall schedule a Final Acceptance Inspection with the Engineer.

1.13.2 The Final Acceptance Inspection shall be made for the complete work at the facility as a whole and shall be as further described in Section 105 of the Standard Specifications.

2. PRODUCTS:

2.1 Materials and Equipment

2.1.1 Quality

All materials, equipment and appurtenances shall be new, shall be suitable for the application and shall be the product of established, reputable manufacturers.

2.1.2 Standards

The construction, sizes, ratings and capacities of items shall be in conformance with the requirements under paragraph 1.3.1 of this Section, as applicable.

2.1.3 UL Label

Unless otherwise indicated, materials and equipment shall bear the UL label whenever such labeling is available for the type of material or equipment being furnished.

2.1.4 Service Equipment

Equipment which is used as electric service equipment shall bear a UL listing: "SUITABLE FOR USE AS SERVICE EQUIPMENT".

2.1.5 Other Requirements

Refer to Division 1 for other requirements relating to materials and equipment.

3. EXECUTION:

3.1 General

3.1.1 Provide other trades with advance information on locations and sizes of concrete pads, frames, boxes, sleeves and openings needed for the Work. Also provide information and shop drawings necessary to permit trades affected to install their Work properly and without delay.

3.1.2 Prior to submittal of shop drawings coordinate electrical equipment, particularly motor control equipment and control panels, with all applicable equipment and systems furnished under other Divisions of the Specifications. Acknowledge in submittal drawings any designated instrument tag numbers when tag numbers are assigned in drawings or specifications. Acknowledge that coordination of all applicable equipment has been performed.

3.1.3 The electrical system design, including, but not limited to, the type, size and quantity of equipment and components, layout, installation and

connections as shown on Plans and/or as indicated in the Specifications, is based on electrical, electro-mechanical and/or electronic equipment supplied by selected manufacturers. If equipment furnished by the Contractor requires a different electrical system than that specified hereinafter or shown on Plans, the Contractor shall make all necessary modifications to the electrical system design, subject to the Engineer's approval, to provide a complete electrical system ready for successful operation. The costs of making the modifications to the electrical system shall be entirely borne by the Contractor without extra cost to the City. If equipment furnished by the Contractor necessitates changes to electric, gas and/or telephone utilities' service equipment, or to the Work specified under other Sections of the Specifications, then the cost for making the changes shall also be entirely borne by the Contractor without extra cost to the City.

- 3.1.4 Locate all equipment such that they are readily accessible for operation, maintenance, repair and replacement. Ready accessibility to removable parts of equipment and to wiring shall be provided without moving other equipment which is to be installed or which is in place. In general, such equipment is not to be blocked or concealed except where specifically permitted. Do not route conduits across or through access or maintenance space of other equipment. Where equipment is permitted to be concealed, provide approved access door. Where equipment is concealed in fire-resistance rated walls or partitions, provide access doors having same fire-resistance rating as well as partitions in which door is placed.
- 3.1.5 Where electrical equipment is to be installed in limited space, provide additional drawings (scale - minimum 1/4 in. = 1 ft.) as necessary to show physical and dimensional relationship between electrical equipment and adjacent equipment furnished under other Divisions of the Specifications. Acknowledge locations of adjacent structural or mechanical systems, including ductwork, piping, or equipment accesses. Acknowledge clearances established by all codes and regulations are met or exceeded.
- 3.1.6 The installation shall be such that its components will function together as workable systems. It shall be complete, with all accessories necessary for its operation, and shall be left with all equipment properly adjusted and in working order. The Work shall be executed in conformity with the best practices and so as to contribute to efficiency of operation, minimum maintenance, accessibility and appearance.
- 3.1.7 Location of electrical equipment shown on Plans are approximate and are subject to minor changes as directed by and at no extra cost to the City.
- 3.1.8 Perform equipment tests as per manufacturer's instructions except where otherwise specified

3.2 Protection of Work

- 3.2.1 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.
- 3.2.2 Prior to final acceptance, protective measures shall be removed and equipment and items shall be cleaned as required to deliver the installation to the City in clean, undamaged condition.

3.3 Clean-Up and Safety

- 3.3.1 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, pole 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.

3.4 Electric Service

- 3.4.1 Work under this Section shall include all equipment, wiring and appurtenances required for both the complete, operational temporary and permanent electric service.
- 3.4.2 All electric utility's charges for providing new service to the pump station shall be paid to the utility by the Contractor. The Contractor will be reimbursed the exact amount of these charges under separate pay items, ELECTRICAL SERVICE CONNECTION and ELECTRIC SERVICE INSTALLATION, SPECIAL.
- 3.4.3 The Drawings and Specifications indicate the general nature of work required for electric service. The 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.
- 3.4.4 Power metering cabinets shall consist of transformers, and meter socket in a NEMA 3R enclosure. Coordinate the transformer rating with the electric utility.
- 3.4.5 All electric service work must conform to the requirements of the electric utility.
- 3.4.6 The 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 the Engineer for the record prior to installation.

3.5 Final Acceptance Inspection

3.5.1 When the work is complete, tested and fully operational, and only after the Record Drawings have been reviewed and accepted by the Engineer, the Contractor shall schedule a Final Acceptance Inspection with the Engineer. The Contractor is cautioned to test for the proper operation of all equipment prior to the final acceptance inspection and to make any corrections necessary to establish proper operation. THE FINAL ACCEPTANCE INSPECTION SHALL NOT BE HELD WHILE FINAL CONNECTIONS AND CHECKS ARE BEING MADE.

3.5.2 The Final Acceptance Inspection shall be made for the complete work at the facility as a whole and shall be as further described in Division 1.

3.6 Maintenance

3.6.1 During the course of the construction work and until final acceptance, the Contractor shall be responsible for maintenance and operational integrity of the facility as specified in Division 1.

3.7 Testing Electrical Systems

3.7.1 Summary

- (a) Prior to energizing equipment, retain services of recognized independent testing laboratory for purpose of performing inspections and tests as herein specified.
- (b) Ensure electrical equipment supplied by Contractor and Owner is operational within industry and manufacturer's tolerances and installed in accordance with Specifications.
- (c) Device Ratings and Settings: Verify ratings and settings of overload relays, motor circuit protectors, and overcurrent devices. Make final adjustments of devices in accordance with Section 16B.

3.7.2 General

- (a) Testing agency shall meet federal, state, and local safety requirements for accreditation of testing laboratories, CFR Title 29, art 1907, "Accreditation of Testing Laboratories." and have membership in InterNational Electrical Agency (NETA).
- (b) Contractor's Responsibilities:
 - 1. Supply source of test power to testing agency at each equipment location.
 - 2. Notify testing agency when equipment becomes available for tests.

3. Coordinate work to minimize Project delay.
4. Supply complete set of approved and updates record electrical drawings, specifications, and pertinent change orders to testing agency prior to commencement of testing.

(c) Testing Agency's Responsibilities:

1. Notify Engineer and City a minimum of 14 days prior to commencement of testing.
2. Provide material, test procedures, applicable tables of NETA to verify acceptance of test results, equipment, labor, and technical supervision to perform such tests and inspections.
3. Test labeling: On satisfactory completion of tests for each piece of equipment, attach dates and signed "Satisfactory test" label to tested component.
4. Test forms submitted for Engineer review shall include the range of accepted values in the test forms for insulation resistance tests.

(d) Test Work and equipment installed to ensure proper and safe operation accordance with intent of Drawings and Specifications.

1. Check interlocking and automatic control sequences and test operation of safety and protective devices.
2. Correct defects found by Work of this paragraph (3.7 Testing Electrical Systems).
3. Cooperate with Power Company, supplier, and manufacturer representatives in order to achieve proper intended operation of equipment.

(e) Test, adjust, and record operating voltages at each system level before energizing branch circuits.

1. Transformer taps shall be adjusted to obtain as near as possible nominal system voltage.
2. Where transformer is under utility jurisdiction, obtain services of utility to correct voltage.
3. Replace devices and equipment damaged due to failure to comply with this requirement.

(f) Balance load among feeder conductors at each panelboard, switchboard or substation and reconnect loads as necessary to obtain reasonable load balance on each phase. Electrical unbalance shall not exceed 20%.

3.7.3 Circuit Breakers (600 V) – Insulated-Case/Molded-Case

(a) Visual and Mechanical Inspections:

1. Compare equipment nameplate data with drawings and specifications.

2. Inspect for physical and mechanical damage.
3. Inspect for proper alignment and anchorage.
4. Verify the unit is clean.
5. Operate the circuit breaker to insure smooth operation.
6. Check tightness of accessible bolted bus joints by calibrated torque wrench method. Refer to manufacturer's instructions for proper ft-lb levels or NETA ATS Table 100.12.
7. Inspect operating mechanism, contacts, and arc shuts in unsealed units.
8. Perform adjustments for final protective device settings in accordance with coordination study.

(b) Electrical Tests:

1. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with the circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.1.
2. Perform a contact/pole-resistance test.
3. Determine long-time pickup and delay by primary current injection.
4. Determine short-time pickup and delay by primary current injection.
5. Determine ground-fault pickup and time delay by primary current injection.
6. Determine instantaneous pickup by primary current injection.
7. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data.
8. Verify correct operation of auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, anti-pump function, and trip unit battery condition. Reset all trip logs and indicators.
9. Verify operation of charging mechanism.

(c) Test Values:

1. Bolt torque levels shall be in accordance with manufacturer's instructions. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
2. Settings shall comply with coordination study recommendations.
3. Insulation-resistance values of bus insulation shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.1. Values of insulation-resistance less than this table or manufacturer's recommendations should be investigated.
4. Long-time pickup values shall be as shown in coordination study, and the trip characteristic shall not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are not available, trip

times shall not exceed the value shown in NETA ATS Table 100.7.

5. Short-time pickup values shall be as shown in coordination study, and the trip characteristic shall not exceed manufacturer's published time-current characteristic tolerance band.
6. Ground fault pickup values shall be as shown in coordination study, and the trip characteristic shall not exceed manufacturer's published time-current characteristic tolerance band.
7. Instantaneous pickup voltage shall be as shown in coordination study, and the trip characteristic shall not exceed manufacturer's published time-current characteristic tolerance band.
8. Pickup values and trip characteristics shall be within manufacturer's published tolerances.
9. Minimum pickup voltage of the shunt trip and close coils shall conform manufacturer's published data. In the absence of the manufacturer's published data, refer to NETA ATS Table 100.20.
10. Breaker open, close, trip, trip-free, anti-pump, and auxiliary features shall function as designed.
11. The charging mechanism shall operate in accordance with manufacturer's published data.

3.7.4 Instrument Transformers

(a) Visual and Mechanical Inspection:

1. Compare equipment nameplate data with drawings and specifications.
2. Inspect for physical and mechanical damage.
3. Verify correct connection of transformers with system requirements.
4. Verify that adequate clearances exist between primary and secondary circuit wiring.
5. Verify the unit is clean.
6. Check tightness of accessible bolted electrical connections by calibrated torque wrench method. Refer to manufacturer's instructions for proper ft-lb levels or NETA ATS Table 100.12.
7. Verify that all required grounding and shorting connections provide contact.
8. Verify correct primary and secondary fuse sizes for voltage transformers.
9. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

(b) Electrical tests:

1. Confirm transformer polarity electrically.
2. Verify connection at secondary CT leads by driving low current through leads and checking for this current at applicable devices.
3. Confirm transformer ratio.

4. Measure insulation resistance of transformer secondary and leads with 500 v megohm meter.
5. Measure transformer primary insulation with applicable overpotential tests.
6. Verify connection of secondary PT leads by applying low voltage to leads and checking for this voltage at applicable devices.

3.7.5 Metering and Instrumentation

(a) Visual and Mechanical Inspection:

1. Compare equipment nameplate data with drawings and specifications.
2. Inspect meters and cases for physical.
3. Clean front panel and remove shipping restraint material.
4. Verify tightness of electrical connections.
5. Record model number, serial number, firmware revision, software revision, and rated control voltage.
6. Verify operation of display and indicating devices.
7. Record passwords.
8. Verify unit is grounded in accordance with manufacturer's instructions.
9. Verify unit is connected in accordance with manufacturer's instructions and approved shop drawings.
10. Set all required parameters including instrument transformer ratios, system type, frequency, power demand methods/intervals, and communications requirements.

(b) Electrical Tests:

1. Apply voltage or current as appropriate to each analog input and verify correct measurement and indication.
2. Confirm correct operation and setting of each auxiliary input/output feature including mechanical relay, digital, and analog.
3. After initial system energization, confirm measurements and indications are consistent with loads present.

(c) Test Values:

1. Tightness of electrical connections shall assure a low resistance.
2. Display and indicating devices shall operate per manufacturer's published data.
3. Measurement and indication of applied values of voltage and current shall be within manufacturer's published tolerances for accuracy.

3.7.6 Grounding System

(a) Visual and Mechanical Inspection:

1. Verify grounding system is in compliance with drawings, specifications, and NFPA 70 National Electrical Code Article 250.
2. Inspect physical and mechanical condition of ground system.
3. Inspect tightness of accessible bolted electrical connections by calibrated torque wrench method. Refer to manufacturer's instructions for proper ft-lb levels or NETA ATS Table 100.12.

(b) Electrical Tests:

1. Subject completed grounding system to megger test at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells.
2. Measure ground resistance not less than 2 full days after last trace of precipitation, and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
3. Perform tests by 2 point method according to Section 9.03 of IEEE 81.

(c) Maximum grounding resistance values are as follows:

1. Equipment Rated 500 kVA and Less: 10 ohms.
2. Equipment Rated 500 to 1000 kVA: 5 ohms.
3. Equipment Rated More than 1000 kVA: 3 ohms.
4. Unfenced Substations and Pad-Mounted Equipment: 5 ohms.
5. Manhole Grounds: 10 ohms.

(d) Excessive Ground Resistance: Where resistance to ground exceeds specified values, notify ENGINEER promptly and include recommendations to reduce ground resistance and to accomplish recommended work.

(e) Report: Prepare certified test reports, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

3.7.7 Transfer Switches

(a) Visual and Mechanical Inspections:

1. Compare equipment nameplate data with drawings and specifications.
2. Inspect physical and mechanical condition.

3. Inspect anchorage, alignment, grounding, and required clearances.
4. Verify the unit is clean.
5. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
6. Verify that manual transfer switch warnings are attached and visible.
7. Verify tightness of all control connections.
8. Inspect bolted electrical connections for high resistance using one or more of the following methods:
 - a. Use of low-resistance ohmmeter in accordance with NETA ATS 7.5.1.2.2.
 - b. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - c. Perform thermographic survey in accordance with NETA ATS Section 9.
9. Perform manual transfer operation.
10. Verify positive mechanical interlocking between normal and alternate sources.

(b) Electrical Tests:

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with NETA ATS Section 7.22.3.1.
2. Perform a contact/pole-resistance test.
3. Verify settings and operation of control devices.
4. Calibrate and set all relays in accordance with NETA ATS Section 7.9.
5. Verify phase rotation, phasing, and synchronized operation as required by application.
6. Perform automatic transfer tests:
 - a. Simulate loss of normal power.
 - b. Return to normal power.
 - c. Simulate loss of emergency power.
 - d. Simulate all forms of single-phase conditions.
7. Verify correct operation and timing of the following functions:
 - a. Normal source voltage-sensing and frequency-sensing relays.
 - b. Engine state sequence.
 - c. Time delay upon transfer.
 - d. Alternate source voltage-sensing and frequency-sensing relays.
 - e. Automatic transfer operation.

- f. Interlocks and limit switch function.
- g. Time delay and retransfer upon normal power restoration.
- h. Engine cool down and shutdown feature.

(c) Test Values:

1. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar connections by more than 50 percent of the lowest value.
2. Bolt-torque levels shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS Table 100.12.
3. Results of the thermographic survey shall be in accordance with NETA ATS Section 9.
4. Compare bolted connection resistance values to values of similar connections. Investigate values which deviate from those of similar bolted connections by more than 50 percent of the lowest value.
5. Microhm or dc millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. In the absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
6. Control devices shall operate in accordance with manufacturer's published data.
7. Relay test results shall be in accordance with NETA ATS Section 7.9.
8. Phase rotation, phasing, and synchronization shall be in accordance with system design specifications.
9. Automatic transfer shall operate in accordance with manufacturer's design.
10. Operation and timing shall be in accordance with manufacturer's and system design requirements.

END OF THIS SECTION

SECTION 16B - ELECTRICAL POWER SYSTEM STUDIES

1. GENERAL:

1.1 Section Includes:

- 1.1.1 Short circuit study, protective device evaluation study, protective device coordination study, and arc flash study on entire electrical power distribution system.
- 1.1.2 Portions of electrical distribution system from normal and alternate sources of power throughout distribution system. Normal system operating method, alternate operation, and operations which could result in maximum fault conditions and maximum incident energy shall be covered in studies.

1.2 Contractor shall engage services of independent engineering firm (cannot be same manufacturer of equipment supplied on project) for purpose of performing power system studies as specified. Independent engineering firm shall have a minimum of 10 years' experience in Power System Studies.

1.3 The Electrical Power System Studies shall be performed and the shop drawing shall be submitted and approved prior to submitting the shop drawing for the electrical equipment.

1.4 A Study Report providing summary of results of power systems study. Include:

- 1.4.1 Description, purpose, basis, and scope of study and single line diagram of power system.
- 1.4.2 Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short circuit duties and commentary regarding same.
- 1.4.3 Protective device time versus current color coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
- 1.4.4 Fault current calculations including definition of terms and guide for interpretation of computer printout.
- 1.4.5 Tabulation of appropriate tap settings for relay units.
- 1.4.6 Arc flash calculations and tabulation of incident energy level (calories/cm²) for each equipment location and recommended personal protective equipment (PPE).

1.5 Regulatory Requirements:

- 1.5.1 Conform to those listed in Section 16A.

1.6 Qualifications of engineering firm:

- 1.6.1 Corporately and financially independent engineering organization which can function as unbiased engineering authority, professionally

independent of manufacturers, suppliers and installers of equipment or system studies as specified.

1.6.2 Study report shall be signed and sealed by Professional Engineer licensed in the State of Illinois.

1.6.3 Engineering organization may be testing organization.

1.7 Basis of Payment

1.7.1 The work shall be paid at the contract lump sum price for

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which shall be payment in full for the work described herein.

1.7.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

(Not Used)

3. EXECUTION:

3.1 Studies to include the following:

1.1.1 Utility Company incoming service lines.

1.1.2 Automatic transfer switches.

1.1.3 Power transformers.

1.1.4 Main circuit breakers.

1.1.5 Power and lighting distribution panels.

1.1.6 Cable, wire, and conduit systems.

1.1.7 Studies do not include equipment as shown on Drawings indicated as future.

1.1.8 Contractor and company performing the power system studies are responsible for gathering information on the equipment and conductors required to perform the power system studies.

3.2 Short Circuit Study

3.2.1 Provide complete report with printout data sheets using digital computer type programs as part of study.

3.2.2 Include utilities' short circuit contribution, resistance and reactance components of branch impedances, X/R ratios, base quantities selected, and other source impedances.

3.2.3 Calculate short circuit momentary duty values and interrupting duty values based on assumed 3-ph bolted short circuit at switch gear base medium voltage controller, switchboard, low voltage MCC, distribution panelboard, pertinent branch circuit panel, and other significant locations

through system. Include short circuit tabulation of symmetrical fault currents and X/R ratios. List with respective X/R ratio each fault location, total duty on bus, and individual contribution from each connected branch.

3.3 Equipment Device Evaluation Study

- 3.3.1 Provide protective device evaluation study to determine adequacy of circuit breakers, molded case switches, automatic transfer switches, knife switches, controllers, surge arresters, busways, and fuses by tabulating and comparing short circuit ratings of these devices with calculated fault currents. Apply appropriate multiplying factors based on system X/R ratios and protective device rating standards. Notify ENGINEER of problem areas or inadequacies in equipment due to short circuit currents and provide suggested alternate equipment.

3.4 Equipment Device Coordination Study

- 3.4.1 Provide protective device coordination study with necessary calculations and logic decisions required to select or check selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. Objective of study to obtain optimum protective and coordination performance from these devices.
- 3.4.2 Include as part of coordination study, medium and low voltage classes of equipment from utility's incoming line protective device down to and including largest rated device in 480 v MCCs and panelboards. Include phase and ground overcurrent protection as well as settings of other adjustable protective devices.
- 3.4.3 Draw time-current characteristics of specified protective devices in color on log-log paper or computer printout. Include with plots complete titles, representative one-line diagram and legends, associated Power Company's relays or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating bands of low voltage circuit breaker trip curves and fuses. Indicate types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing in-rush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits, and significant symmetrical and asymmetrical fault currents. Provide coordination plots for phase and ground protective devices on system basis. Provide sufficient number of separate curves to indicate coordination achieved.
- 3.4.4 Provide separate selection and settings of protective devices in tabulated form listing circuit identification, IEEE device number, current transformer ratios and connection, manufacturer and type, range of adjustment, and recommended settings. Tabulate recommended power fuse selection for medium voltage fuses where applied in system. Notify ENGINEER of discrepancies, problem areas or inadequacies and provide suggested alternate equipment ratings and/or settings.

3.5 Arc Flash Study

- 3.5.1 Provide Incident Energy Study – An incident energy study shall be done in accordance with the IEEE 1584, "IEEE Guide for Performing Arc Flash Hazard Calculations" as referenced in NFPA 70E, "Standard for Electrical Safety in the Workplace", in order to quantify the hazard for selection of personal protective equipment (PPE).
- 3.5.2 Adjust system design to optimize the results of the study as it relates to safety and reliable electrical system operation (e.g. overcurrent device settings, current limiting devices). This includes mitigation, where possible, of incident energy levels that exceed 40 calories/cm². Provide suggested alternate equipment and settings to minimize incident energy levels.
- 3.5.3 Provide incident energy level (calories/cm²) for each equipment location and recommended PPE.
- 3.5.4 Based on the results of the incident energy study provide and install a warning label (orange <40 cal/cm²) or danger label (red > 40 cal/cm²) for each piece of equipment. The label must be readable in both indoor and outdoor environments and contain the following information:
 - (a) Arc hazard boundary (feet and inches).
 - (b) Working distance (feet and inches).
 - (c) Arc flash incident energy at the working distance (calories/cm²).
 - (d) PPE category and description including the glove rating.
 - (e) Voltage rating of the equipment.
 - (f) Limited approach distance (feet and inches).
 - (g) Restricted approach distance (feet and inches).
 - (h) Prohibited approach distance (feet and inches).
 - (i) Equipment/bus name.
 - (j) Date prepared.
- 3.5.5 Provide one day of arc flash safety training, travel time excluded and at jobsite or classroom designated by the City, 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:
 - (a) Proper use of the system analysis data.
 - (b) Interpretation of hazard labels.
 - (b) Selection and utilization of personal protective equipment.
 - (c) Safe work practices and procedures.

3.6 Protective Device Testing, Calibration, and Adjustment

- 3.6.1 Comply with Section 16A, see Testing Electrical Systems under paragraph 3.7.

END OF THIS SECTION

SECTION 16C - BASIC ELECTRICAL MATERIALS AND METHODS

1. GENERAL:

1.1 Description

- 1.1.1 Basic materials and methods specified herein shall be incorporated in the work wherever applicable unless specifically indicated otherwise.
- 1.1.2 The basic materials and methods specified herein are intended to define a minimum standard of quality and workmanship.
- 1.1.3 Refer to Division 1 for additional requirements.

1.2 Related Sections

- 1.2.1 Section 16A – General Electric Provisions.
- 1.2.2 Section 16C – Basic Electrical Equipment Materials and Methods.
- 1.2.3 Section 16D – Supervisory Control and Data Acquisition (SCADA) Equipment.

1.3 References

Codes and Standards referred to in this Section are:

Fed. Spec.

- W-F-408 - Fittings for conduit, metal (rigid thick wall and thin wall).
- ASTM B-3 - Specification for soft annealed copper wire.
- ASTM B-8 - Specification for concentric lay stranded copper conductors, hard medium, hard or soft.
- ASTM B-33 - Specification for tinned or soft or annealed copper wire for electrical purposes.
- IEEE 383 - Class 1E electric cables, field splices and connections for nuclear power generating stations, standard for type test for.
- ASTM D 635 - Test method for rate of burning and/or extent and time of burning of self-supporting plastics in a horizontal position.
- HH-I-595 - Insulation tape, electrical, pressure sensitive adhesive, plastic.

Fed. Spec.

WC-596	-	Electrical power connectors.
NEC	-	National Electrical Code
NEMA WD-1	-	General requirements for ac switches.
UL 50	-	Cabinets and boxes.
UL96A	-	Installation Requirements for Lightning Protection Systems.
ANSI/NFPA 780-		Standard for the Installation of Lightning Protection Systems.

1.4 Submittals

- 1.4.1 Provide shop drawings and product data under provisions of Section 1A for the following items: Cabinets and Enclosures with NEMA classification higher than NEMA 1.
- 1.4.2 All iron and steel products, which are to be incorporated into the raceway work, including conduit and all conduit fittings, shall be domestically manufactured or produced and fabricated as specified in Article 106.
- 1.4.3 Raceway, Conductors and Cables, Electrical Identification, Grounding, Wiring Devices, Supporting Devices, and Cabinets and Enclosures with NEMA 1 classification submittals are not required if CONTRATCOR supplies material or equipment as specified. If CONTRACTOR proposes substitutes to material or equipment, submittals identified below are required.
 - (a) Product data.
 - (b) Submit in accordance with Section 1A.

1.5 Warranty

- 1.5.1 Provide warranty under provisions of Section 1A.

1.6 Basis of Payment

- 1.6.1 The work shall be paid at the contract lump sum price for

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which shall be payment in full for the work described herein.

- 1.6.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

2.1 Raceways

2.1.1 Metal Conduit and Tubing

- (a) Galvanized Rigid Steel Conduit: ANSI C80.1.
- (b) Flexible Metal Conduit: Zinc-coated steel.
- (c) Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.
- (d) Plastic- Coated Steel Conduit and Fittings: UL Listed (UL 6); rigid steel conduit system as specified with coated interior walls and external PVC coating, 40 mil (.1 mm) thick. 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.

- 1) 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%

- 2) 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.
- 3) 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).
- 4) 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.
- 5) 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.

- 6) 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.

2.1.2 Nonmetallic Conduit

- (a) Rigid Nonmetallic Polyvinyl Chloride (PVC) Conduit: NEMA TC 2, Schedule 40 or 80 PVC.
- (b) PVC Conduit Fittings: NEMA TC 3; match to conduit type and material.

2.1.3 Fittings

- (a) Fittings for steel conduit:
 - 1) Steel or malleable iron, zinc galvanized or cadmium plated.
 - 2) Do not use set screw or indentor type fittings.
 - 3) Do not use aluminum or die cast fittings.
 - 4) GRS Connectors and Couplings:
 - i. Threaded.
 - ii. Insulated throat.
 - iii. Gland compression type.
 - iv. Rain and concrete type.
 - 5) Comply with ANSI C80.4.
 - 6) Comply with NEMA FB 1, compatible with conduit materials.

- (b) Fittings for PVC Coated galvanized rigid steel conduits:
 - 1) Use only fittings approved for use with that material. Patch nicks and scrapes with PVC coating after installing conduit.
- (c) Conduit bodies:
 - 2) Malleable iron with galvanized finish.
- (d) Fittings for flexible metal conduit:
 - 1) Insulated throat type.
 - 2) Threaded.
 - 3) Grounding type.
 - 4) Liquidtight: 1 piece sealing "O" rings with connectors when entering boxes or enclosures. 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.
- (e) PVC Conduit Fittings:
 - 1) NEMA TC 3; match to conduit type and material.
- (f) Expansion Joints:
 - 1) Conduit expansion fittings complete with copper bonding jumper, Crouse-Hinds Type XJ.
 - 2) Conduit expansion/deflection fittings with copper bonding jumper, Crouse-Hinds Type XD.
- (g) Conduit Sealing Bushings:
 - 1) Molded one-piece neoprene sealing ring.
 - 2) Hot dip galvanized, malleable or ductile iron locking collar.
 - 3) Stainless steel hex socket head cap screws for sealing ring compression.
- (h) Drain Fittings:
 - 1) Automatic Drain Breather:
 - i. Explosionproof - Safe for Class 1, Group C and D.
 - ii. Capable of passing minimum 25 cc water/min and minimum 0.05 cu ft air/min at atmospheric pressure.

2) Condensate Drain:

- i. Conduit outlet body, Type T.
- ii. Threaded, galvanized plug with 3/16 in. drilled holed through plug.

(i) Hazardous Areas:

- 1) Explosionproof.
- 2) Horizontal seal fittings, Crouse-Hinds Type EYS.
- 3) Vertical seal fittings, Crouse-Hinds Type EYD.
- 4) Vertical seal fittings shall have drain type plug.

2.1.4 Raceway/Duct Sealing Compound

- (a) Nonhardening, putty-like consistency workable at temperatures as low as 35°F.
- (b) Compound shall not slump at temperature of 300°F and shall readily adhere to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

2.2 Conductors and Cables

2.2.1 Building Wire and Cables

- (a) UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as required to meet application and NEC requirements.
- (b) Wire and cable for 600 volts and below: Soft drawn, copper wire with 600 volt insulation.
 - 1) Conductors:
 - i. Annealed, copper in accordance with ASTM B33.
 - ii. Stranding: Class B in accordance with ASTM B8.
 - 2) Insulations and Coverings:
 - i. Rubber: Conform to NEMA WC 3.
 - ii. Thermoplastic: Conform to NEMA WC 5.
 - iii. Cross-Linked Polyethylene: Conform to NEMA WC 7.
 - iv. Ethylene Propylene Rubber: Conform to NEMA WC 8.
- (c) Feeders, service conductors, and motor feeders: Single conductor Type XHHW-2.

(d) Branch Circuits:

- 1) Single Conductor Type THHN/THWN (90° C): Above ground and underfloor conduits.
- 2) Single Conductor Type XHHW-2: Duct bank conduit.
- 3) No. 12 AWG minimum size (unless otherwise noted) for branch circuit wiring, including motor circuits.
- 4) Size 120 v branch circuits for length of run on following basis.
 - i. Wiring sized for 3% maximum voltage drop.
- 5) For other branch circuits, voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of the NEC 215.

(e) Control Circuits:

- 1) Single conductor Type THHN/THWN (90° C): Above ground and underfloor conduits.
- 2) No. 12 AWG minimum size (unless otherwise noted).
- 3) Multi-wire cable assembly: Duct bank conduits.

(f) Non-shielded Instrumentation, Graphic Indication, and Other Control Wiring Operating at Less Than 120 v: No. 14 AWG except as otherwise indicated with same insulation as control circuits.

- 1) Single conductor Type THHW/THWN (90° C), above ground and underfloor conduits.
- 2) Multi-wire cable assembly: Duct bank conduits.

(g) Shielded instrumentation wiring, above ground and underfloor conduits:

- 1) PVC insulation, tinned copper (19 by 27) stranded, No. 16 AWG, twisted pair or triplet cabled with aluminum mylar shielding, stranded, tinned, No. 18 AWG copper drain wire, and overall black FR-PVC, 90°C, 600 volt jacket.
- 2) Multi-wire cable assembly: Duct bank conduits.

(h) Multi-Wire Control and Instrumentation Cable Assemblies:

- 1) Multi-conductor, color-coded cable with number and size of conductors indicated.
- 2) Where spare conductors are not indicated provide 10% spare conductors. One pair minimum.
- 3) Control and non-shielded instrumentation.

- i. Bare soft stranded No. 14 or 12 AWG copper in accordance with ASTM B3.
- ii. Class B stranded in accordance with ASTM B8.
- iii. Type THWN insulation also meeting requirements of NEMA WC-5 with armor-nylon in accordance with UL 83-THHN/THWN.
- iv. Color coded in accordance with NEMA WC-5 Method I Table K-2.
- v. Cabled with suitable fillers.
- vi. Overall black FR-PVC, 90°C, 600 volt sunlight resistant jacket.

4) Shielded Instrumentation:

- i. Bare soft stranded No. 16 AWG copper in accordance with ASTM B3.
- ii. Class B stranded tinned copper in accordance with ASTM B8.
- iii. PVC with nylon armor insulation.
- iv. Twisted pairs color coded in accordance with NEMA WC-5 Method I Table K-2, and numbered.
- v. Individual and overall aluminum mylar shields and seven strand tinned copper drain wires.
- vi. Overall black FR-PVC 90°C 600 volt sunlight resistant jacket.

2.2.2 Connectors and Splices

- (a) Underwriters Laboratories (UL) -listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated.
- (b) Select to comply with Project's installation requirements and as required to meet application.
- (c) Conductors No. 10 AWG and Smaller: 3M Electric Products, Skotchlok pre insulated spring connector. Comply with manufacturer's packaging requirements for number, size, and combination of conductors.
- (d) Conductors No. 8 AWG and Larger: Bronze 2-bolt type connectors with spacer.

2.2.3 Terminations

- (a) Power Conductors: Compression crimp type lugs.
- (b) Control and Instrumentation Conductors: Compression crimp type fork tongue, insulated support type lugs on terminal strips. Do not splice.

2.3 Electrical Identification

2.3.1 Raceway and Conductor Labels

- (a) Manufacturer's Standard Products: Where more than one type is listed for specified application, selection is Installer's option, but provide a single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, or as specified elsewhere.
- (b) Conform to ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.
 - 1) Color: Black legend on orange field.
 - 2) Legend: Indicates voltage.
- (c) Adhesive Labels: Preprinted, flexible, self-adhesive vinyl. Legend is over-laminated with clear, wear and chemical resistant coating.
- (d) Pre-tensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color coded, acrylic bands sized to suit diameter of line it identifies and arranged to stay in place by pre-tensioned gripping action when placed in position.
- (e) Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 in. wide (0.08 mm thick by 25 to 51 mm wide).
- (f) Underground Line Warning Tape: Permanent, bright colored, continuous printed, vinyl tape with following features:
 - 1) Size: Not less than 6 in. wide by 4 mils thick (152 mm wide by 0.102 mm thick).
 - 2) Compounded for permanent direct burial service.
 - 3) Embedded continuous metallic strip or core.
 - 4) Printed Legend: Indicates type of underground line.
- (g) Aluminum, Wraparound Marker Bands: Bands cut from 0.014 in. (0.4 mm) thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.
- (h) Plasticized Card Stock Tags: Vinyl cloth with preprinted and field printed legends. Orange background, except as otherwise indicated, with eyelet for fastener.
- (i) Aluminum Faced Card Stock Tags: Wear resistant, 18 point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 in. (0.05 mm) thick, laminated with moisture resistant acrylic adhesive, and punched for fastener. Preprinted legends suit each application.

- (j) Brass or Aluminum Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2 by 2 in. (51 by 51 mm) by 0.05 in. (1.3 mm).

2.3.2 Engraved Nameplates and Signs

- (a) Manufacturer's Standard Products: Where more than one type is listed for specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, or as specified elsewhere.
- (b) Engraved stock, melamine plastic laminate, 1/16 in. (1.6 mm) minimum thick for signs up to 20 sq in. (129 sq cm), 1/8 in. (3.2 mm) thick for larger sizes.
 - 1) Engraved Legend: Black letters on white face.
 - 2) Punched for mechanical fasteners.
- (c) Baked Enamel Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size as indicated or as otherwise required for application. 1/4 in. (6.4 mm) grommets in corners for mounting.
- (d) Exterior, Metal Backed, Butyrate Signs: Wear resistant, non-fading, preprinted, cellulose acetate butyrate signs with 0.0396 in. (1 mm), galvanized steel backing, with colors, legend, and size appropriate to application. 1/4 in. (6.4 mm) grommets in corners for mounting.
- (e) Fasteners for Plastic Laminated and Metal Signs: Self tapping stainless steel screws or No. 10/32 stainless steel machine screws with nuts, flat washers and lock washers.

2.3.3 Miscellaneous Identification Products

- (a) Cable Ties: Fungus-inert, self extinguishing, 1 piece, self locking Type 6/6 nylon cable ties with following features:
 - 1) Minimum Width: 3/16 in. (5 mm).
 - 2) Tensile Strength: 50 lb (22.3 kg) minimum.
 - 3) Temperature Range: Minus 40 to 185°F (Minus 4 to 85°C).
 - 4) Color: As indicated where used for color coding.
- (b) Paint: Alkyd-urethane enamel. Primer as recommended by enamel manufacturer.

2.4 Grounding

2.4.1 Grounding and Bonding Products

- (a) Governing Requirements: Where types, sizes, ratings, and quantities are in excess of NEC requirements, more stringent requirements and greater size, rating, and quantity indications govern.

2.4.2 Wire and Cable Grounding Connectors

- (a) Conform to NEC Table 8, except as otherwise indicated, for conductor properties, including stranding.
 - 1) Material: Copper.
- (b) Equipment Grounding Conductors: Insulated with green color insulation.
- (c) Grounding-Electrode Conductors: Stranded cable.
- (d) Underground Conductors: Bare, tinned, stranded, except as otherwise indicated.
- (e) Bare Copper Conductors:
 - 1) Solid Conductors: ASTM B3.
 - 2) Assembly of Stranded Conductors: ASTM B8.
 - 3) Tinned Conductors: ASTM B33.

2.4.3 Miscellaneous Conductors

- (a) Grounding Bus: Bare, annealed-copper bars of rectangular cross section.
- (b) Braided Bonding Jumpers: Copper tape, braided No. 3/0 AWG bare copper wire, terminated with copper ferrules.
- (c) Bonding Straps: Soft copper, 0.05 in. (1 mm) thick and 2 in. (50 mm) wide, except as indicated.

2.4.4 Connector Products

- (a) Pressure Connectors: High-conductivity-plated units.
- (b) Bolted Clamps: Heavy-duty type.
- (c) Exothermic-Welded Connections: Provided in kit form and selected per manufacturer's written instructions for specific types, sizes, and combinations of conductors and connected items.

2.4.5 Grounding Electrodes and Test Wells

- (a) Grounding Rods: Copper-clad steel.
 - 1) Size: 3/4 in. by 120 in. (19 by 3000 mm).
- (b) Plate Electrodes: Copper, square or rectangular shape. Minimum 0.10 in (3 mm) thick, size as indicated.
- (c) Test Wells: Fabricate from 15 in. (400 mm) long, square-cut sections of 8 in. (200 mm) diameter, Schedule 80, PVC pipe or as detailed on Drawings.

2.5 Wiring Devices

2.5.1 Receptacles

- (a) Straight Blade and Locking Receptacles: Heavy Duty specification grade.
- (b) GFCI Receptacles: Termination type, with integral NEMA WD 6, Configuration 5-20R duplex receptacle. Design units for installation in 2-3/4 in. (70 mm) deep outlet box without an adapter.
- (c) Isolated Ground Receptacles: Equipment grounding contacts connected only to green grounding screw terminal of device with inherent electrical isolation from mounting strap.
 - 1) Devices: Listed and labeled as isolated ground receptacles.
 - 2) Isolation Method: Integral to receptacle construction and not dependent on removable parts.
- (d) Industrial Heavy Duty Receptacles: Comply with IEC 309-1.
- (e) Color: White unless otherwise indicated or required by Code.

2.6 Supporting Devices

2.6.1 Materials

- (a) Stainless Steel.

2.6.2 Manufactured Supporting Devices

- (a) Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.

- (b) Fasteners: Types, materials, and construction to match support materials listed above.
- (c) Modular Mechanical Conduit Seals: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- (d) Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers.
- (e) U-Channel Systems: Channels, with 9/16-in. dia holes, at minimum of 8 in. on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of same manufacture.

2.6.3 Fabricated Supporting Devices

- (a) Shop- or field-fabricate supports or manufacture supports assembled from U-channel components.
- (b) Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- (c) Pipe Sleeves: Provide pipe sleeves of one of following:
 - 1) Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from following gage metal for sleeve diameter noted:
 - i. 3 in. and smaller: 20 ga.
 - ii. 4 in. to 6 in.: 16 ga.
 - iii. Over 6 in.: 14 ga.
 - 2) Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
 - 3) Plastic Pipe: Fabricate from Schedule 40 galvanized steel pipe.

2.6.4 Fire Resistant Joint Sealers

- (a) Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors.
- (b) Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.

2.7 Cabinets, Boxes, and Fittings

2.7.1 General

- (a) Electrical Cabinets, Boxes, and Fittings: Of indicated types, sizes, and NEMA enclosure classes. Where not indicated, provide units of types, sizes, and classes appropriate for use and location. Provide items complete with covers and accessories required for intended use. Provide gaskets for units in outdoor locations. Enclosures shall be lockable.

2.7.2 Miscellaneous Materials and Finishes

- (a) Fasteners for General Use: Corrosion resistant screws and hardware including cadmium and zinc plated items.
- (b) Fasteners for Damp or Wet Locations: Stainless steel screws and hardware.
- (c) Fittings for Boxes, Cabinets, and Enclosures: Conform to UL 514B. Malleable iron or zinc plated steel for conduit hubs, bushings and box connectors.
- (d) Finishes:
 - 1) Exterior Finish: Galvanized or Gray baked enamel for items exposed in finished locations except as otherwise indicated.
 - 2) Interior Finish: Where indicated, white baked enamel.
- (e) Fastener Style:
 - 1) Stainless steel door clamp assembly (Hoffman SS6LP series or Weigmann SSN4 series) for stainless steel boxes. Screw-down clamps are not acceptable.
 - 2) Snap-hinge covers or quarter turn semi-flush oil tight latch for non-metallic boxes.
 - 3) External quick-release or quarter turn semi-flush oil tight latches for galvanized boxes.

- 4) Spring loaded, triple-thread, captive hex-head bolts for cast metal boxes.

2.7.3 Metal Outlet, Device, and Small Wiring Box

- (a) General:
 - 1) Conform to UL 514A and UL 514B.
 - 2) Boxes shall be of type, shape, size, and depth to suit each location and application.
- (b) Steel Boxes: Conform to NEMA OS 1. Boxes shall be sheet steel with stamped knockouts, threaded screw holes and accessories suitable for each location including mounting brackets and straps, cable clamps, exterior rings and fixture studs.
- (c) Galvanized Cast-Iron Boxes: Iron alloy, waterproof, with threaded raceway entries and features and accessories suitable for each location, including mounting ears, threaded screw holes for devices and closure plugs.

2.7.4 Pull and Junction Boxes

- (a) General: Comply with UL 50 for boxes over 100 cu in. volume. Unless otherwise noted, boxes shall have continuous hinge on one side with fastening mechanism on the opposite side. Cover and fasteners shall be of material same as box and shall be of size and shape to suit application.
- (b) Galvanized Steel Boxes: Flat rolled, code gauge, sheet steel with welded seams. Where necessary to provide rigid assembly, construct with internal structural steel bracing. Hot-dip galvanized after fabrication. Cover shall be gasketed.
- (c) Stainless-Steel Boxes: Fabricate of stainless steel conforming to Type 316 of ASTM A167. Where necessary to provide rigid assembly, construct with internal structural stainless steel bracing. Cover shall be gasketed.
- (d) Galvanized Cast-Iron Boxes: Molded of cast iron alloy with gasketed cover and integral threaded conduit entrances.
- (e) Boxes Approved for Classified Locations: Cast metal or cast nonmetallic boxes conforming to UL 886 listed and labeled for use in specific location classification, and with specific hazardous material encountered. Conduit entrances shall be integral threaded type. Provide flat cover with multiple hinges and stainless steel, spring loaded, triple-thread, captive hex-head bolts.

2.7.5 Terminal Strips for Junction Boxes

- (a) Manufacturers:
 - 1) Square D Co.
 - 2) Buchanan.
 - 3) Phoenix Contact.
- (b) Channel mount snap-on type.
- (c) Individual gangable with nylon bases.
- (d) Solderless box lug type rated at 600 v to accommodate No. 22 to 8 AWG wire or as otherwise indicated.
- (e) Provide 50% spare terminals.

3. EXECUTION:

3.1 Raceways

3.1.1 Examination

- (a) Examine surfaces to receive raceways, wireways, and fittings for compliance with installation tolerances and other conditions affecting performance of raceway system.
- (k) Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.
- (l) Install conduit identification tags as shown on Drawings.

3.1.2 Wiring Methods

- (a) Outdoors Locations: Use following wiring methods unless otherwise noted on Drawings:
 - 1) Outdoor Locations: PVC-Coated galvanized rigid steel.
 - 2) Underground Power and Control, Single Run: Rigid nonmetallic (PVC) conduit.
 - i. Concrete encased except for area lighting branch circuits or as otherwise noted on Drawings.
 - 3) Underground Power and Control, Grouped: Rigid nonmetallic (PVC) conduit.

- i. Concrete encased except for area lighting branch circuits or as otherwise noted on Drawings.
- 4) Underground Shielded Instrumentation Cables and Shielded Instrumentation Cables run in concrete slabs, Single Run or Grouped: Galvanized rigid steel.
- 5) Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquidtight flexible metal conduit.
- (b) Hazardous classified locations: Use the following wiring methods unless otherwise noted on drawings.
 - 1) Exposed and concealed: PVC-Coated Galvanized rigid steel conduit.
- (c) Use 3/4 in. minimum size unless otherwise noted except conduit runs to room light switches may be 1/2 in.
- (d) Unless specifically indicated otherwise on Drawings or in Specifications, use galvanized rigid steel conduit for general wiring.
- (e) Encase galvanized rigid steel conduits installed underground or underfloor in at least 3 in. of concrete. PVC conduit may be used without encasing in concrete for underfloor conduit or where specifically indicated on Drawings.
 - 1) Underground conduit shall be minimum of 1 in., buried at depth of not less than 24 in. below grade.
 - 2) Provide conduits or ducts terminating below grade with means to prevent entry of dirt and moisture.
 - 3) When using concrete encased PVC conduit provide PVC coated galvanized rigid steel elbows.
- (f) Raceways Embedded in Slabs: Install in middle third of slab thickness where practical, and leave at least 1 in. (25 mm) concrete cover.
 - 1) Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2) Space raceways laterally to prevent voids in concrete.
 - 3) Run conduit larger than 1 in. trade size parallel to or at right angles to main reinforcement and spaced on center of at least 3 times conduit trade dia. with minimum 2 in. concrete covering. Conduits over 1 in. may not be installed in slab without approval of ENGINEER.

- 4) When at right angles to reinforcement, place conduit close to slab support.
- 5) Conduits embedded in concrete frame shall comply with applicable provisions of ACI 318.

3.1.3 Installation

- (a) Conceal raceways by enclosing within finished walls, ceilings, and floors, unless otherwise indicated.
- (b) Provide watertight conduit system where installed in wet places, underground or where buried in masonry or concrete.
 - 1) Use threaded hubs when entering top of enclosures.
 - 2) Use sealing type locknuts when entering sides or bottom of enclosures.
- (c) Install two spare 1 in. conduits from top of each flush mounted panelboard to area above ceiling for future use. On flush mounted panelboards located on first and higher level floors, provide two spare 1 in. conduits from bottom of panelboard to ceiling area of floor below for future use.
- (d) Install raceways level and square and at proper elevations. Provide adequate headroom.
- (e) Complete raceway installation before starting conductor installation.
- (f) Support raceway as specified in Section 16C-2.6.
- (g) Use temporary closures to prevent foreign matter from entering raceway.
- (h) Run concealed raceways with minimum of bends in shortest practical distance considering type of building construction and obstructions, except as otherwise indicated.
- (i) Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow surface contours as much as practical.
 - 1) Mount exposed horizontal runs as high above floor as possible, and in no case lower than 7 ft above floors, walkways, or platforms in passage areas.
 - 2) Run parallel or banked raceways together, on common supports where practical.
 - 3) Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where

they can be installed parallel; otherwise, provide field bends for parallel raceways.

- (j) Join raceways with fittings designed and approved for purpose and make joints tight.
 - 1) Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 - 2) Use insulating bushings to protect conductors.
- (k) Terminations: Where raceways are terminated with locknuts and bushings, align raceway to enter squarely, and install the locknuts with dished part against the box. Use two locknuts, one inside and one outside the box. Use insulating bushings. Provide insulated grounding bushings to terminate ground wire.
- (l) Where terminations in threaded hubs, screw raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to box, and tighten chase nipple so no threads are exposed.
- (m) Install pull wires in empty raceways. Use monofilament plastic line having not less than 200 lb (90 kg) tensile strength. Leave not less than 12 in. (300 mm) of slack at each end of pull wire.
- (n) Telephone and Signal System Raceways 2 in. Trade Size and Smaller: In addition to above requirements, install in maximum lengths of 150 ft (45 m) and with maximum of two 90° bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.
- (o) PVC Externally Coated Galvanized Rigid Steel Conduit: Use only fittings approved for use with that material. Patch nicks and scrapes in PVC coating after installing conduit.
- (p) 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.

3.1.4 Conduit Stub-Ups

- (a) Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above finished slab.
- (b) Transition under floor conduit to PVC coated galvanized rigid steel conduit before rising above floor. Under floor conduit elbows shall be PVC coated galvanized rigid steel conduit. Extend the PVC coated galvanized rigid steel conduit portion of the stub-up minimum 12 inch above floor or slab.

3.1.5 Conduit Bends

- (a) Make bends and offsets so inside diameter is not reduced. Unless otherwise indicated, keep legs of bend in same plane and straight legs of offsets parallel.
- (b) Provide NEMA standard conduit bends, except for conduits containing medium voltage cable, fiber optic cable, or conductors requiring large radius bends.

3.1.6 Flexible Connections

- (a) Use maximum of 6 ft (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures.
- (b) Terminate conduits at motor terminal boxes, motor operated valve stations or pipe-mounted instruments and other equipment subject to vibration with maximum of 3 ft (915 mm) liquidtight flexible metal conduit unless otherwise indicated.
- (c) Use liquidtight flexible conduit in wet or damp locations.
- (c) Use approved flexible connections in hazardous locations.
- (d) Install separate ground conductor inside flexible conduit connections.

3.1.7 Fittings

- (a) Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. Install raceway sealing fittings at following points and elsewhere as indicated:
 - 1) Where conduits enter or leave hazardous locations.
 - 2) Where conduits pass from warm locations to cold locations, such as boundaries of refrigerated spaces and air-conditioned spaces.
 - 3) Where otherwise required by NEC.

- (b) Use raceway fittings compatible with raceway and suitable for use and location. For GRS, use threaded galvanized rigid steel conduit fittings, except as otherwise indicated.
- (c) Install automatic breather drain fittings according to manufacturer's written instructions. Locate fittings to drain conduit system and prevent condensate from entering device enclosures. Install automatic breather drain fittings at following points and elsewhere as indicated.
 - 1) Where vertical seals are installed.
 - 2) Low points in conduit system.
 - 3) Below field instrumentation at junction boxes of flexible and rigid conduit.
 - 4) Where otherwise required by NEC.
- (d) Install wall entrance seal as dictated by application where conduits pass through foundation walls below grade.
- (e) Install conduit expansion fittings complete with bonding jumper in following locations.
 - 1) Conduit runs crossing structural expansion joints.
 - 2) Conduit runs attached to 2 separate structures.
 - 3) Conduit runs where movement perpendicular to axis of conduit may be encountered.
- (f) Where conduit passes from inside of building to outdoors, it shall be firmly packed at fitting nearest wall line with Johns-Manville Duxseal to depth of at least 1 in. after wires and cables are pulled in; or, if conduit enters directly into equipment, it shall be fitted with seal and drain fitting to prevent water entering equipment.

3.1.8 Grounding

- (a) Ground in accordance with Section 16C-2.4.
- (b) Provide grounding connectors for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL 486A.

3.1.9 Protection

- (a) Provide final protection and maintain conditions, in manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.
 - 1) Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2) Repair damage to PVC or paint finishes with matching touch-up coating recommended by manufacturer.

3.1.10 Cleaning

- (a) Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

3.2 Electrical Identification

3.2.1 Installation

- (a) Install As indicated where used for color coding.
- (b) Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
- (c) Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and or designations used for electrical identification with corresponding designations used in Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- (d) Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- (e) Self-Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.
- (f) Install painted identification as follows:
 - 1) Clean surfaces of dust, loose material, and oily films before painting.
 - 2) Prime Surfaces: For galvanized metal, use single component, acrylic vehicle coating formulated for galvanized surfaces. For concrete masonry units, use

- heavy duty, acrylic resin block filler. For concrete surfaces, use clear, alkali resistant, alkyd binder type sealer.
- 3) Apply one intermediate and one finish coat of silicone alkyd enamel.
 - 4) Apply primer and finish materials according to manufacturer's instructions.
- (g) Identify Raceway Systems containing power, control and instrumentation conductors with adhesive labels. Locate labels at penetrations of walls and floors, at 50 ft (15 m) maximum intervals in straight runs, and at 25 ft (7.5 m) in congested areas. Labels shall be color coded and identify the contents (i.e. orange label with black print reading 480V FEEDER – ID #001)
- (h) Install Circuit Identification Labels on Boxes: Label externally as follows:
- 1) Exposed Boxes: Pressure sensitive, self adhesive plastic label on cover.
 - 2) Concealed Boxes: Plasticized card stock tags.
 - 3) Labeling Legend: Permanent, water proof listing of panel and circuit number or equivalent.
- (i) Identify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communications lines, install continuous underground plastic line marker located directly above line at 6 to 8 in. (150 to 200 mm) below finished grade. Where multiple lines installed in common trench or concrete envelope, provide multiple underground line warning tapes, one for each 16 inches of width of lines. If lines do not exceed an overall width of 16 in. (400 mm), use single line marker.
- 1) Install line marker for underground wiring, both direct buried and in raceway.
- (j) Color Code Conductors: Secondary service, feeder, and branch circuit conductors throughout secondary electrical system.
- 1) Field applied, color coding methods may be used in lieu of factory coded wire for sizes larger than No. 10 AWG.
 - i. Colored, pressure sensitive plastic tape in half lapped turns for distance of 6 in. (150 mm) from terminal points and in boxes where splices or taps are made. Apply last 2 turns of tape with no tension to prevent possible unwinding. Use 1 in. (25 mm) wide tape in colors as specified. Adjust tape bands to avoid obscuring cable identification markings.

- ii. Colored cable ties applied in groups of 3 ties of specified color to each wire at each terminal or splice point starting 3 in. (76 mm) from terminal and spaced 3 in. (76 mm) apart. Apply with special tool or pliers, tighten to snug fit, and cut off excess length.
- 2) 208/120-V Systems: As follows:
 - i. Phase A: Black.
 - ii. Phase B: Red.
 - iii. Phase C: Blue.
 - iv. Neutral: White.
 - v. Ground: Green.
- 3) 480/277-V Systems: As follows:
 - i. Phase A: Brown.
 - ii. Phase B: Orange.
 - iii. Phase C: Yellow.
 - iv. Neutral: Grey (comply with NEC exhibit 200.3).
 - v. Ground: Green.
- (k) Power Circuit Identification: Use metal tags or aluminum wraparound marker bands for cables, feeders, and power circuits in vaults, pull boxes, junction boxes, and switchboard rooms.
 - 1) Legend: 1/4 in. (6.4 mm) steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
 - 2) Fasten tags with nylon cable ties; fasten bands using integral ears.
- (l) Apply identification to conductors as follows:
 - 1) Conductors to Be Extended in Future: Indicate source and circuit numbers.
 - 2) Multiple Power or Lighting Circuits in Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.
 - 3) Multiple Control and Communications Circuits in Same Enclosure: Identify each conductor by its system and circuit designation. Use consistent system of tags, color coding, or cable marking tape.

- (m) Apply warning, caution, and instruction signs and stencils as follows:
- 1) Install warning, caution, and instruction signs where indicated or required to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved, plastic laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.
 - 2) Emergency Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8 in. (9 mm) high lettering for emergency instructions on power transfer, load shedding, and or emergency operations.
- (n) Install identification as follows:
- 1) Apply equipment identification labels of engraved plastic laminate on each major unit of equipment, including central or master unit of each system. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Except as otherwise indicated, provide single line of text with 1/2 in. (13 mm) high lettering on 1-1/2 in. (38 mm) high label; where 2 lines of text are required, use lettering 2 in. (51 mm) high. Use black lettering on white field. Apply labels for each unit of following categories of equipment.
 - i. Panelboards, electrical cabinets, and enclosures.
 - ii. Access doors and panels for concealed electrical items.
 - iii. Power transfer equipment.
 - iv. Transformers.
 - 2) Apply designation labels of engraved plastic laminate for disconnect switches, breakers, push buttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

3.3 Conductors and Cables

3.3.1 Installation

- (a) Install wires and cables as indicated, according to manufacturer's written instructions and NECA "Standard of Installation".
- (b) Run wire and cable in conduit unless otherwise indicated on Drawings. Pull conductors into raceway simultaneously where more than 1 is being installed in same raceway.
 - 1) Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
 - 2) Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
 - 3) Do not draw conductor into conduits until building is enclosed, watertight, and work causing cable damage has been completed.
- (c) Install cable supports for vertical feeders in accordance with NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.
- (d) For panelboards, cabinets, switches, and equipment assemblies, neatly form, train, and tie cables in individual circuits.
- (e) Seal cable and wire entering building from underground between wire and conduit, where cable exits conduit, with non-hardening approved compound.
- (f) Install wire and cables in separate raceway systems as follows:
 - 1) Shielded Instrumentation.
 - 2) Intrinsically safe circuits.
 - 3) As required by NEC.
- (g) Where control or instrumentation cables are run in underground conduit and ducts provide multi-wire cable assemblies.
- (h) Where power cables and instrument/signal cables enter and pass through same or distribution box, steel barrier or separate raceways shall continue through box to avoid magnetic interaction between power cables and instrumentation conductors.
- (i) Wiring at Outlets: Install with at least 12 in. (300 mm) of slack conductor at each outlet.
- (j) Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and

terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL 486A.

- (k) Drawings do designate number of conductors in conduit. CONTRACTOR is responsible for verifying number of conductors in conduit prior to installation. Location of branch circuits and switch legs indicated on Drawings may be routed differently as dictated by construction and these Specifications.

3.3.2 Terminations and Splices

- (a) Terminate control, instrumentation, and communication cables on terminal strips in separate terminal cabinets located near conduit entrances of buildings or as shown on Drawings.
- (b) Power Cable Splices (no splices in cables unless approved by Engineer):
 - 1) Provide continuous lengths of cable without splices in motor circuits and feeders unless otherwise noted. Splices may be installed in motor circuits and feeders with prior approval by ENGINEER.
 - 2) Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
 - 3) Use splice and tap connectors that are compatible with conductor material.
 - 4) Where pre-insulated spring connectors are used for equipment connections, tape connector to wire to prevent loosening under vibration.
 - 5) Each tap, joint or splice in conductors No. 8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and finish wrap of color coding tape where required by code.
 - 6) Cable splices shall be made only in distribution boxes and junction boxes.
- (c) Power Cable Terminations:
 - 1) Termination of wires with full compression type lugs installed with appropriate hand or hydraulic tool. Use proper dies to achieve the desired compression.
 - 2) For screw type terminal blocks, terminations for stranded conductors shall be made with T & B lock-on fork connector with insulated sleeves.
 - 3) Motor lead conductor terminations shall be made with a T & B or approved equal, full compression lug, full ring type, bolted,

and taped as required. For connecting motor lead to service wiring fasten full ring lugs together with cadmium plated steel cap screws, and cover with a minimum of 2 layers 1/2 lap, electrical tape.

3.3.3 Control Circuits

(a) Control circuit wiring from same area for the same system returning to same panel, (e.g., LCP, DPC, etc.,) may be combined provided signal and voltage types are not mixed.

(b) Following types of wiring shall not be combined with other types:

- 1) 4-20 ma dc analog; Type 2 shielded cable.
- 2) 24 vdc discrete (e.g., field or LCP powered dry contacts).

3.3.4 Branch Circuits

(a) Motor branch circuits and branch circuits for 3 phase circuits shall not be combined.

(b) Branch circuits for single phase equipment devices from same LP or PP may be combined provided that such combining does not result in having to derate ampacity of conductors.

3.3.5 Feeders

(a) Extend feeders at full capacity from origin to termination.

(b) Each conduit raceway shall contain only those conductors constituting single feeder circuit.

(c) Where multiple raceways are used for single feeder, each raceway shall contain conductor of each phase and neutral if used.

(d) Where feeder conductors run in parallel, conductors shall be of same length, material, circular-mil area, insulation type, and terminated in same manner.

(e) Where parallel feeder conductors run in separate raceways, raceways shall have same physical characteristics.

(f) Confine feeders to insulated portions of building unless otherwise shown.

(g) On network systems, neutral shall be run with phase wires. Unbalanced neutral current shall not exceed normal or derated conductor capacity.

3.3.6 Motor and Equipment Wiring

- (a) Provide motor circuits in accordance with diagrams and schedules on Drawings and code requirements, from source of supply to associated motor starter and starter to motor terminal box, including necessary and required intermediate connections.
- (b) Do not include associated control conductors in same conduit with power conductors.
- (c) Provide branch circuits to conform with NEC requirements and nameplate ratings. CONTRACTOR responsible for verification of ratings of motors and installing proper branch circuits.

3.3.7 Color Coding

- (a) Conductors for Lighting and Power wiring:

Phase	208/120 v	480/277 v
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Travelers	Pink	Purple
Neutral	White	Grey
Ground	Green	Green

- (b) Colored pressure-sensitive plastic tape.
 - 1) Apply in half overlapping turns for minimum of three inches at terminal points, and in junction boxes, pull boxes, and troughs.
 - 2) 3/4 in. wide with colors as specified.
 - 3) Apply last two laps of tape with no tension to prevent possible unwinding.
 - 4) Where cabling markings are covered by tape, apply tags to cable starting size and insulation type.
- (c) Color code for insulated power system wiring shall be in accordance with NEC.
- (d) Color code for intrinsically safe systems shall be light blue.

3.3.8 Control, Communication and Signal System Identification

- (a) Install permanent wire marker at termination.

- (b) Identifying numbers and letters on wire markers shall correspond to those on terminal blocks or wiring diagrams used for installing systems.
- (c) Plastic sleeve or self adhesive vinyl cloth.

3.3.9 Feeder Identification

- (a) Pullboxes and junction boxes, install metal tags on circuit cables and wires to clearly designate circuit identification and voltage.
- (b) Comply with Section 16C-2.3.

3.3.10 Field Quality Control

- (a) Visual and Mechanical Inspection:
 - 1) Inspect cables for physical damage and proper connection in accordance with single-line diagram.
 - 2) Test cable mechanical connections to manufacturer's recommended values using calibrated torque wrench.
 - 3) Check cable color coding with specifications and NEC standards.
- (b) Electrical Tests:
 - 1) Perform insulation-resistance test on each conductor with respect to ground and adjacent conductors. Applied potential shall be 1000 volts dc for 1 min.
 - 2) Perform continuity test to insure proper cable connection.
- (c) Test Values:
 - 1) Evaluation results by comparison with cables of same length and type. Investigate any value less than 50 megohms.

3.4 Grounding

3.4.1 Application

- (a) Equipment Grounding Conductors: Comply with NEC Article 250 for types, sizes, and quantities of equipment grounding conductors, except where specific types, larger sizes, or more conductors than required by NEC are indicated.
 - 1) Install equipment grounding conductor with circuit conductors for items below in addition to those required by Code:
 - i. Feeders and branch circuits.

- ii. Lighting circuits.
 - iii. Receptacle circuits.
 - iv. Single-phase motor or appliance branch circuits.
 - v. Three-phase motor or appliance branch circuits.
- 2) Isolated Grounding-Receptacle Circuits: Install separate insulated equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding-conductor terminal of applicable derived system or service, except as otherwise indicated.
- 3) Isolated Equipment Enclosure Circuits: For designated equipment supplied by branch circuit or feeder, isolate equipment enclosure from supply raceway with nonmetallic raceway fitting listed for purpose. Install fitting where raceway enters enclosure, and install separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding-conductor terminal of applicable derived system or service, except as otherwise indicated.
- (b) Signal and Communications Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding-electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
- 1) Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on 1/4 by 2 by 12 in. (6 by 50 by 300 mm) grounding bus.
- 2) Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- (c) Separately Derived Systems: Where NEC requires grounding, ground according to NEC Paragraph 250-26.
- (d) Common Ground Bonding with Lightning Protection System: Bond electric power system ground directly to lightning protection system grounding conductor at closest point to electric service grounding electrode. Use bonding conductor sized same as system grounding conductor and install in conduit.
- (e) Piping Systems and Other Equipment: Comply with NEC Article 250 for bonding requirements.

3.4.2 Installation

- (a) Ground electrical systems and equipment according to NEC requirements, except where Drawings or Specifications exceed NEC requirements.
- (b) Grounding Rods: Locate minimum of 1 rod length from each other and at least same distance from any other grounding electrode.
 - 1) Drive until tops are 2 in. (50 mm) below finished floor or final grade, except as otherwise indicated.
 - 2) Interconnect with grounding-electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make these connections without damaging copper coating or exposing steel.
- (c) Grounding Conductors: Route along shortest and straightest paths possible, except as otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- (d) Underground Grounding Conductors: Use bare tinned copper wire. Bury at least 24 in. (600 mm) below grade.
- (e) Metal Water Service Pipe: Provide insulated copper grounding conductors, sized as indicated, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding-clamp connectors. Where dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Do not install grounding jumper across dielectric fittings. Bond grounding-conductor conduit to conductor at each end.
- (f) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding-clamp connectors.
- (g) Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.
- (h) Test Wells: One for each driven grounding electrode system, except as otherwise indicated. Set top of well flush with finished grade or floor. Fill with 1 in. 25 mm) maximum-size crushed stone or gravel.

3.4.3 Connections

- (a) Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors,

and connection methods so metals in direct contact will be galvanically compatible.

- 1) Use electroplated or hot-tin-coated materials to assure high conductivity and to make contact points closer in order of galvanic series.
 - 2) Make connections with clean, bare metal at points of contact.
 - 3) Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4) Make aluminum-to-galvanized steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5) Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- (b) Exothermic-Welded Connections: Use for connections to structural steel and for underground connections, except those at test wells. Comply with manufacturer's written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- (c) Equipment Grounding-Wire Terminations: For No. 8 AWG and larger, use pressure-type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure-type connectors.
- (d) Noncontact Metal Raceway Terminations: Where metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with bare grounding conductor to grounding bus or terminal in housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors, except as otherwise indicated.
- (e) Connections at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connections between conductors and grounding rods.
- (f) Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Where these requirements are not available, use those specified in UL 486A and UL 486B.
- (g) Compression-Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by manufacturer of connectors. Provide embossing die code or other standard method to make visible indication that connector has been adequately compressed on grounding conductor.

- (h) Moisture Protection: Where insulated grounding conductors are connected to grounding rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.4.4 Underground Distribution System Grounding

- (a) Ground pad-mounted equipment and noncurrent-carrying metal items associated with substation by connecting them to underground cable and grounding electrodes.

3.4.5 Field Quality Control

- (a) Test in accordance with 16A-3.7.
- (b) Testing Agency: Provide services of qualified independent testing agency to perform specified acceptance testing.
- (c) Testing: Upon completion of installation of ground-fault protection system and after electrical circuits have been energized, demonstrate capability and compliance with requirements.
 - 1) Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
- (d) Correct malfunctioning units at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.4.6 Restoration

- (a) Restore surface features, including vegetation, at areas disturbed by work of this Section.
 - 1) Re-establish original grades, except as otherwise indicated.
 - 2) Where sod has been removed, replace it as soon as possible after backfilling is completed.
 - 3) Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition.
 - 4) Include topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.
 - 5) Maintain restored surfaces.
 - 6) Restore disturbed paving.

3.5 Wiring Devices

3.5.1 Installation

- (a) Mounting height as follows unless otherwise shown on Drawings:
 - 1) Switches: 48 in. above floor.
 - 2) AC Receptacles and Telephone Outlets: 15 in. above floor or 6 in. above counters, counter back-splashes, and baseboard radiators in finished areas; 48 in. above floor in unfinished areas.
- (b) Install devices and assemblies plumb and secure.
- (c) Install wall plates when painting is complete.
- (d) Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- (e) Protect devices and assemblies during painting.

3.5.2 Identification

- (a) Comply with Section 16C-2.3.
 - 1) Switches: Where three or more switches are ganged, and elsewhere as indicated, identify each switch with approved legend engraved on wall plate.
 - 2) Receptacles: Identify panelboard and circuit number from which served. Use machine printed, pressure sensitive, abrasion resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.5.3 Connections

- (a) Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- (b) Isolated Ground Receptacles: Connect to isolated ground conductor routed to designated isolated equipment ground terminal of electrical system.
- (c) Tighten electrical connectors and terminals according to manufacturers published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A.

3.5.4 Field Quality Control

- (a) Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.
- (b) Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- (c) Replace damaged or defective components.

3.5.5 Cleaning

- (a) Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

3.6 Supporting Devices

3.6.1 Installation

- (a) Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- (b) Coordinate with structural system and with other electrical installation.
- (c) Raceway Supports: Comply with NEC and following requirements:
 - 1) Conform to manufacturer's recommendations for selection and installation of supports.
 - 2) Strength of each support shall be adequate to carry present and future load multiplied by safety factor of at least four. Where this determination results in safety allowance of less than 200 lbs, provide additional strength until there is minimum of 200 lbs safety allowance in strength of each support.
 - 3) Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 - 4) Support parallel runs of horizontal raceways together on trapeze-type hangers.
 - 5) Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1 in. and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4 in. dia or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.

- 6) In vertical runs, arrange support so load produced by weight of raceway and enclosed conductors is carried entirely by conduit supports with no weight load on raceway terminals.
- (d) Vertical Conductor Supports: Install simultaneously with installation of conductors.
- (e) Miscellaneous Supports: Support miscellaneous electrical components as required to produce same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- (f) Sleeves: Install in concrete slabs and walls and other fire-rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL listed firestopping sealant in gaps between sleeves and enclosed conduits and cables.
- (g) Conduit Seals: Install seals for conduit penetrations of slabs below grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- (h) Conduit extending through roof shall pass through ceiling box at roof line.
 - 1) Provide 14 ga minimum copper box complete with watertight soldered seams and flanged to serve as pitch pocket for each conduit.
 - 2) Install conduit and pitch pocket in advance of roofing work.
- (i) Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with following:
 - 1) Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
 - 2) Holes cut in concrete shall not cut main reinforcing bars. Fill holes that are not used.

- 3) Load applied to any fastener shall not exceed 25% of proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

3.7 Cabinets, Boxes and Fittings

3.7.1 Installation, General

- (a) Locations: Install items where indicated and where required to suit code requirements and installation conditions.
- (b) Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.
- (c) Support and fasten items in accordance with Section 16C-2.11.
- (d) Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than sizes indicated
- (e) Remove sharp edges where they may come in contact with wiring or personnel.

3.7.2 Applications

- (a) Hinged Door Enclosures in Outdoor Locations: NEMA type 4X stainless steel metal enclosure, or as indicated on Drawings.
- (b) Outlet Boxes and Fittings: Install outlet and device boxes and associated covers and fittings of materials and NEMA types for each location in conformance with following requirements unless otherwise noted:
 - 1) Outdoor Locations: Stainless Steel, NEMA type 4X enclosures.
 - 2) Hazardous (Classified) Locations: NEMA type listed and labeled for location and class of hazard indicated.
- (c) Pull and Junction Boxes:
 - 1) Outdoor Locations: Stainless Steel, NEMA type 4X enclosures.
 - 2) Hazardous (Classified) Locations: NEMA type listed and labeled for location and class of hazard indicated.

3.7.3 Installation of Outlet Boxes

- (a) Outlets at Windows and Doors: Locate close to window or door trim.

- (b) Column and Pilaster Locations: Locate outlet boxes for switches and receptacles on columns or pilasters so centers of columns are clear for future installation of partitions.
- (c) Locations in Special Finish Materials: For outlet boxes for receptacles and switches mounted in desks or furniture cabinets or in glazed tile, concrete block, marble, brick, stone or wood walls, use rectangular shaped boxes with square corners and straight sides. Install boxes without plaster rings. Saw cut recesses for outlet boxes in exposed masonry walls.
- (d) Gasketed Boxes: At following locations use cast metal, threaded hub type boxes with gasketed weatherproof covers:
 - 1) Exterior Locations.
 - 2) Where surface mounted on unfinished walls, columns or pilasters. (Cover gaskets may be omitted in dry locations).
 - 3) Where exposed to moisture laden atmosphere.
 - 4) Where indicated.
- (e) Mounting: Mount outlet boxes for switches with long axis vertical or as indicated. Mount boxes for receptacles vertically. Gang boxes shall be mounted with long axis horizontal. Locate box covers or device plates so they will not span different types of building finishes either vertically or horizontally. Locate boxes for switches near doors on side opposite hinges and close to door trim, even though electrical floor plans may show them on hinge side.
- (f) Ceiling Outlets: For fixtures, where wiring is concealed, use outlet boxes 4 in. sq by 1-1/2 in. deep, minimum with raised plaster or tile cover. Provide 3/8 in. fixture stud.
- (g) Cover Plates for Surface Boxes: Use plates sized to box front without overlap.
- (h) Protect outlet boxes to prevent entrance of plaster, and debris. Thoroughly clean foreign material from boxes before conductors are installed.
- (i) Concrete Boxes: Use extra deep boxes to permit side conduit entrance without interfering with reinforcing, but do not use such boxes with over 6 in. depth.
- (j) Secure boxes rigidly to substrate upon which being mounted or solidly embed boxes in concrete or masonry. Do not support from conduit, mechanical ductwork or piping.
- (k) Set boxes in concealed conduit runs, flush with wall surfaces, with or without covers as required.

- (l) Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall minimum 12 in.
- (m) Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with finished surface.
- (n) Do not burn holes, use knockout punches or saw.
- (o) Provide outlet box divider barriers between 277/480 v and 120/240 v devices as required and per NEC.
- (p) Where emergency switches occur adjacent to normal light switches, install in separate boxes in accordance with NEC and device plate color coding separation.

3.7.4 Outlet Box Locations

- (a) Locate flush mounted wall boxes in corner of nearest brick or block to keep cutting to minimum.
- (b) Location of outlets and equipment as shown on Drawings is approximate and exact location to be verified and shall be determined by:
 - 1) Construction or code requirement.
 - 2) Conflict with equipment or other trades.
 - 3) Equipment manufacturer's drawings.
- (c) Minor modification in location of outlets and equipment considered incidental up to distance of 10 ft with no additional compensation, provided necessary instructions given prior to roughing in of outlet.
- (d) Mounting heights for devices and equipment to be measured from finished floor to centerline of device and unless otherwise noted on Drawings as follows.
 - 1) Switches: 48 in. above floor.
 - 2) Ac Receptacles and Telephone Outlets: 15 in. above floor or 6 in. above counters, counter backsplashes, and baseboard radiators in finished areas; 48 in. above floor in unfinished areas.
 - 3) Wall Bracket Lighting Fixtures: 8 in. above mirrors or or 6 ft 6 in. above floor.
 - 4) Pushbuttons: 48 in. above floor.
 - 5) Disconnect Switches: 60 in. above floor

3.7.5 Installation of Junction Boxes

- (a) Box Selection: For boxes in main feeder conduit runs, use sizes not smaller than 8 in. sq by 4 in. deep. Do not exceed 6 entering and 6 leaving raceways in single box.
 - 1) Cable Supports: Install clamps, grids, or devices to which cables may be secured. Arrange cables so they may be readily identified. Support cable at least every 30 in. inside boxes.
 - 2) Mount pull boxes in inaccessible ceilings with covers flush with finished ceiling.
 - 3) Size: Provide pull and junction boxes for telephone, signal, instrumentation, control, and other systems at least 50% larger than would be required by the NEC for boxes smaller than 24 in. by 24 in., or as indicated. Locate boxes strategically and provide shapes to permit easy pulling of future wires or cables of types normal for such systems.

3.7.6 Grounding

- (a) Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes grounding conductor, provide grounding terminal in interior of cabinet, box or enclosure.

3.7.7 Cleaning and Finish Repair

- (a) Upon completion of installation, inspect components. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, abrasions and weld marks.
- (b) Galvanized Finish: Repair damage using zinc-rich paint recommended by manufacturer.
- (c) Painted Finish: Repair damage using matching corrosion inhibiting touch-up coating.

3.8 Excavation and Backfill

- 3.8.1 Excavation and backfill for work under this Division shall be provided under this Division in conformance with Division 2.

3.9 Concrete

- 3.9.1 Concrete for equipment pads, conduit encasement, handholes, manholes and other work under this Division shall be provided under this Division in conformance with Division 3.

3.10 Cutting and Patching

- 3.10.1 All cutting and patching of building materials required for work under this Division shall be provided under this Division.

- 3.10.2 No structural members shall be removed, cut or otherwise modified without approval of the Engineer and any such work shall be done in a manner as directed by the Engineer.
- 3.10.3 Cutting and patching shall be performed in a neat and workmanlike manner, consistent with the best practices of the appropriate trade. All patching shall be done in a manner consistent with the building material being patched.
- 3.10.4 Holes made in concrete shall be made using a suitable core drill. The use of a star drill or air hammer will not be permitted.
- 3.10.5 In new construction, sleeves, chases, inserts and the like required for work under this Division shall be provided under this Division and the furnishing and placement of these items shall be fully coordinated with the other trades involved so as not to delay the new construction.

END OF THIS SECTION

SECTION 16D - SUPERVISORY, CONTROL AND DATA ACQUISITION (SCADA) EQUIPMENT

1. GENERAL:

1.1. Descriptions, Definitions, and Responsibilities

- 1.1.1 Process Control System (PCS): a complete, integrated system of PLC's, HMI's, Windows-based computer, instruments, devices, wireless and wired process control networks, software, Application Engineering, and ancillary equipment for monitoring and control of stormwater collection.
- 1.1.2 System Integrator: Organization, whose principle function is design, program, configure, manufacture, provide, install and service of PCS. An organization, under the direction of the 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 PCS.
- 1.1.3 SCADA (Supervisory Control and Data Acquisition) system shall be provided to function as the Master Control for the Pump Station facility. The SCADA system shall consist of, but not be limited to; programmable controllers, software, radio network and communications equipment, process instrumentation and control devices, uninterruptible power supplies (UPS), and other devices as required and/or as indicated on Drawings and Plans.
- 1.1.4 System Integrator shall inspect Equipment provided under this Section prior to shipment to Project site.
- 1.1.5 System Integrator shall coordinate work with Contactor to insure that:
 - 1.1.5.1 All components provided under this Section are properly installed.
 - 1.1.5.2 All components provided under this Section are properly configured.
 - 1.1.5.3 The proper type, size, and number of control wires within conduits are provided.
 - 1.1.5.4 Proper electric power circuits are provided for all components and systems.
- 1.1.6 System Integrator shall be responsible for the operational testing of the HMI, and PLC software programs.
- 1.1.7 System Integrator shall be responsible for all Application Engineering. The System Integrator shall provide all programming and configuration of

equipment and software including development of graphic displays and reports. Displays and report development shall be coordinated with existing Owner standards. A PDF sample program will be provided to the successful bidder.

- 1.1.8 System Integrator shall be responsible for coordination of voltage levels and signal types for signals connected to Process Control System. Provide relays, signal isolators, termination or pull-up resistors, signal conditioners or other devices only as required for proper interfacing and operation of non-compatible devices. Auxiliary and accessory devices necessary for system operation or performance, such as transducers, isolation barriers, or relays to interface with equipment provided under this Contract shall be included whether shown on the Drawings or not.
- 1.1.9 All materials, equipment, labor, installation, configuration, software, programming, and incidentals required to achieve a fully integrated and operational system shall be furnished and installed complete by a qualified System Integrator with a minimum of 10-years' experience with comparable size projects. The system integrator shall design and coordinate the instrumentation and control system for proper operation with related equipment and materials.
- 1.1.10 The System Integrator shall provide a detailed descriptive narrative of the Pump Station control system strategy describing auto/manual pump controls locally, and at VFD enclosures. The control system narrative shall include analog level control, float backup, monitoring and security systems, communications architecture and scheme for monitoring at Naperville Water Service Center. The control system narrative shall include all system components shown on E Drawings within contract documents. HMI screens shall accompany the control system narrative along with any photographs, cut sheets, or other materials that aid in the understanding of Pump Station controls. Pump Station control system strategy shall use Contract documents as a basis for a more detailed narrative and expand in greater detail for each piece of equipment.
- 1.1.11 The System Integrator shall install the control system and shall perform all on-site testing, calibration, start-up, troubleshooting, and training of Owner staff.
- 1.1.12 All necessary coordination required for interfacing the proposed Pump Station facility with the proposed SCADA system shall be provided by the System Integrator.
- 1.1.13 The Pump Station SCADA system shall be remotely monitored at Naperville Water Service Center via MDS EntraNet extended range IP/Ethernet radio.
 - 1.1.13.1 Contractor is responsible for coordination with the System Integrator and Electrical Maintenance Contractor required for ensuring the proper functioning of the remote monitoring systems.

1.1.13.2 All inputs at the remote monitoring locations shall be checked via each means of communications. Field test results of all I/O points verifying functionality for remote monitoring shall be submitted to Engineer and Owner for review. Contractor to provide PLC I/O addresses for network monitoring from remote locations.

1.1.13.3 Payment for the work specified under this paragraph shall be paid for under Article 109.04 of IDOT's Standard Specifications for Road and Bridge Construction.

1.2. System Integrator

1.2.1 Advanced Automation & Controls, Inc.

1.2.2 No Substitutes Permitted.

1.3. System Integrator Experience Requirement

1.3.1 The Contractor shall utilize a System Integrator having the experience and knowledge, as defined herein, to undertake the work specified in this Section. The System Integrator shall be an organization having the following organizational and individual experience, knowledge, and capabilities:

1.3.1.1 System Integrator shall be regularly engaged in the design, installation, and servicing of wastewater and storm-water collection and treatment PCS.

1.3.1.2 System Integrator shall demonstrate the ability to produce electrical and control logic diagrams in the level of detail required by this specification.

1.3.1.3 System Integrator shall have previously executed a minimum of five (5) storm-water collection treatment PCS projects of similar size and complexity to this Project incorporating PLC's and HMI platforms included in this Project.

1.3.1.4 Systems Integrator shall have previously successfully executed Ethernet wired networked projects of comparable size and complexity to this Project.

1.3.1.5 The person(s) performing the field Instrumentation and Controls work, as required by the Contract Documents, shall have a minimum of five (5) years' experience on PLC-based systems.

1.3.1.6 System Integrator 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 (3)

projects of similar or greater complexity, and shall have a demonstrated proficiency in authoring logic in PLC ladder logic.

1.3.1.7 Upon request of Engineer and in addition to other specified requirements, Contractor shall provide a minimum of five (5) System Integrator references to confirm compliance with these requirements.

1.3.1.8 Upon written approval of Engineer, additional System Integrator's that meet all requirements may be considered by the Contractor.

1.4. Submittals

1.4.1. Submit project specific product data, shop drawings, project documentation, certified shop test reports, O&M data and record documents in accordance with the provisions of Section 1A. and the following:

1.4.2. Product Data

1.4.2.1 Bill of Materials: 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.

1.4.2.2 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.

1.4.2.3 All Drawings shall be generated in CAD software. There shall not be handwritten additions/changes/updates. Photocopy or other electronic duplication and submission of Contract Documents is not acceptable and will be rejected.

1.4.3. System Diagrams

1.4.3.1 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 block (terminal schedule).

- 1.4.3.2 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 16C. Wiring and devices external to panel shall be clearly identified.
 - h. Control devices shall utilize the symbology depicted in NFPA 79 and IEEE315.
 - 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.
- 1.4.3.3 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.
- 1.4.3.4 SCADA System Block Diagram: Furnish system hardware configuration and identify model numbers of each system component.

- 1.4.3.5 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.
- 1.4.3.6 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.
- 1.4.3.7 SCADA System Block Diagram: Furnish system hardware configuration and identify model numbers of each system component.
- 1.4.3.8 I/O List segregated by PLC module and module type. Include detailed description of each I/O point with respect to function (i.e.: Main Pump 1 Running, etc.).
- 1.4.3.9 Process Control Network Drawings: Furnish Drawings showing connections between Process Control System devices including panel network switch, PLC, VFD's, radio, antenna, power monitors, and any other network devices. Drawings shall indicate network domain and device IP addresses, subnet masks, gateways, and other pertinent network address information. Drawings shall show type of media used for communications (radio, copper Ethernet, fiber, etc.).
- 1.4.3.10 Detailed Pump Control system descriptions (floats and SCADA control) and associated communications with remote facilities.
- 1.4.3.11 SCADA screen shots for review prior to site installation.
- 1.4.4. Test Procedures and Results
 - 1.4.4.1 Detailed field test procedure for Control Enclosure.
 - 1.4.4.2 Detailed field test procedure for Ethernet Radio communications to verify function of station monitoring and alarming.
- 1.4.5. Software Documentation
 - 1.4.5.1 Submit system software, application software, I/O point data base listing, programming ladder diagrams, graphic pages and report forms in prints. Software, application programs, ladder diagrams and control logic shall be submitted in CD format.
- 1.4.6. O&M and Instruction Manuals

1.4.6.1 Submit project specific instruction manuals covering installation, operation, calibration, maintenance, diagnostic and repair for all hardware and software. Refer to Section 1A for additional requirements.

1.4.7. Record Documents

1.4.7.1 Accurately record actual calibration setting and scales of instruments.

1.4.7.2 Approved Shop Drawings.

1.4.7.3 Record Contract Drawings.

1.4.7.4 Refer to Section 1A for additional requirements.

1.5. Work for Hire

1.5.1 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 Naperville and shall be turned over to the Naperville fully documented (with accompanying commentary) as the work is completed.

1.5.2 Naperville intends only to obtain the SOFTWARE for its own use.

1.5.3 Naperville 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 Naperville from all claims, damages and expenses (including reasonable litigation costs), arising out of any use, misuse or misapplication of SOFTWARE concepts and ideas.

1.6. Operational and Performance Requirements

1.6.1 The Pump Station Control Panel (100-CP-1) includes a Allen Bradley Micrologix 1400 PLC with I/O expansion modules as required, Ethernet switch, MDS EntraNet extended range IP/Ethernet radio, intrinsically safe barriers, surge protection devices (SPD), motor protection relays (MPR), UPS, panel heater, circuit protection, control relays, control timer relay, terminal blocks, level indicators, selector switches, pushbuttons, pilot lights, panel intrusion switch, and elapsed time meters for Pump Station system control.

1.6.2 The system will control operation of 2 submersible pumps, Pump No. 1 (100-P-0101) and Pump No. 2 (100-P-0102) located in wetwell structure 100. The pump transfer water from Wetwell to Discharge Manhole (2-38). Pump

operation is via 2 VFD's (100-VFD-0101, 100-VFD -0102) enclosed in separate enclosures. PLC operational control and monitoring of VFD's shall be via digital I/O, analog I/O, and Ethernet communication as shown on drawings.

- 1.6.3 Each VFD enclosure shall have a 3-position LOR (Local-Off-Remote) to determine primary control of VFD. Placing the selector switch in the Local position will allow for manual operation at the VFD enclosure using the VFD manufacturer provided OIU. Placing the selector switch in the Remote position will place VFD under control of the pump station control panel.
- 1.6.4 The swing out panel shall have two 3-position Hand-Off-Auto (HOA) selector switches for Pump No. 1 and Pump No. 2. Placing the selector switch in the Hand position will immediately start the associated pump. The pump will continue to run until the switch is set to the Off or Auto position (Hand operation is intended for maintenance purposes only, running pump continuously in hand could cause damage to pump). Pump speed while in Hand will be controlled using a potentiometer located on swing out panel. Placing the selector switch in the Off position will disable pump operation (the off position does not place the pump in a safe mode for maintenance). Placing the selector switch in the Auto position will allow the PLC to start and stop the pumps as needed in order to maintain desired wetwell water level.
- 1.6.5 The PLC logic shall operate the pumps in Lead/Lag sequence. As the water level in wetwell rises to the Lead Pump Start setpoint, the lead pump will be the 1st to start and continue to run until the water level falls below the Pump Stop setpoint. Should the water level continue to rise high enough to reach the Lag Pump Start setpoint the lag pump will start and both pumps will continue to run until the water level falls below the Pump Stop setpoint.
- 1.6.6 The swing out panel shall have a 3 position selector switch to allow the operator to manually assign which pump shall be lead pump. The selector switch positions shall be Lead 1/Auto/Lead 2. Placing the selector switch in the Lead 1 position tells the PLC to assign the Pump No. 1 as lead pump. Placing the selector switch in the Lead 2 position tells the PLC to assign the Pump No. 2 as lead pump. Placing the selector switch in the Auto position tells the PLC to assign Lead/Lag status to the 2 pumps. The PLC shall contain programming that tracks pump number of starts and hours of operation. It will use values as it assigns Lead/Lag status to ensure even wear on pumps.
- 1.6.7 The SCADA panel shall have a 3-position selector switch which functions in a spring return to center from left position/Center position maintained/Right position maintained. The 3-position selector switch shall include an engraved legend: Control Mode, Reset/Auto/Floats
- 1.6.8 When the Control Mode switch is set to Auto:

- 1.6.7.1 The PLC will automatically sequence the Pumps in a Lead/Lag configuration (as described above).
- 1.6.7.2 Shall a lead pump fail (fail to start, overload, over-temp, VFD fault, VFD breaker off, or HOA switch set to anything other than Auto), then the associated pump is automatically removed from the pump sequence. The second pump will then become the lead pump. The failed pump will remain unavailable until fault is cleared.
- 1.6.7.3 Should a pump fail due to seal fail (as detected by associated MPR), the affected pump shall be assigned lag pump. The pump will still be available for operation to the PLC. The PLC will energize the Seal Fail light on the swing out panel for the associated pump.
- 1.6.7.4 Should a pump fail due to motor overtemp (as detected by associated MPR), the affected pump shall be assigned lag pump. The pump will not be able to run while the Overtemp fault is active. The PLC will energize the Motor Overtemp light on the swing out panel for the associated pump. Once the motor overtemp fault is removed by the associated MPR, the PLC will wait an additional 30 minutes before placing the pump into service. Should the pump fault due to motor overtemp 3 consecutive times the PLC will permanently remove the pump from service until it receives a signal from SCADA system that is okay to run pump.
- 1.6.7.5 Primary pump station operational control will be based on analog Wetwell Level Transducer (100-LT-0120). The PLC will continuously monitor water level and operate the pumps based on the level of water. As the water level starts to rise in the wetwell, the PLC will start the lead pump at the Minimum Pump Speed Setpoint when the level has exceeded the Lead Pump Start Setpoint for duration of 1 minute. The lead pump shall continue to run at speed until the water level drops below the Pumps Off Setpoint. (setpoints shown in Figure 1.6.12 below)
- 1.6.7.6 Should the water level continue to rise, the PLC shall incrementally increase the speed of the lead pump and efforts to maintain a stable flow in and out of the wetwell.
- 1.6.7.7 Once the lead pump is at maximum speed and the water level continues to rise to exceed the Lag Pump Start Setpoint for duration 1 minute, the PLC will start the lag pump. When both pumps are required to run the PLC will operate both pumps at the same speed. Both pumps shall continue to run until the water level in wet well falls below the Pumps off Setpoint.
- 1.6.7.8 The pumps shall remain off until the water exceeds the lead pump start setpoint.
- 1.6.9 When the Control Mode switch is set to Float:

- 1.6.9.1 The Float Mode backup system shall be hardwired such that Lead Pump is Pump No. 1, Lag Pump is Pump No. 2.
- 1.6.9.2 In float mode, the pumps will run at a constant speed.
- 1.6.9.3 When the water level in the wetwell rises high enough to activate the Lead Pump Start ball float switch (100-LSH-0113) for duration of 1 minute (on-delay timer relay), a signal will be sent to VFD to start Pump No. 1. A latching circuit shall allow the pump to continue to run until the water level drops to a level that deactivates the Pump Stop ball float switch (100-LSL-0114) for duration of 30 seconds (off-delay timer relay) causing a break in that latching circuit.
- 1.6.9.4 Should the water level continues right to the point activating the Lag Pump Start ball float switch (100-LSH-0112) for duration of 1 minute (on-delay timer relay), a signal will be sent to VFD to start Pump No. 2. A latching circuit shall allow the pump to continue to run until the water level drops to a level that deactivates the Pump Stop ball float switch (100-LSL-0114) for duration of 30 seconds (off-delay timer relay) causing a break in the latching circuit of both pumps.
- 1.6.10 The PLC shall check the validity of the primary level signal using float level signals as broad reference. If the primary and secondary level signals differ the system shall generate an alarm. If the PLC deems the primary level signal is invalid (or out of range, broken wire, etc.), it will then start and stop pumps based on digital input signals from the ball float switches.
- 1.6.11 The PLC will monitor and provide an alarm should the water level in the wetwell rise above High Level Alarm setpoint as monitored by wet well transducer or High Level Alarm ball float switch (100-LSHH-0111) is activated.
- 1.6.12 The PLC will monitor and provide an alarm should it receive a signal that either of the two pumps are running and the water level in the wetwell falls below Low Level Alarm setpoint as monitored by wet well transducer or the Low Level Alarm ball float switch (100-LSLL-0115) is deactivated.
- 1.6.13 Should the Low Level Alarm ball float switch be deactivated, pump operation shall be inhibited.
- 1.6.14 The Pump Station Control Panel shall monitor and provide alarm indications for ball float switches located in the Control structure (2-35). The PLC will signal alarm when the water level rises high enough to activate High-Level Warning (235-LSH-0132) ball float switch and High-Level Alarm (235-LSHH-0131) ball float switch. This is intended to provide notification of possible obstruction of the restriction plate located in control structure.

1.6.15 The Pump Station Control Panel shall monitor signal from the pump station Surge Protection Device (100-SPD-1) and provide notification for Station SPD Fail Alarm.

1.6.16 The Pump Station Control Panel shall monitor signals from the pump station Automatic Transfer Switch (100-ATS-1) and provide notifications for Station ATS - Primary Utility Available, Station ATS - On Primary Utility Power, Station ATS - Secondary Utility Available, Station ATS - On Secondary Utility Power.

1.6.17 Control of the Pumps shall be as shown in Figure 1.6.12 below:

FIGURE 1.6.12					
PLC Control – Station Wetwell			Float Mode Control – Station Wetwell		
Elev. (Feet)	Rising Level Action	Falling Level Action	Rising Level Action	Falling Level Action	Elev. (Feet)
698.00	High Level Alarm		High Level Alarm		698.00
697.50	Start Lag Pump		Start Lag Pump (No. 2)		697.50
696.50	Start Lead Pump		Start Lead Pump (No.1)		696.50
695.00		Stop Main Pumps		Stop Main Pumps	695.00
694.50		Low Level Alarm		Low Level Alarm	694.50
PLC Monitoring – Control Structure			PLC Monitoring – Control Structure		
707.00	High Level Alarm				
705.75	High Level Warning				

1.7. Related Sections

- 1.7.1 Section 16A – General Electrical Provisions.
- 1.7.2 Section 16B – Electrical Powers Systems Study
- 1.7.3 Section 16C – Basic Electrical Materials and Methods.
- 1.7.4 Section 16E – Packaged Engine Generator Systems.
- 1.7.5 Section 16F – Motor Control Center.

1.8. Reference

- 1.8.1 ISA Standards and Recommended Practices for Instrumentation and Control.

1.9. Warranty

- 1.9.1 Provide warranty from all defects of material and workmanship for the manufacturer's standard length of warranty or for 1 year from the date final acceptance, whichever is longer.

1.10. Deliver, Storage and Handling

1.10.1 Delivery, storage and handling shall be in accordance with the provisions of Section 1A.

1.11. Basis of Payment

1.11.1 Supervisory, Control and Data Acquisition (SCADA) equipment and programming will be paid for under the contract lump sum price for PUMP STATION CONTROL EQUIPMENT.

1.11.2 Refer to 1.22 of Section 1A for Method of Measurement.

1.12. SCADA System I/O List

1.12.1 PLC (Micrologix 1400) Hardwired I/O Points:

MICROLOGIX 1400	
ADDR	DESCRIPTION
I:0/0	Power OK
I:0/1	Pump No. 1 In Auto
I:0/2	Pump No. 1 in Hand
I:0/3	Pump No. 1 Running
I:0/4	Pump No. 1 VFD Fault
I:0/5	Pump No. 1 VFD Enclosure Intrusion Alarm
I:0/6	Pump No. 1 Seal Fail
I:0/7	Pump No. 1 Motor Overtemp
I:0/8	Pump No. 2 In Auto
I:0/9	Pump No. 2 in Hand
I:0/10	Pump No. 2 Running
I:0/11	Pump No. 2 VFD Fault
I:0/12	Pump No. 2 VFD Enclosure Intrusion Alarm
I:0/13	Pump No. 2 Seal Fail
I:0/14	Pump No. 2 Motor Overtemp
I:0/15	Pump No. 1 Lead
I:0/17	Pump No. 2 Lead
I:0/18	Pump Station Control Enclosure Intrusion Alarm
I:0/19	Float Mode
O:0/0	Pump No. 1 Call to Run
O:0/1	Pump No. 1 Running Light
O:0/2	Pump No. 1 Fault light
O:0/3	Pump No. 2 Call to Run
O:0/4	Pump No. 2 Running Light
O:0/5	Pump No. 2 Fault light
O:0/6	Wetwell High Level Alarm Light
O:0/7	Wetwell Low Level Alarm Light
O:0/8	Not used
O:0/9	Not used
O:0/10	Alarm Beacon
O:0/11	Float Mode (Back up) Reset
AI:0/0	Wetwell Level Feet
AI:0/1	Not used
AI:0/2	Not used

AI:0/3	Not used
AO:0/0	Pump No. 1 Speed Reference
AO:0/1	Pump No. 2 Speed Reference

1.12.2 PLC (Micrologix 1400 Expansion) Hardwired I/O Points:

MICROLOGIX 1400 Expansion Digital Input Card	
ADDR	DESCRIPTION
I:1/0	Wetwell Float Switch 1 High High
I:1/1	Wetwell Float Switch 2 Lag Start
I:1/2	Wetwell Float Switch 3 Lead Start
I:1/3	Wetwell Float Switch 4 Pump Stop(all)
I:1/4	Wetwell Float Switch 5 Low Low (cutout)
I:1/5	Wetwell Intrusion Alarm
I:1/6	Control Structure High Level Alarm Float Switch
I:1/7	Control Structure High Level Warning Float Switch
I:1/8	Pump Station Control Enclosure SPD Fail
I:1/9	Pump Station Control Enclosure UPS Fail
I:1/10	Pump Station Control Enclosure On UPS Power
I:1/11	Pump No. 1 VFD In Local
I:1/12	Pump No. 1 VFD In Remote
I:1/13	Pump No. 2 VFD In Local
I:1/14	Pump No. 2 VFD In Remote
I:1/15	Station SPD No. 1 Fail Alarm
I:2/0	Station ATS - Primary Utility Available
I:2/1	Station ATS – On Primary Utility Power
I:2/2	Station SPD No. 2 Fail Alarm
I:2/3	Station ATS - Secondary Utility Available
I:2/4	Station ATS – On Secondary Utility Power
I:2/5	Spare
I:2/6	Spare
I:2/7	Spare

1.12.3 SCADA data via MDS EntraNet extended range IP/Ethernet Radio:

1.12.1.1 From Station Control Enclosure:

- 1) Wetwell Ball Float Status (x5).
- 2) Float Mode Status.
- 3) Wetwell Level
- 4) Control Structure Ball Float Status (x2).
- 5) Pump in Auto (x2).
- 6) Pump in Hand (x2).
- 7) Pump Running (x2).
- 8) Pump Fail to Run (x2).
- 9) Pump Seal Fail (x2).
- 10) Pump Motor Overtemp (x2).
- 11) VFD Fault (x2).
- 12) Pump Lead Status.
- 13) Level Setpoints (x5).

- 14) Station SPD Fail (x2).
- 15) Enclosure SPD Fail.
- 16) Enclosure Power Status.
- 17) Intrusion Alarm (x4).
- 18) ATS – Primary Power Available.
- 19) ATS – On Primary Power.
- 20) ATS – Secondary Power Available.
- 21) ATS – On Secondary Power.
- 22) UPS – Fail.
- 23) UPS – On Battery Power

1.13. System Description

1.13.1 The following narrative points are not intended to be a comprehensive list of the system's features, only summarize the major functions of the system. The SCADA system specified herein shall perform the following generalized functions:

- a) Perform real-time process control, including proportional integral derivative control action, sequencing, process calculations, etc.
- b) Collect and store accurate, reliable operating information for present and future uses.
- c) Assist plant operating personnel by noting and communicating off-normal operating conditions and equipment failures.
- d) Accumulate and store equipment running times for use in preventative maintenance.
- e) Provide color graphic displays and summary reports for use by the plant operating and supervisory personnel.
- f) Provide trending for all analog values.
- g) Provide control system monitoring and diagnostics.

1.13.2 The system is based on the SCADA system architecture diagram shown on Drawings. The system shall include:

- a) Programmable Logic Controllers (PLC's) with local input/output (I/O), network communications and other capabilities as specified herein and shown on the SCADA system architecture diagram.
- b) HMI's shall be linked to the PLC's over an Ethernet/IP based local area network (LAN) via managed Ethernet Switch.
- c) Communications with Naperville Water Service Center.

- 1.13.3 All process control functions including PID, calculations, sequencing, set-points, timing, etc., shall reside in the PLC. The real-time database, report generation, graphic screens, program development, set-point modification, data archiving, etc., shall be done by the HMI computer.

2. PRODUCTS:

2.1 Process Control, Network, and field devices:

2.1.1 Equipment listed in the table below shall conform to the instrumentation standards described in the paragraphs following the table:

- a) Station Control Enclosure (Type A).
- b) VFD Enclosure (Type B).
- c) Level Instrumentation (L Series).
- d) Miscellaneous Instrumentation (M Series).
- e) Pressure Instrumentation (P Series).
- f) Temperature Instrumentation (T Series).

Tag	Device Type	Location/Description	Additional Information
100-CP-1	Type A	Pump Station Control Enclosure	NEMA 4X
100-ZS-0100	Type M	Pump Station Control Enclosure Intrusion Switch	NEMA 7
100-ANT-1	Type M	Pump Station Antenna	--
100-SPD-1	Type A	Pump Station Surge Protection Device	--
100-SPD-2	Type A	Pump Station Surge Protection Device	--
100-ATS-1	Type A	Pump Station Automatic Transfer Switch	--
100-VFD-0101	Type B	Pump No. 1 VFD Enclosure	NEMA 4X
100-ZS-0101	Type M	Pump No. 1 VFD Enclosure Intrusion Switch	--
100-VFD-0102	Type B	Pump No. 2 VFD Enclosure	NEMA 4X
100-ZS-0102	Type M	Pump No. 2 VFD Enclosure Intrusion Switch	--
100-SBX-1	Type X	Pump No. 1 Splice Box	NEMA 7
100-SBX-2	Type X	Pump No. 2 Splice Box	NEMA 7
100-SBX-3	Type X	Pump Station Wetwell Instrumentation Splice Box	NEMA 7
100-ZS-0103	Type M	Pump Station Wetwell Intrusion Switch	NEMA 7
100-LSHH-0111	Type C	Pump Station Wetwell High-High Level Ball Float Switch	NEMA 7
100-LSH-0111	Type C	Pump Station Wetwell Lag Pump Start Ball Float Switch	NEMA 7
100-LSH-0111	Type C	Pump Station Wetwell Lead Pump Start Ball Float Switch	NEMA 7
100-LSL-0114	Type C	Pump Station Wetwell Pump Stop Ball Float Switch	NEMA 7
100-LSLL-0115	Type C	Pump Station Wetwell Low-Low Level Ball Float Switch	NEMA 7
100-LT-0120	Type C	Pump Station Wetwell Submersible Level Transmitter	NEMA 7
235-LSHH-0131	Type C	Control Structure High-High Level Ball Float Switch	NEMA 7
235-LSH-0132	Type C	Control Structure High Level Ball Float Switch	NEMA 7
See Figure 1.6.12 for float elevations.			

2.2 Pump Station Control Enclosure (Type A):

- 2.2.1 The control enclosure shall house a programmable logic controllers (PLC) which shall be programmed for automatic control and monitoring of the all operations at the Pump Station. The PLC shall control operation of Pump No. 1 and Pump No. 2 for the removal of stormwater from the North Aurora Road underpass. The PLC shall be configured to communicate over wireless network 900MHz radio modem.
- 2.2.2 The control enclosure shall be NEMA 4X, 316SS, wall mounted, dead-front panel, lockable enclosure, arranged for cable and/or conduit bottom entry as required. The panel shall have a full piano hinge door(s) and a 3-point latch with a locking handle. The handle shall have a cylinder type lock keyed to match owner requirements. Panel design shall allow easy access to inner swing out panel with mounted operators and indicators. Swing out panel shall be mounted in a manner to maintain enclosure NEMA 4X integrity and open to allow easy access to all internal wiring and appurtenances.
- 2.2.3 The control enclosure shall include LED lighting kit activated by door switches and enclosure intrusion device wired to PLC.
- 2.2.4 The Control enclosure shall include thermostatically controlled space heater set up to operate within a range to curb condensation within control enclosure. Provide heat calculations for enclosure and equip with thermostatically controlled air conditioning/ventilation fan including air filters as required. All climate control devices shall be installed in a manner that maintains enclosures NEMA 4X integrity. Additional devices as shown on Drawings.
- 2.2.5 Nameplates shall be as specified in Section 16C. Nameplates for all enclosures shall be provided and mounted to main door in a manner that maintains enclosure NEMA 4X integrity. Nameplates for all devices located on swing out panel shall be provided. All control device on back panel shall be identified with functional nameplates that match device ID's on Drawings.
- 2.2.6 The control enclosure front swing out panel shall include 120V LED, 30.5mm, NEMA 4X pilot lights for Power OK, Float Mode Active, Pump No. 1 Running I, Pump No. 2 Running, Pump No. 1 VFD Fault, Pump No. 2 VFD Fault t, Pump No. 1 Seal Fail, Pump No. 2 Seal Fail, Pump No. 1 Motor Overtemp, Pump No. 2 Motor Overtemp, Wetwell High Level Alarm, Wetwell Lag Pump Start, Wetwell Lead Pump Start, Wetwell Pump Stop, Wetwell Low Level Alarm, Control Structure High Level Alarm and Control Structure High Level Warning.
- 2.2.7 The control enclosure front swing out panel shall include 30.5mm panel operators for Pump No. 1 HOA, Pump No. 1 Speed Potentiometer, Pump No. 2 HOA, Pump No. 2 Speed Potentiometer, Pump No.1 Reset, Pump No. 2 Reset, Control Mode: Reset/Auto/Floats, and Lead Pump Select: Pump1/Auto/Pump 2.

- 2.2.8 The control enclosure front swing out panel shall include the following devices; Wetwell Level Display Unit, Pump No.1 Elapsed Time Meter (ETM), Pump No.2 Elapsed Time Meter (ETM), and Graceport convenience outlet.
- 2.2.9 The control enclosure back panel shall house control relays, control timer relays, pump alternating relays, surge protective device, line filter, circuit protection, Ethernet radio modem, unmanaged Ethernet switch, intrinsically safe barriers which shall be wired for PLC control/ monitoring using level transducer or ball floats. Hardwired relay logic and ball floats that shall serve as a simultaneous backup system to the PLC for critical functions at the Pump Station.
- 2.2.10 The control enclosure back panel shall include 25% spares and white-space for future equipment/devices.
- 2.2.11 The enclosure shall be UL rated and conform to all applicable standards of NEMA and ANSI and shall be complete with float type water level control systems integrated as indicated on the Drawings and as specified.
- 2.2.12 Wiring shall be brought to terminal strips within the enclosure and 25 percent spare terminals shall be provided. The identification of terminals shall conform to the schematic diagrams and shall consist of slip-on heat shrink labels as manufactured by Brady, Thomas and Betts, or Hellermannntyton. Terminals and devices that are provided for intrinsically safe circuits shall be segregated from all other circuits/devices as described elsewhere.
- 2.2.13 The float control system circuit shall be as specified under Float Control System. The float relays shall be intrinsically safe.
- 2.2.14 Intrinsically Safe circuits, wiring, mounting and installation shall be in accordance with NEC Article 504 (latest edition).
- 2.3 Operator Devices and Control Station Components:
 - 2.3.1 Manufacturer:
 - a) Allen Bradley 800T/800H.
 - b) Square D Class 9001, Type K.
 - c) Siemens, Class 52
 - 2.3.2 Construction:
 - a) Heavy duty.
 - b) Watertight.
 - c) Oil-tight.
 - d) Flush panel mounting.
 - e) 30.5mm.
 - f) NEMA 4X.
 - 2.3.3 Pushbuttons:

- a) Flush head unless specified elsewhere.
- b) Contact Blocks:
 - 1) Double break silver contacts.
 - 2) Ac Ratings: 7,200 va make, 720 va break.
 - 3) Single pole, double throw or double pole, single throw.
 - 4) Up to six tandem blocks.
- c) Momentary contact unless specified elsewhere.
- d) Non-illuminated.
- e) Legend plates, as required, for type of operation or as specified elsewhere.

2.3.4 Selector Switches:

- a) Maintained position.
 - 1) Exception. The Control Mode 3-position selector switch shall include spring return to center from the left position. Center position shall be maintained, and the right position shall be maintained.
- b) Contact Blocks:
 - 1) Double break silver contacts.
 - 2) Ac Ratings: 7,200 va make, 720 va break.
 - 3) Contact configuration as specified.
 - 4) Up to six tandem blocks.
- c) Number of positions as specified elsewhere.
- d) Knob Lever Style unless specified elsewhere.
- e) Legend plates as required for type of operation or specified elsewhere.

2.3.5 Pilot Lights:

- a) LED Type.
- b) Transformer type.
- c) Colored lens as specified elsewhere.
- d) Interchangeable lenses.
- e) Transformer rated for 120Vac
- f) Push to test.
- g) Legend plates as specified elsewhere.

2.4 Ball Float Switches

2.5.1 Manufacturer:

- a) Flygt ENM-10Ex.
- b) No Substitutes Allowed.

- 2.5.2 Float: Conductive polypropylene/carbon black.
 - 2.5.3 Provide sufficient length of oil resistant jacketed cable for direct connection to junction box without splice.
 - 2.5.4 For Class 1, Divisions 1 or 2 hazardous (classified) locations, provide intrinsically safe relays in corresponding control panel.
 - 2.5.5 The float switches shall be mounted to a 1 pipe utilizing all 316 stainless steel float switch mounting hardware and secured in place by 316 stainless steel mounting clamps. See M Drawings for mounting details.
 - 2.5.6 Switch: non-mercury SPDT reed type 1A@150Vac/Vdc non-inductive.
 - 2.5.7 Float shall have a 3-year factory warranty minimum. Warranty shall commence from the Final Acceptance of the Pump Station.
- 2.5 Submersible Level Element and Transmitter
- 2.7.1 Manufacturer:
 - a) Ametek 575.
 - b) No Substitutes Allowed.
 - 2.7.2 Transducer: Level transmitter consisting of variable capacitance, hydrostatic head-pressure sensing assembly enclosed in submersible Type 316 stainless steel housing with 316L SS or ceramic pressure sensing diaphragm, special cable containing 1/8 in. breather tube and signal wiring, and sealed breather bag and transmitter assembly.
 - 2.7.3 Provide intrinsically safe barriers when used in hazardous areas.
 - 2.7.4 Transducer:
 - a) Designed for continuous submergence.
 - b) Low movement 316L SS (or ceramic) diaphragm.
 - c) Protective, weighted, plate kit for diaphragm.
 - d) Oil-filled.
 - e) Barometrically compensated
 - f) Temperature compensated.
 - g) Variable capacitance type internal sensing element.
 - 2.7.5 Cable Assembly:
 - a) 1/2 in. outside dia.
 - b) Positive seal where entering transducer housing.
 - c) Contains 1/8 in. breather tube.
 - d) Provide sufficient length to accommodate installation.
 - 2.7.6 Junction Box and Breather Assembly:

- a) Desiccant systems not allowed.
- b) 2-wire, 4-20 mAdc.
- c) Fused.
- d) Output loop resistance 0-750 ohms.
- e) Span and off-set adjustable.
- f) Active transient protection.
- g) Repeatability: $\pm 0.25\%$.
- h) Accuracy: $\pm 0.25\%$ of full scale.
- i) Loop powered.

2.7.7 Measurement Requirements:

- a) Range of instrument shall be 0-11.5ft. (0-5psi) for discharge chamber.
- b) Range of instrument shall be 0-23ft. (0-10psi) for wet well and inlet chamber.

2.6 Electronic Process Indicator:

2.9.1 Manufacturer:

- a) Precision Digital.
- b) Red Lion, PAX.
- c) Endress + Hauser.

2.9.2 120Vac

2.9.3 4 ½ digit LED indicator

2.9.4 4-20mAdc Input.

2.9.5 Loop power - device.

2.9.6 4 contact relay output module.

2.9.7 Enclosure shall reflect same NEMA rating as panel it is located in.

2.7 Intrinsically Safe Relay:

2.10.1. Manufacturer:

- a) P.R. Electronics 5104B (discrete), and 5202B (analog).
- b) Pepperl+Fuchs
- c) Phoenix Contact.

2.10.2. Input/Output:

- a) (discrete) pulse/relay contact
- b) (analog) 4-20mA/4-20mA

- 2.10.3. Protection: IP20.
- 2.10.4. Mounting: DIN rail.
- 2.10.5. Operating temperature: -20°C to 60°C.
- 2.10.6. Operating humidity: <95% non-condensing.
- 2.10.7. Non-zener diode operation.
- 2.10.8. UL-913, UL-508 Listed.

2.8 Line Filter:

2.11.1 Manufacturer:

- a) Emerson Islatrol IE Series.
- b) SOLA STFE Elite Series.
- c) Eaton Aegis Series.

2.11.2 UL 1449 Surge Voltage Rating:

- a) 120V Normal Mode: 330 Volts.
- b) 120V Common Mode: 400 Volts.

2.11.3 Peak Surge Current Capability (8 x 20 μ s)

- a) 120V Line to Neutral: 15,000 Amps.
- b) Line to Ground: 15,000 Amps.
- c) Neutral to Ground: 15,000 Amps.
- d) Total: 45,000 Amps.

2.11.4 Frequency Response (Forward-Reverse)

- a) Normal Mode: 100 kHz to 50MHz - 90 dBMin.
- b) Common Mode: 5MHz to 50MHz - 60 dBMin.

2.11.5 Typical Category A Ringwave (6kV, 200A, 100kHz) Normal Mode/Common Mode

- a) 3 Amp: 1 V/300 V
- b) 5 Amp: 0.7 V/292 V
- c) 10 Amp: 0.7 V/300 V
- d) 20 Amp: 0.7 V/300 V

2.11.6 Typical Category B Ringwave (6kV, 500A, 100kHz) Normal Mode/Common Mode

- a) 3 Amp: 178 V/300 V
- b) 5 Amp: 162 V/291 V

- c) 10 Amp: 153 V/300 V
- d) 20 Amp: 200 V/300 V

2.11.7 MCOV

- a) 120 Volt: 150 VRMS
- b) 240 Volt: 275 VRMS
- c) Line Frequency: 47 - 63 Hz
- d) Connection: Terminal
- e) Mounting Type: DIN/Flange
- f) Weight: < 3 lbs

2.11.8 Response Time

- a) Normal Mode: < 0.5 ns
- b) Common Mode: < 5 ns
- c) Operating Temperature: -40°C to +45°C
Derate Linearl to 60% at +70°C
- d) Operating Humidity: 0% to 95%

2.11.9 Other Features:

- a) LED status indication and form C contact for remote indication.
- b) DIN mountable enclosure.
- c) UL 1449, 1283, CUL recognized, CE.
- d) Active tracking filtration.
- e) 10 year warranty. Warranty shall commence from the Final Acceptance of the Pump Station.

2.9 Enclosure Thermostat:

2.12.1 Manufacturer:

- a) Hoffman.
- b) Honeywell.
- c) Stego Inc.

2.12.2 Features:

- a) One normally open and one normally closed contact.
- b) 32°F to 142°F adjustability.
- c) Bimetallic sensor element.
- d) DIN mountable.

2.10 Enclosure Fan:

2.13.1 Manufacturer:

- a) Hoffman.
- b) Dayton.

c) Rittal.

2.13.2 Features:

- a) Size for enclosure heat dissipation requirements.
- b) Includes filters and grille.
- c) Include one additional filter.
- d) Include exhaust grille.

2.11 Uninterruptible Power Supply (UPS):

2.14.1 Manufacturer:

- a) Allen Bradley 1609
- b) APC Smart-UPS
- c) Emerson

2.14.2 Uninterruptible Power Supply (UPS) System shall be provided for the SCADA and instrumentation systems as shown on the Drawings and specified herein. The UPS shall sustain operation during short-term power failures, and shall provide power for an orderly shutdown to prevent the loss of data during power failure and shall provide full isolation between the control system and the plant power system.

2.14.3 Provide true on-line non switching uninterruptible power supply (UPS). Double power conversion on-line operation including rectifier and inverter, constantly conditioned AC output.

2.14.4 Provide make-before-break automatically operated bypass contactor to bypass UPS to allow operation of system controls in event of UPS failure.

2.14.5 Each system shall consist of a static dc to ac sine wave inverter, a battery charger, sealed batteries, a monitor and transfer switch, and accessories as listed below.

2.14.6 Each system shall operate on a 120-volt, 60-Hz ac branch circuit. The input ac circuit shall supply energy to the battery charger which shall supply energy to the inverter as well as to the battery to maintain its charge. The output of the inverter shall supply energy to the load. If the input ac circuit is interrupted, the inverter shall continue to supply energy to the load without interruption, drawing power from the battery. If the input ac circuit is restored prior to discharge of the battery, the charger shall resume the supply of energy to the inverter and shall restore the battery to full charge. In the event of malfunction of the battery charger, battery or inverter that results in interruption of the output from the inverter, the monitor shall detect this condition and shall automatically transfer the load to the system's ac input circuit within 25 milliseconds. After the malfunction is corrected, the load shall be retransferred to the inverter manually.

2.14.7 System output voltage shall be regulated within plus or minus 5 percent of 120 volts and frequency stability shall be plus or minus 1/2 percent of 60-Hz.

The output characteristic shall be sinusoidal with not more than 5 percent total harmonic distortion at full load with input ac circuit at 120 volts. For a 20 percent instantaneous load change, voltage overshoot or undershoot shall be not more than plus or minus 10 percent. For a 10 to 90 percent load change, recovery time shall be not longer than 100 milliseconds.

- 2.14.8 The UPS system shall have an efficiency of at least 90% when operated from AC line.
 - 2.14.9 UPS shall supply power to PLC's, HMI's, Ethernet Switch, DC power supplies, field instruments, and other low voltage control devices as specified and as shown on Drawings and Plans.
 - 2.14.10 UPS shall have enough capacity to power these devices for a period of 30 minutes after the utility power has failed. Provide with extended battery module(s) to meet this requirement.
 - 2.14.11 Size UPS for 125% of connected electrical load with 750VA as a minimum UPS size.
 - a) The System Integrator shall provide sizing data on the UPS listing all loads and calculations required for sizing the UPS system, and include with submittal.
 - 2.14.12 Rack Mount Form Factor shall be used unless stated otherwise on Drawings or Specifications.
 - 2.14.13 UPS shall be located in network wall-mount Rack (NET-1). Additional batteries, if required, shall be mounted internal to the wall-mount rack.
- 2.12 DC Power Supplies:
- 2.15.1 Manufacturer:
 - a) Sola/Hevi-Duty
 - b) Phoenix Contact Quint-PS
 - c) Eaton
 - 2.15.2 General
 - a) Power supply shall be fully enclosed, and provide screw terminations. All wiring points and plug connections shall be touch safe with no live voltages that can make contact with a misplaced finger in accordance with IEC 529. Housing shall be at least IP20.
 - b) Power Supplies shall have an efficiency of at least 80%.
 - c) The power shall have an MTBF (Mean Time Between Failures) greater than 500,000 hours according to IEC 1709.
 - d) The power supply shall be able to withstand shock of 30G in all space directions according to IEC 68-2-27 and vibration up to 2.3G 90 min. (<15hz, amplitude = +/-2.5mm/15-150hz) according to IEC 68-2-6.

- e) Power supplies shall be UL-508A listed to allow the use of the power supply at full rated output amperage with no de-rating.

2.15.3 Mounting

- a) All power supplies shall have integral metal mounting foot to attach to 35mm DIN-rail conforming to DIN EN50022.

2.15.4 Wire Connections

- a) Attach wires to the power supplies by means of a cable-clamping terminal block activated by a screw. Connections shall be gas-tight, and the terminal block shall be fabricated with non-ferrous, non-corrosive materials.
- b) Wire connection for currents less than 20A shall use pluggable terminals on both input and output ends.
- c) Pluggable terminals shall accept wire sizes 24 through 14 AWG.

2.15.5 Equipment

- a) Nominal current rating to be based on an operating temperature of 60°C or higher.
- b) Power supplies shall have a visible DC Power OK indicator. This indicator will flash when the output drops below 10% of the adjusted output voltage.
- c) Ambient temperature range for operation shall be at least -25°C to +70°C
- d) Residual ripple shall not exceed 100 mV peak to peak at nominal current values.
- e) Integral surge suppression shall be incorporated into the power supply.
- f) Power supplies shall conform to CE electromagnetic compatibility as described in EN61000-6-2 and EN 50081-2.
- g) Power supplies shall have means of limiting DC current in case of short circuit or an overload and shall automatically reset themselves when the fault is corrected.
- h) Power supplies when wired in parallel will not require external circuitry.
- i) Power supplies shall have a voltage monitoring relay contact and signaling output.
- j) Input must auto-range between 85 to 264VAC and 90 to 350VDC for 1 phase power supplies with no manual intervention.
- k) Power supplies shall have a power factor of at least 0.6.

2.13 Programmable Logic Controller Hardware:

2.16.1 Programmable Logic Controller Hardware

2.16.2 Manufacturer:

- a) Allen Bradley Micro 1400.
- b) No Substitutes Allowed.

- 2.16.3 A Programmable Logic Controller (PLC) system shall be furnished and shall be programmed to operate all functions specified herein. All analog and discrete inputs and outputs shall be provided as necessary. The logic program shall be of universal type architecture and shall not be of a proprietary language. In addition, the programmable controller shall be capable of communication with Naperville Water Service Center via wireless Ethernet modem. The programmable controller equipment supplier shall be responsible for coordinating and providing a complete and properly functioning software package for the control and operation of the equipment as specified herein.
- 2.16.4 The PLC shall be equipped with sufficient memory and I/O capacity to handle control functions of present system plus 20% spare memory and 10% spare I/O minimum.
- 2.16.5 The System Integrator shall furnish the Pump Station operational program. A CD copy and printout of the PLC control program shall be furnished to owner at the time of start-up. Disk and printed copy of the operating program shall be maintained on the file with the System Integrator.
- a) PLC shall be programmed using RSLogix (latest edition).
 - b) Program shall be fully commented including each page and each rung with detailed description of the logic performed.
- 2.16.6 Chassis:
- a) NA
- 2.16.7 Power Supply:
- a) NA
- 2.16.8 Processor:
- a) 1766-L32AWAA.
 - b) Include 1766-MM1 Memory Module.
 - c) Provide orderly shutdown on power failure, saving register contents with automatic restart on power restoration.
- 2.16.9 Input/Output Modules:
- a) Digital Input: 1762-IA8.
 - b) Relay Output: 1762-OA8.
 - c) Analog Input: 1762-IF4.
 - d) Analog Output: 1762-OF4.
- 2.16.10 Each relay output shall be individually protected with properly sized MOV, and interposing relay.

2.16.11 Wiring and Termination System:

- a) Wiring of PLC I/O shall be wired to individual terminal blocks.
- b) Provide sufficient terminal blocks to accommodate active I/O points, spares, and future expansion.

2.16.12 Manufacturer part numbers listed above reflect information known at time of design and shall be independently researched and verified for availability with latest version available prior to submittal.

2.14 Unmanaged Data Switch:

2.17.1 Manufacturer:

- a) N-Tron 300 Series.
- b) Phoenix Contact.
- c) MOXA.

2.17.2 Features:

- a) Users/Nodes: Unlimited
- b) Port Assignable DMZ Capability
- c) Shall support Packet filtering.
- d) Shall support Network Address translation.
- e) Shall support protection against viruses.
- f) Firewall Throughput: Up to 300 Mbps
- g) 3DES/AES VPN Throughput: Up to 170 Mbps
- h) IPSec VPN Peers 250
- i) Concurrent Sessions: 9,000
- j) Integrated Network Ports: 5-10/100 2 Gigabit Ethernet.

2.17.3 Technical Specifications:

- a) Memory: 256MB
- b) System Flash: 64MB
- c) System Bus: Multi-bus Architecture

2.17.4 Operating Ranges:

- a) Temperature -40° to 70°C
- b) Relative Humidity 5 to 95 percent non-condensing
- c) Altitude 0 to 9840 ft (3000 m)
- d) Shock 1.14 m/sec (45 in./sec) 1/2 sine input
- e) Vibration 0.41 Grms² (3 to 500 Hz) random input
- f) Acoustic Noise 60 dBa max

2.17.5 Input Power

- g) Range Line Voltage 100 V---240 VAC
- h) Normal Line Voltage 100 V---240 VAC
- i) Current 3 A
- j) Frequency 47 to 63 Hz, single phase

2.15 Mobile Gateway:

2.18.1 Manufacturer:

- a) GE MDS entraNET modem.
- b) No Substitutes Allowed.

2.18.2 Extended Range IP/Ethernet.

2.18.3 Provide antenna and cable for mounting to exterior of panel.

2.18.4 Hardware Interfaces:

- a) 1 10/100 Base-T RJ45 Ethernet
- b) 2 RS-232 serial
- c) 1 Digital I/O
- d) 1 USB 2.0
- e) 1 TNC Antenna

2.18.5 Power: 9-30VDC.

2.18.6 Operating Temperature: -40°C to 70°C.

2.18.7 90%RH @60°C.

2.18.8 Fixed remote antenna.

- a) Yagi Directional Antenna.
- b) Mount on site light pole; 20 feet above grade.
- c) PolyPhaser Type N F/F Bulkhead Coaxial Surge Protector (IS-B50LN-C2)

2.16 INTRUSION PROXIMITY SWITCHES

2.18.1 Manufacturer:

- a) Sentrol 2750.
- b) GE Interlogix.
- c) ADT.

2.18.2 Proximity switch for monitoring of building or control panel door position.

2.18.3 Solid State Hall Effect sensor with magnetic actuating bar.

2.18.4 Switch shall be industrial grade.

2.18.5 Form C contact, 30Vac, 0.25A max.

2.18.6 Provide intrinsically safe barrier when installed in hazardous locations.

2.18.7 Provide interposing relay to interface with 120Vac PLC input.

2.17 Control Relays:

2.22.1 Manufacturer:

- a) Allen Bradley.
- b) Potter and Brumfield.
- c) Idec.

2.22.2 Operating Data:

- a) Pickup Time: 13 ms maximum.
- b) Dropout Time: 10 ms maximum.
- c) Operating Temperature: -45°F to 150°F.

2.22.3 ac Coil:

- a) 120Vac.
- b) Continuous rated.
- c) 3.5va inrush maximum.
- d) 1.2va sealed, maximum.
- e) 50-60 Hz.
- f) Light to indicate energization.
- g) Minimum Dropout Voltage: 10% of coil rated voltage.

2.22.4 dc Coil:

- a) 24Vdc.
- b) Continuous rated.
- c) Light to indicate energization.
- d) Minimum Coil Resistance: 24Vdc: 450 Ω .

2.22.5 Contacts:

- a) Gold flashed fine silver, gold diffused for 1 amp or less resistive load.
- b) Silver cadmium oxide.
- c) 3 form C.
- d) 300 vac.

e) 10 amp (B300) make, 1.5 amp break, (inductive).

2.22.6 Rated at 10 million operations.

2.22.7 11 pin, square socket (shall be same manufacturer as relay).

2.22.8 DIN rail mountable.

2.22.9 Enclosed and protected by polycarbonate cover.

2.22.10 Provide relay-retaining clips.

2.18 Interval/Duration Timer (Rear of Panel):

2.23.1 Manufacturer:

- a) Idec
- b) Potter and Brumfield, CN series.
- c) Eagle Signal DM 100 series.

2.23.2 Mounting: Plug-in with dust tight cover.

2.23.3 Type: Integrated circuit.

2.23.4 Range: 0.5 sec to 99 min. Field selectable.

2.23.5 Contacts: 2 DPDT contacts rated 10 amp, 120 vac.

2.23.6 Power: 120Vac, 60 Hz.

2.19 Terminal Blocks:

2.24.1 Manufacturer:

- a) Phoenix Contact.
- b) Weidmuller.

2.24.2 300 v rating for 120 v circuits and below, 600 v rating for 480 v circuits.

2.24.3 Clamping screw type.

2.24.4 Isolating end caps for each terminal.

2.24.5 Identification on both terminals.

2.24.6 Clip-mounted on DIN rail.

2.24.7 Accept AWG 12 to 22.

2.24.8 Feed-Through Terminals:

- a) 20 Amp rating

2.24.9 Switched Terminals:

- a) Knife disconnect with test sockets.
- b) 10 Amp rating.

2.24.10 Fused Terminals:

- a) Hinged fuse removal/disconnect.
- b) 10 Amp rating.
- c) Include blown fuse indication.

2.20 Power and Data Port:

2.25.1 Manufacturer:

- a) GracePort
- b) Automation Direct ZP-PGA-32-201
- c) Hubble

2.25.2 General

- a) One Ethernet port.
- b) 120Vac GFCI Receptacle.
- c) Bulkhead style.
- d) Nema 4X.
- e) Mounted on SCADA Panel.
- f) Wired to Ethernet switch.

2.21 Backup Float System:

2.28.1. The float system shall function as described on Drawings and as described under paragraph 1.6.

2.28.2. The float control system shall include floats, interconnecting integral cable of length required, conduit, splice box and controls for the functions indicated in drawings and plans.

2.28.3. The system shall be intrinsically safe for installation in the wet well.

2.28.4. The system shall be complete with control logic to provide the contacts for control and alarm functions indicated. Intrinsically safe relays and associated wiring shall be located in pump station control enclosure.

2.28.5. The system shall be complete with all required mounting hardware and accessories.

2.28.6. The float system shall be complete with mounting arrangement with a stilling well of adequate size, as shown in drawing details to minimize collection of debris and calm liquid disturbances. The mounting arrangement shall permit easy removal of the floats and easy realignment when replaced.

2.28.7. When float arrangement is such that there is a possibility of float switch entanglement with an adjacent float switch, then two float trees with stilling well assemblies shall be provided - staggering the switches as required to alleviate float switch entanglement.

2.22 PLC Program Development and Software:

2.34.1. 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.

2.34.2. ControlLogix PLC's shall be programmed using Allen-Bradley RSLogix (latest version compatible with all software and hardware), and be fully commented.

2.34.3. 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.

2.23 PLC Program Development Guidelines:

2.35.1. Owner will provide sample PLC logic upon request of the Contractor. Sample logic shall be used as the basis for programming development on this project.

2.35.2. 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.

2.35.3. Unless specified otherwise, procedure for control power fail restart for equipment shall be as follows:

- a) Equipment shall shut down on loss of control power (if UPS has been exhausted).
- b) Upon restoration of power, previously running equipment shall be restarted using same sequence of startup used for Auto control.
- c) Prior to Restart, Auxiliary equipment shall be placed in Off position.
- d) Equipment Restart shall be sequenced through use of timer functions to prevent simultaneous restart.

2.35.4. 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.

- 2.35.5. 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.
- 2.35.6. Setting of Off-Normal status bits shall cause status conditions to be displayed and/or alarmed at HMI.
- 2.35.7. Resetting Off-Normal status bits shall cause status conditions displayed and/or alarmed at HMI to be cleared.
- 2.35.8. 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.
- 2.35.9. Setting of Motor Failed status bits:
- a) If motor is required to run via PLC control (MCC Hand/Off/Auto selector switch in Auto),
 - b) And if absence of Motor Running status causes Motor Fail watchdog timer to time out,
 - c) Then Motor Failed status bit shall be set.
- 2.35.10. 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.
- 2.35.11. Resetting of Motor Failed status bits:
- a) If MCC Hand/Off/Auto selector switch is in Auto position,
 - b) And if failure condition is abated,
 - c) Then Motor Failed status bit shall be reset.
- 2.35.12. 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.
- 2.35.13. Adjustable filtering of analog inputs shall eliminate process upsets due to noise. Filtering shall be by running-average method.

- 2.35.14. 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.
- 2.35.15. PLC input coils shall be configured as non-latched unless specified otherwise.
- 2.35.16. PLC output contacts shall be configured as maintained unless specified otherwise.
- 2.35.17. The following are PLC generated alarms or conditions (specific to this project) that are extrapolated based on field I/O conditions:
- a) The PLC shall monitor water level indications (as measured by 100-LT-0120) and compare with water level signals given by ball float switches. Should water level indicated by transducer not follow within the prescribed range for the well or not match water levels indicated by ball float switches, the PLC will send Wetwell Level Sensor Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Wetwell Level Sensor Alarm.
 - b) If the water level in wetwell (as measured by 100-LT-0120) falls below 694.50 elevation and the PLC is seeing input signal indicating one or both pumps are running, then the PLC shall energize Station Alarm Beacon on top of station control panel and the Low Level Alarm light on swing out panel. The PLC will also send Low Level Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Wetwell Low Level Alarm-Pump running.
 - c) If the water level in wetwell (as measured by 100-LT-0120) exceeds 698.00 elevation the PLC shall energize Station Alarm Beacon on top of station control panel and the High Level Alarm light on swing out panel. The PLC will also send High Level Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Wetwell High Level Alarm.
 - d) If the water level in control structure exceeds 705.75 and activates ball float switch 235-LSH-0132, the PLC shall energize Station Alarm Beacon on top of station control panel and the Control Structure High Level Warning light on swing out panel. The PLC will also send High Level Warning indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Control Structure High Level Warning.
 - e) If the water level in control structure exceeds 707.00 and activates ball float switch 235-LSHH-0131, the PLC shall energize Station Alarm Beacon on top of station control panel and the Control Structure High Level Alarm light on swing out panel. The PLC will also send High Level Warning indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Control Structure High Level Alarm.
 - f) A Motor Protection Relay (MPR) shall be provided by the pump manufacturer for each pump and install in pump station control enclosure

by system integrator. The MPR monitors for high motor temperature and seal failure.

- g) If the MPR detects excessive motor temperature, it will send a signal to PLC. The PLC shall remove run signal and take pump out of service until the temperature returned to normal operating range for a period of 30 minutes.

The PLC shall energize Station Alarm Beacon on top of station control panel and the Pump No. 1/2 Motor Overtemp Alarm light on swing out panel. The PLC will also send Pump No. 1/2 Motor Overtemp Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Pump No. 1 Motor Overtemp Alarm / Pump No. 2 Motor Overtemp Alarm.

- h) If the MPR detects excessive moisture in motor casing, it will send a signal to PLC. The PLC shall allow the pump to remain in service and shall automatically assign it to the lag pump position. The PLC shall energize Pump No. 1/2 Motor Seal Fail Alarm light on swing out panel. The PLC will also send Pump No. 1/2 Seal Fail Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Pump No. 1 Seal Fail Alarm / Pump No. 2 Seal Fail Alarm.

Note: the panel alarm lights for Pump No. 1 VFD Fault and Pump No. 2 VFD Fault shall be lit by PLC in the event of a VFD fault and the PLC fail to respond fault. Fault clarification shall be presented on SCADA system alarm banners.

- i) If the PLC receives this digital signal from the VFD of a fault; The PLC energize Station Alarm Beacon on top of station control panel and the Pump No. 1/2 VFD Fault light on swing out panel. The PLC will also send Pump No. 1/2 Fault Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Pump No. 1 VFD Fault / Pump No. 2 VFD Fault.
- j) If the PLC sends run request to either of the pump VFD's and after a period of 5 seconds, does not receive acknowledgment that the pump is running; The PLC shall energize Station Alarm Beacon on top of station control panel and the Pump No. 1/2 VFD Fault light on swing out panel. The PLC will also send Pump No. 1/2 Fail To Respond Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Pump No. 1 Fail To Respond Alarm / Pump No. 2 Fail To Respond Alarm.
- k) If the PLC receives the signal from the intrusion switch in Pump Station Control Enclosure (100-ZS-0100), the PLC shall energize Station Alarm Beacon on top of station control panel. The PLC will also send Pump Station Control Enclosure Intrusion Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Pump Station Control Enclosure Intrusion Alarm.
- l) If the PLC receives the signal from the intrusion switch on Pump No. 1 VFD enclosure (100-ZS-0101) or Pump No. 2 VFD enclosure (100-ZS-0102), the PLC shall energize Station Alarm Beacon on top of station

control panel. The PLC will also send Pump No. 1 VFD Intrusion Alarm/
Pump No. 2 VFD Intrusion Alarm.

- m) If the PLC receives the signal from the intrusion switch for the Pump Station Wetwell Access Hatch (100-ZS-0103), the PLC shall energize Station Alarm Beacon on top of station control panel. The PLC will also send Pump Station Control Enclosure Intrusion Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Pump Station Wetwell Intrusion Alarm.
- n) If the PLC receives the signal from the Pump Station Control Enclosure UPS indication that control power has failed him control power is being provided by UPS, PLC will send Pump Station Control Enclosure - On UPS Power Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Control Power Fail – On UPS Power.
- o) If the PLC receives the signal from the Pump Station Control Enclosure UPS indication that indicates the UPS has a Fault, PLC will send Pump Station Control Enclosure UPS Fault Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Pump Station Control Enclosure UPS Fault Alarm.
- p) If the PLC receives the signal from the Pump Station Automatic Transfer Switch indicating it is switch to secondary power, PLC will send Pump Station Control Enclosure Primary Power Fail Alarm indication via Ethernet communication to SCADA system that will display on alarm banner. Alarm shall be designated Pump Station Primary Power Fail Alarm.

2.24 HMI Program Development Guideline:

2.36.1. Graphical Screens:

- a) The Pump Station Overview screen shall be configured in accordance with Naperville Water Control Center existing standards. Coordinate layout and information requirements with owner prior to development of screens – see EXECUTION Section below for details and requirements.
- b) HMI screens shall be developed for the complete operation of the Pump Station as allowed by design and PLC involvement in the processes.
- c) 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 the Owner 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 the Owner.
- d) 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.

- e) 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.
- f) Each screen shall include a legend of shapes and colors that depict status of equipment.
- g) The following shall be provided as minimum:
 - 1) Main Menu Screen: Icon selection of all graphics screens available for selection.
 - 2) 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 below and shown on drawing 009-N-1 shall be individually segregated with an alarm square:
 - a. Pump No. 1 Not in Auto
 - b. Pump No. 2 Not in Auto
 - c. Pump No. 1 Fail to Respond
 - d. Pump No. 2 Fail to Respond
 - e. Pump No. 1 VFD Fault
 - f. Pump No. 2 VFD Fault
 - g. Pump No. 1 Seal Fail
 - h. Pump No. 2 Seal Fail
 - i. Wetwell Low Water Level
 - j. Wetwell High Water Level
 - k. Control Structure High Water Level Warning
 - l. Control Structure High Water Level Alarm
 - m. Pump Station Control Enclosure Intrusion Alarm
 - n. Pump No. 1 VFD Enclosure Intrusion Alarm
 - o. Pump No. 2 VFD Enclosure Intrusion Alarm
 - p. Wetwell Intrusion Alarm
 - q. ATS - Primary Power Fail
 - r. ATS - Secondary Power Fail
 - s. SPD No. 1 – Fail
 - t. SPD No. 2 - Fail
 - u. Pump Station Control Enclosure UPS Fault
 - v. Control Power Fail – On UPS Power
 - w. Station in Float Mode
 - x. Wetwell Level Sensor Alarm
 - y. Up to (10) additional as defined by Owner / Engineer.
 - 3) System Overview: Depiction of wetwell including wetwell level, ball float status (wetwell and control structure), pump operational status, Lead/Lag pump status, VFD operational status, and pump station utility power status. Icon of all other Screens shall be provided for jump to that specific screen.

- 4) Float Status Screen: Shows wetwell 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. This screen will include current values for setpoints for Low Level Alarm Setpoint, Pump Stop Setpoint, Lead Pump Start setpoint, Lag Pump Start setpoint, and High Level Alarm setpoint. Icon of all other Screens shall be provided for jump to that specific screen.
 - 5) 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.
 - 6) 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 if space permits. Icon of all other Screens shall be provided for jump to that specific screen.
 - 7) Each pump service shall indicate voltage, operational frequency, power (kW), and power factor. Icon of all other Screens shall be provided for jump to that specific screen.
 - 8) Network Communications Diagram. Icon of all other Screens shall be provided for jump to that specific screen.
 - 9) 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 shall be provided whereby a level differential between level sensor in the Screen Chamber and the level sensor in the Inlet Chamber shall cause an alarm. Icon of all other Screens shall be provided for jump to that specific screen.
 - 10) Station Status Screen: contains depiction of PLC and their status with regards to power and communications.
 - 11) 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.
 - 12) Event logs and password protected system administration screens.
 - 13) Trend Screen: Operator adjustable points for trending. Provide trending capability for all analog inputs at PLC.
- h) Operator and Engineering screens shall be segregated to allow password protection of engineering-entered values.

- i) 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).
- j) 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).

2.36.2. Data Input:

- a) Data entry areas shall be provided at HMI for adjustment of process and alarm set-points. Data entry areas shall be password protected.
- b) 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.
- c) 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.
- d) Upper and lower limits shall determine range of analog input value. Value shall be scaled in standard Engineering Units.
- e) Password protection shall consist of alpha-numeric sequence and shall be intended for Plant Supervisor and Head Operator entry only.
- f) Unless otherwise specified process points shall be scanned as follows:
 - 1) Critical Alarm points and analog input process points shall be scanned continuously.
 - 2) General Alarm points shall be scanned only on change of state into alarm condition.
 - 3) All other points scanned only when required for display at HMI.
- g) All dynamic screen displays shall be updated every 10 seconds, minimum.

2.36.3. Display Objects – General

- a) Process piping and pumps/fans/mixers may be animated with color to show active/non-active status.
- b) Use graphic symbology for rendering of objects.

2.36.4. Display Objects – Process Lines and Inline Device Symbology

- a) 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 Owner's existing HMI configuration. Recommended color use:
 - 1) Off – Red.
 - 2) On – Green.
 - 3) Fail/Alarm – Red, Flashing.

4) Status – Amber.

- b) Inline devices shall have alphanumeric tag identified near them, adjacent to associated symbol.
- c) 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.
- d) 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.
- e) Process lines shall be identified with flow stream abbreviation as listed in standard symbolic table and as shown on Drawings, where convenient.

2.36.5. Display Objects – Data Fields

- a) Analog process data not conducive to graphic symbology shall be formatted as rectangular Data Fields.
- b) 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.
- c) Data Fields shall be configured with high and low limits (adjustable) as described above.

2.36.6. Display Objects – Status Displays

- a) Status Displays shall be similar to Data Fields but shall be linked to discrete data points or status bits.
- b) 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.
- c) Displays shall be classified as Alarms or Events (see below).

2.36.7. Data Entry Field:

- a) Similar to Data Display Field described above. Allows Operator entry of process values such as set-points.
 - 1) 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.

2.36.8. Alarming Requirements:

- a) Alarms and Events shall be logged to data file.

- b) Alarms shall fall within one of following categories.
 - 1) Critical: Alarms displayed and annunciated at control panel and broadcast to Naperville Water Service Center.
 - 2) General: Alarms displayed and annunciated at control panel and broadcast to Naperville Water Service Center.
- c) Provide alarm summary screen(s) at SCADA.
- d) Display only current alarms. Acknowledged alarms which are no longer active shall not be displayed.
- e) Allow operator to acknowledge alarms using single keystroke or cursor pick at alarm summary screen.
- f) Alarm Display shall include following information:
 - 1) Time and date alarm initially occurred.
 - 2) Alarm point identification.
 - 3) Alarm value and engineering units for alarms generated from analog process points.
 - 4) Description of alarm (up to 40 characters).
- g) Events shall be logged to separate data file. Events shall not be displayed unless evoked and shall not be annunciated.
- h) The Operator shall have the ability to silence alarms.
- i) The alarm silence feature shall also have a manual override.

2.36.9. Data Logging requirements – Analog and Discrete

- a) All input process points shall be logged to the hard disk of the HMI computer.
- b) Procedure for data collection and storage shall be as follows:
 - 1) HMI I/O driver shall poll process points as specified on I/O list and transfer data to image table.
 - 2) HMI shall scan image table for analog process points once every second, and log value to data base.
 - 3) HMI shall calculate minimum, maximum and average for each analog process point and log to data base.
 - 4) HMI shall scan image table for discrete process points on status change only, and log value to data base.

2.36.10. Trend Display Requirements

- a) Configure SCADA computer to display logged data in graphical trend format.
- b) Trend Display Requirements:
 - 1) Identification of process point being displayed. Use same nomenclature as used on SCADA screens.
 - 2) Start and end time of data being displayed.

- 3) Display shall incorporate movable vertical cursor along time axis. Parameter values at cursor date and time shall be displayed digitally.
 - 4) 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.
 - 5) Displays shall include y-axis range identification, including values and engineering units.
 - 6) Configure trend displays to use maximum of computer screen area possible for purpose of increased resolution.
 - 7) Trend displays shall be accessible, via single keystroke, from graphic screen displaying trended point.
- c) Organize graphics screens for trend displays into categories by process:
- 1) Provide separate graphic screen within each category to display each process point trend. Provide different color for each process point.
 - 2) Provide separate category for manually entered data from HMI computer.

3. EXECUTION:

3.1 Inspection

3.1.1 Verify that field conditions are acceptable and are ready to receive work.

3.2 Installation

3.2.1 Install devices and equipment in accordance with manufacturer's instructions.

3.2.2 All wires and cables shall be labeled and identified at both ends. This includes spares.

3.3 SCADA Screen Development and PLC Programming

3.3.1 Two meetings are required to include: Contractor, System Integrator, the Owner, and Phase 3 Engineer in attendance.

- a) The first meeting shall be limited to 4 hours and shall consist of a formal review of HMI Screens which shall be provided [48 hours in advance] in color hardcopy for all attendees by Contractor. Review shall be an opportunity to provide creative input to the development and artistic representation for Screens. All requested changes/alterations shall be documented and a formal response to each alteration by the Contractor presented prior to the second meeting. PLC programming and operational strategies are also discussed and input provided. Site of meeting shall be at the discretion of the Owner, and shall occur prior to Shop Testing described below.

- b) The second meeting shall be limited to 4 hours and shall consist of a formal review of HMI Screens which shall be provided [48 hours in advance] in color hardcopy for all attendees by Contractor. Review shall be an opportunity to provide creative input to the development and artistic representation for Screens. All requested changes/alterations shall be documented and a formal response to each alteration by the Contractor presented within 3 weeks of meeting. PLC programming and operational strategies are also discussed and input provided. Site of meeting shall be at the discretion of the Owner, and may be combined with Shop Testing (described below) at the discretion of the Owner.

3.4 System Testing:

3.4.1 System testing and Start-up including the following, shall include provisions of Section 1A, and 15D.

3.4.2 System Shop Tests:

- a) The System Integrator shall be able to simulate the SCADA system within his shop. Shop testing shall include, but not necessarily be limited to, the following:
 - 1) Manually fill-in required additions to PLC data base.
 - 2) Manual forcing of outputs.
 - 3) Operation of the control programs.
 - 4) Forcing redundant transfer from primary PLC to secondary as a bump-less transfer.
 - 5) Recall of simulated data points on the HMI display.
 - 6) Recall of all reports with partial fill-in data and manual fill-in data at time of testing.
 - 7) Change of alarm and limit set-points, etc., and observation of results.
 - 8) Any additional testing which may be found to be necessary at the time the above is observed.
 - 9) 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.
 - 10) 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 the Engineer. The System Integrator will be expected to do all necessary pretrial testing and debugging to ascertain that the system is in running order. After the System Integrator has confirmed that the proper responses can be achieved, the date for final shop test may be established.
 - 11) During shop testing, the System Integrator 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 Owner reserves the right to be present when shop tests are run as described below.

- b) The Contractor shall notify the Owner, in writing, with the System Shop Test date(s). The Contractor shall submit an itinerary to the Owner, for review and acceptance, a minimum of four (4) weeks prior to the scheduled travel.
- c) Provide enclosure heat calculations for Pump Station Control Panel and VFD enclosures along with verification of proper ventilation is provided.

3.4.3 System Field Tests

- a) 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.

3.4.4 Start-up and Operational Testing:

- a) The start-up services and Operational Test for the following equipment shall be coordinated with the Owner; Owner shall be notified at least two weeks in advance:
 - 1) SCADA System complete.
 - 2) Float Control System
 - 3) Pumping System
 - 4) Outside Communications
- b) 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.
- c) Owner and Engineer shall both be given the opportunity to witness all Operational Testing. Contractor shall coordinate schedules of all parties.

3.5 Operational Testing:

- 3.5.1 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.
- 3.5.2 Automatic pump operational testing under both modes of control shall be performed based on the rising water and falling water conditions.
- 3.5.3 Operational testing shall include verification of local indication, and SCADA indication at Naperville Water Service Center.

- 3.5.4 With the LOR (Local-Off-Remote) switch at the VFD enclosure in Local, each Pump shall be started, stopped, and bumped from the VFD enclosure individually. Pump ramp up, and operational parameters 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 (seal fail, 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 Main Pumps shall be run concurrently for testing. Testing shall utilize both power sources, assuring functional testing of the ATS. During testing, Contractor shall assure minimum pump submergence is observed at all times.
- 3.5.5 With the LOR (Local-Off-Remote) switch at the VFD enclosure in Remote, 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.
- 3.5.6 SCADA Pump testing shall be performed as follows:
- a) Confirm wet-well level is above Low Level Alarm Float Switch (100-LSLL-0115), and no pumps are running.
 - b) Place CONTROL MODE selector switch in AUTO mode position.
 - c) Fill water in the wet well – Contractor shall be responsible for providing water.
 - d) For each rising water level benchmark shown on Drawings, verify operation of respective pump. Verify on/off operation. Verify a maximum of two Main Pumps running at a time. Verify PLC pump sequencer operation. Verify Lead/Lag configuration for all six possible scenarios of pump sequencer. Verify pilot light functionality and SCADA HMI operation for each signal and respective status of equipment.
 - e) Force Lead Pump MPR into alarm (this may require an electrical jumper) and verify Standby Pump Operation. Force Lag Pump MPR into alarm and verify continued operation.
 - f) 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.
 - g) Verify wetwell High Level alarm. (at this point, it is suggested to immediately perform Float System Operational Testing, and then return to this point).
 - h) 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.
 - i) Verify wetwell Low Level alarm. This may require the use of temporary portable pumping equipment, and shall be provided by Contractor.
 - j) Verify and document all equipment changes of state with respect to water level during functional testing and submit.
 - k) Verify all alarms Naperville Water Service Center.
 - l) During testing, Contractor shall assure minimum pump submergence is observed during pump operation.
 - m) Verify Float mode is activated by each of the following events:

- 1) Wetwell High Level Float (100-LSHH-0111) Activated.
 - 2) Primary level element failure.
-
- n) Verify Float mode is deactivated and the PLC reassumes automatic control of pumping operations when CONTROL MODE selector switch is moved to RESET and then back to AUTO position.
 - o) Verify alarm condition is the result when CONTROL MODE selector switch is moved to RESET position and left there.

3.5.7 Float System Pump testing shall be performed as follows:

- a) Wetwell 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.
- b) Place CONTROL MODE selector switch in FLOATS mode position.
- c) Fill water in the wet well – Contractor shall be responsible for providing water.
- d) For each rising water level benchmark shown on Drawings, verify operation of respective pump. Verify on/off operation. Verify the ability of two Main Pumps running at a time. Verify pilot light functionality for each signal and respective status of equipment.
- e) Using selector switch assign Pump No. 1 as Lead Pump and run. Simulate Fail mode (may require jumper of electrical circuit) and verify Lag Pump (Pump No. 2) start. Repeat test with Pump No. 1 as Lead pump
- f) Verify wetwell High Level Float alarm. (Wetwell and Control Structure).
- g) Verify wetwell Low Level Float alarm. (Wetwell and Control Structure).
- h) 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.
- i) Verify and document all equipment changes of state with respect to water level during functional testing and submit.
- j) Verify all alarms at Naperville Water Service Center.
- k) During testing, Contractor shall assure that the required minimum pump submergence is observed during pump operation.

3.5.8 Analog Level sensors shall be performed as follows:

- a) Verify 4-20mA output and respective wet-well level at panel indicator from empty to full wet-well conditions.
- b) Demonstrate failure of primary level element with bump-less transfer of control to ball floats.

3.5.9 Communications:

- a) Verify each alarm represented on Drawings at Pump Station Control Panel is transmitted and received at Naperville Water Service Center.

3.5.10 Additional Testing:

- a) 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.
- b) Verify each SCADA setpoint data entry via radio communication is tested and verified for functionality, document and submit.
- c) PLC's shall be tested for seamless transfer PLC failure to relay logic float mode.
- d) Demonstrate a complete SCADA loss of radio communications, with PLC maintaining control of the Pump Station. Resumption of radio communications shall immediate update of SCADA screens.
- e) Demonstrate loss of primary and secondary power and that function of PLC includes proper communication of loss of power alarms and proper operation of pump station upon return of utility power.
- f) Demonstrate UPS failure for each UPS, alarming, and bypass contactors.
- g) Demonstrate power failure for each 120Vac power circuit to SCADA panel, and alarming.
- h) Demonstrate 24Vdc power supply failure and alarming.
- i) Demonstrate Float Failure when a float fails to activate. Verify for each wet-well float.
- j) Verify Pumps are inhibited from running (in Auto) with receipt of motor over temp alarm from motor protection relays. Verify override operation from SCADA of this.
- k) Electrical Systems in accordance with procedures as described in relevant Sections (Intrusion Switches, ATS, Surge Protection, Grounding, etc.).
- l) Mechanical Systems in accordance with procedures as described in relevant Sections (fans, heating, air conditioning, etc.).

3.5.11 Final Acceptance

- a) Satisfactory operation of the work by the Owner 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.
- b) All punch list items have been resolved to the satisfaction of Engineer and the Owner.
- c) All O&M manuals, Record Drawings, and record documents shall be delivered to and approved by owner.
- d) All training completed or scheduled (if off-site).
- e) 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.

- f) Written acceptance by the Owner shall be the start date of the warranty period. Warranty shall commence from the Final Acceptance of the Pump Station.

4. TRAINING:

Operator Training:

- 4.1.1. Operator training shall be provided at Owner facility (on-site) concurrently with system installation on a prearranged formalized basis and shall include the necessary training aids in conjunction with actual work on the equipment supplied. Work shall include complete review of all operating and training manuals and physical application. Training shall include project-specific examples.
- 4.1.2. 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.
- 4.1.3. 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.
- 4.1.4. This training shall consist of a minimum of one 1-day (8 hours total) classes for 5 persons in each class. Training materials and manuals shall be provided for each participant.

4.1. Maintenance Training:

- 4.2.1. The Contractor shall provide one 1-day (8 hours total) maintenance training classes for 5 persons in each class. The maintenance training may be combined with the Operator Training.

5. WARRANTY AND ADDITIONAL SERVICES:

- 5.1. Except where noted, all hardware and software furnished under this contract including but not limited to the accessory peripherals, discrete devices, analog instruments and control devices shall have unconditionally warranty for one year from the date of final acceptance.

6. VISITING JOB SITES:

- 6.1. Prospective bidders are urged to visit the job sites in order to familiarize themselves with the extent and the conditions under which the work must be completed. It is the intent that all work requiring additions, revisions, relocation and/or removals of equipment and facilities be fully included in the original bidding; later claims for extra work will not be approved, occasioned by the failure to comply with this disclaimer.

END OF THIS SECTION

SECTION 16E - LIGHTING

1. GENERAL:

1.1 Description

- 1.1.1 Basic materials and methods specified herein shall be incorporated in the work wherever applicable unless specifically indicated otherwise.
- 1.1.2 The basic materials and methods specified herein are intended to define a minimum standard of quality and workmanship.
- 1.1.3 Refer to Division 1 for additional requirements.

1.2 Related Sections

- 1.2.1 Section 3A - Cast-In-Place Concrete.
- 1.2.2 Section 16A – General Electric Provisions.
- 1.2.3 Section 16C – Basic Electrical Equipment Materials and Methods.

1.3 References

Codes and Standards referred to in this Section are:

ANSI C82.16 - LED Drivers, methods of measurement of.

UL 50 - Cabinets and boxes.

1.4 Submittals

- 1.4.1 Provide shop drawings and product data under provisions of Section 1A for the following items: Light Fixtures, Lamps, Ballasts, and Emergency Lighting Units, Panelboards, and Lighting Contactors.

1.5 Warranty

- 1.5.1 Provide warranty under provisions of Section 1A.

1.6 Basis of Payment

- 1.6.1 The work shall be paid at the contract lump sum price for

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which shall be payment in full for the work described herein.

- 1.6.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

2.1 Lighting Fixtures

2.1.1 Fixtures and Fixture Components

- (a) Metal Parts: Free from burrs, sharp corners, and edges.
- (b) Sheet Metal Components: Steel, except as indicated. Form and support to prevent warping and sagging.
- (c) Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.
- (d) Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:
 - 1) White Surfaces: 85%.
 - 2) Specular Surfaces: 83%.
 - 3) Diffusing Specular Surfaces: 75%.
 - 4) Laminated Silver Metallized Film: 90%.
- (e) Lenses, Diffusers, Covers, and Globes: 100% virgin acrylic plastic or water white, annealed crystal glass, except as otherwise indicated.
- (f) Fixture Support Components: Comply with Section 16B paragraph 2.11.
 - 1) Pole-Mounted Fixtures: Conform to American Association of State Highway and Transportation Officials (AASHTO) LTS-3.
 - 2) Wind-load strength of total support assembly, including pole, arms, appurtenances, base, and anchorage, is adequate to carry itself plus fixtures indicated at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 100 Miles per Hour (mph) (160 Kilometers per Hour (km/h)) with gust factor of 1.3.
 - 3) Arm, Bracket, and Tenon Mount Materials: Match poles' finish.
 - 4) Mountings, Fastenings, and Appurtenances: Corrosion-resistant items compatible with support components. Use materials that will not cause galvanic action at contact points. Use mountings that correctly position luminaire to provide indicated light distribution.
 - 5) Pole Bases: Anchor type with galvanized steel hold-down or anchor bolts, leveling nuts, and bolt covers.

- 6) Poles: Steel tubing conforming to American Society for Testing and Materials (ASTM) A500, Grade B, carbon steel with minimum yield of 46,000 Pounds per Square Inch (PSI) (317 MegaPascals (MPa)). Poles are 1-piece construction up to 40 feet (12 meters) in length and have access handhole in wall.
 - 7) Metal Pole Grounding Provisions: Welded 1/2 inch (12 millimeter) threaded lug, accessible through handhole.
 - 8) Steel Mast Arms: Fabricated from 2 inch NPS (DN50) black steel pipe, continuously welded to pole attachment plate with span and rise as indicated.
 - 9) Concrete for Pole Foundations:
 - i. Comply with Section 03 30 00.
 - ii. Use 3000 psig strength, 28 day concrete.
- (g) Light-emitting diode (LED) Fixtures: CSA verified, light engines IP 66 rated, luminaire IP 65 rated.
- 1) Class 1 electronic driver with power factor greater than 90%.
 - 2) Total harmonic distortion less than 20%.
 - 3) Expected life of 100,000 hours.
 - 4) Five year warranty.
 - 5) Rated for -40° C.

2.1.2 Finishes

- (a) Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

3. EXECUTION:

3.1 Lighting Fixtures

3.1.1 Installation

- (a) Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to Section 16B-2.11.
- (b) Lamping: Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions.

3.1.2 Connections

- (a) 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.

3.1.3 Grounding

- (a) Poles: Install 10 feet (3 meters) driven ground rod at each pole.
- (b) Nonmetallic Poles: Ground metallic components of lighting unit and foundations. Connect fixtures to grounding system with No. 6 AWG conductor.

3.1.4 Field Quality Control

- (a) Inspect each installed fixture for damage. Replace damaged fixtures and components.
 - 1) Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source.
 - 2) Give advance notice of dates and times for field tests.
 - 3) Provide instruments to make and record test results.
 - 4) Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include following information in tests of emergency lighting equipment:
 - i. Duration of supply.
 - ii. Low battery voltage shutdown.
 - iii. Normal transfer to battery source and retransfer to normal.
 - iv. Low supply voltage transfer.
 - v. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.
 - vi. Report results of tests.
- (b) Replace fixtures that show evidence of corrosion during Project warranty period.

3.1.5 Adjusting and Cleaning

- (a) Clean fixtures after installation. Use methods and materials recommended by manufacturer.
- (b) Adjust aimable fixtures to provide required light intensities.

END OF THIS SECTION

SECTION 16F - MAJOR ELECTRICAL EQUIPMENT

1. GENERAL:

1.1 Description

- 1.1.1 Basic materials and methods specified herein shall be incorporated in the work wherever applicable unless specifically indicated otherwise.
- 1.1.2 The basic materials and methods specified herein are intended to define a minimum standard of quality and workmanship.
- 1.1.3 Refer to Division 1 for additional requirements.

1.2 Related Sections

- 1.2.1 Section 3A - Cast-In-Place Concrete.
- 1.2.2 Section 16A – General Electric Provisions.
- 1.2.3 Section 16B – Electrical Power System Studies
- 1.2.4 Section 16C – Basic Electrical Equipment Materials and Methods.
- 1.2.5 Section 16D – Supervisory Control and Data Acquisition (SCADA) Equipment.

1.3 References

Codes and Standards referred to in this Section are:

Fed. Spec
W-P-115 - Panel, power distribution.

NEMA KS1 - Enclosed and miscellaneous distribution equipment switches (600 volt maximum).

1.4 Submittals

- 1.4.1 Provide shop drawings and product data under provisions of Section 1A for the following items: Panelboards, Disconnects and Safety Switches, Transformers, Motors, SPD units, and Automatic Transfer Switch.
- 1.4.3 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 automatic transfer switch and other components and systems that are interfaced to these systems.
- 1.4.4 The manufacturer of each specified item shall provide not less than four (4) hard-cover 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. Refer to Section 1A for further requirements.

1.4.5 VFD

- 1.4.5.1 Panel fabrication
- 1.4.5.2 Front of panel layout drawings.
- 1.4.5.3 Interior panel layout drawings.
- 1.4.5.4 Nameplate legend.
- 1.4.5.5 Component specification sheets.
- 1.4.5.6 Instruction manuals.
- 1.4.5.7 Parts list.
- 1.4.5.8 Recommended spare parts list.
- 1.4.5.9 Include Engineer's tag number or description when available on each drawing, specification sheet, and manufacturer's catalog cut in submittal for each component included in system.

1.4.6 Quality Assurance

- 1.4.6.1 Review equipment motor submittal for compatibility with drive system and to assure 20-year motor insulation design life and drive sizing.
- 1.4.6.2 Drive equipment shall conform to requirements of IEEE 519.
- 1.4.6.3 VFDs and options shall be UL listed as a complete assembly. The VFD package shall have a UL listed short circuit current rating (SCCR) of 65,000 amps and this rating shall be indicated on the UL data label

1.5 Warranty

- 1.5.1 All electrical equipment shall be covered by warranty from all defects of material and workmanship for the manufacturer's standard length of warranty or for 1 year from the date of final acceptance, whichever is longer.

1.6 Basis of Payment

- 1.6.1 The work shall be paid at the contract lump sum price for

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which shall be payment in full for the work described herein.

- 1.6.2 Refer to 1.22 of Section 1A for Method of Measurement.

2. PRODUCTS:

2.1 Panelboards

2.1.1 Manufacturer's

- (a) Eaton Corporation.
- (b) Square-D Co.
- (c) Siemens.

2.1.2 Panelboard Fabrication

- (a) Enclosures: Flush- or surface-mounted cabinets as indicated. NEMA PB 1, Type 4X 316 stainless steel, unless otherwise indicated to meet environmental conditions at installed location.
- (b) Front: Secured to box with concealed trim clamps, unless otherwise indicated. Front for surface-mounted panelboards shall be same dimensions as box. Fronts for flush panelboards shall overlap box, unless otherwise indicated.
- (c) Directory Frame: Metal, mounted inside each panelboard door.
- (d) Bus: Hard drawn copper of 98% conductivity.
- (e) Main and Neutral Lugs: Compression type.
- (f) Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.
- (g) Service Equipment Approval: Listed for use as service equipment for panelboards with main service disconnect.
- (h) Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for overcurrent protective device ampere ratings indicated for future installation of devices.
- (i) Special Features: Include following features for panelboards as indicated:
 - 1) Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.
- (j) Extra Gutter Space: Dimensions and arrangement as indicated.
 - 1) Subfeed: Overcurrent protective device or lug provision as indicated.
- (k) Feed-through Lugs: Sized to accommodate feeders indicated.

2.1.3 Mini-Power Center

- (a) Branch Overcurrent Protection Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- (b) Doors: In panelboard front, with concealed hinges. Secure with flush catch and tumbler lock, keyed alike.
- (c) Transformers, General
 - 1. Factory-assembled and –tested, air cooled units of types specified, designed for 60Hz service.
 - 2. Cores: Grain-oriented, nonaging silicon steel.
 - 3. Coils: Continuous copper windings without splices, except for taps.
 - 4. Internal Coil Connections: Brazed or pressure type.
 - 5. Enclosure: NEMA 4X 316 stainless steel.
- (d) General-Purpose Distribution and Power Transformers
 - 1. Comply with NEMA ST 20 and listed and label as complying with UL 1561.
 - 2. Efficiency: Efficiency equal to or greater than that stated in NEMA TP 1, for that type and rating of transformer.
 - 3. Cores: 1 leg per phase
 - 4. Windings: One coil per phase in primary and secondary.
 - 5. Enclosure: Outdoor, ventilated, raintight, NEMA 250.
 - 6. Insulation Class: 220°C class 115°C maximum rise above 40°C for transformers 15kVA or smaller.
 - 7. Taps: 220°C class 115°C maximum rise above 40°C for transformers 15kVA or smaller.
 - a. Taps, 15 through 500kVA: Six 2.5% taps, 2 above and 4 below rated high voltage.
- (e) Finishes
 - 1. Outdoor Units: Comply with ANSI C57.12.28.
- (f) Source Quality Control
 - 1. Factory Tests: Design and routine test comply with reference standards.

2.1.4 Distribution Panelboards

- (a) Branch-Circuit Breakers: Where overcurrent protective devices are indicated to be circuit breakers, use bolt-on circuit breakers, except circuit breakers 225-A frame size and

greater may be plug-in type where individual positive-locking
device requires mechanical release for removal.

2.1.5 Overcurrent Protective Devices

(a) Molded-Case Circuit Breakers: NEMA AB 1, handle lockable.

- 1) Characteristics: Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting capacity rating to meet available fault current.
- 2) Application Listing: Appropriate for application, including Type SWD for switching fluorescent lighting loads, Type HACR for heating, air-conditioning, and refrigerating equipment and Class B GFCI for pipeline and vessel fixed electrical heating equipment unless otherwise indicated.
- 3) Circuit Breakers, 200A and Larger: Trip units interchangeable within frame size.
- 4) Circuit Breakers, 400A and Larger: Field-adjustable short-time and continuous current settings.
- 5) Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.
- 6) Shunt Trip: Where indicated.

2.1.6 Surge Protective Device (100-MPC-1)

(a) Description: IEEE C62.41, selected to meet requirements for category indicated.

- 1) Exposure: Low.

(b) Provided with the following features:

- 1) Provide with dedicated disconnecting means to isolate device from system without interrupting service; see 007 Series Drawings for circuit breaker size.
- 2) Protection modes and UL 1449, third edition or latest edition, clamping voltages coordinated with circuit system and circuit voltage.
- 3) Factory mounted with UL listed and labeled mounting device.
- 4) 50 kiloamp (kA) per phase surge current capacity minimum.
- 5) Door mounted diagnostic lights.
- 6) Audible alarm, with silencing switch, to indicate when protection has failed. Switch shall be accessible from outside of enclosure and not require enclosure door to be opened to access.
- 7) Replaceable modular design.
- 8) Form C contact for failure.
- 9) Minimum of 10 year warranty.
- 10) Mounted externally in a NEMA 4X 316 SS enclosure.

2.2 Disconnects, Fuses, and Circuit Breakers

2.2.1 Manufacturer's

(a) Motor and Circuit Disconnects:

- 1) Eaton Corporation.
- 2) Square D Co.
- 3) Siemens.

(b) Molded-Case Circuit Breakers:

- 1) Eaton Corporation.
- 2) Square D Co.
- 3) Siemens.

2.2.2 Enclosed Circuit Breakers

(a) Enclosed Molded-Case Circuit Breaker: NEMA AB 1, handle lockable with 2 padlocks.

(b) Characteristics:

- 1) Frame size, trip rating, number of poles, and auxiliary devices as indicated.
- 2) Interrupting capacity rating to meet available fault current, 25,000 symmetrical rms amps minimum.
- 3) Appropriate application listing when used for switching fluorescent lighting loads or heating, air conditioning, and refrigeration equipment.

(c) Interchangeable Trips: Circuit breakers, 200 amps and larger, with trip units interchangeable within frame size.

(d) Field-Adjustable Trips: Circuit breakers, 400 amps and larger, with adjustable short time and continuous current settings.

(e) Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.

(f) Current Limiters: let-through ratings less than NEMA FU 1, Class RK-5.

(g) Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.

(h) Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

- (i) Shunt Trip: Where indicated, 120 volts, 60 Hz.
- (j) Accessories: As indicated on drawings.

2.2.5 Enclosures

- (a) Enclosure: NEMA AB 1, Type 1, unless specified or required otherwise to meet environmental conditions of installed location.
 - 1) Outdoor or Other Wet or Damp Indoor Locations: NEMA Type 4X 316 stainless steel.
 - 2) Hazardous Areas Indicated on Drawings: NEMA Type 7C.

2.3 External Surge Protection Device

2.3.1 Surge Protective Drives (SPD) – 100-SPD-1

- (a) Surge suppressor shall have UL 1449 listed suppression ratings for each mode of protection, as follows:
 - 1) 480/277 volt, 3 phase “WYE” – 800 volts.
 - 2) 120/208 volt, 3 phase “WYE” – 400 volts.
 - 3) 480 volt 3 phase “Delta” – 1500 volts.
- (b) Provide protection in all modes. Ten modes for “WYE” systems, L-L, L-N, L-G and N-G, and six modes for “Delta” systems, L-L and L-G. (See NEMA 2.2.7 & IEEE Std. 1100-1992).
- (c) Include a predetermined number of Selenium cells in parallel with arrays of non-linear voltage dependent metal oxide varistors to protect against system voltage swells.
- (d) The Catastrophic Protection System shall provide temporary over voltage and voltage swell protection to the following:
 - 1) TOV - should be capable of surviving and continue to protect critical loads against multiple TOV events (described as 200% nominal voltage by 8 mS.
 - 2) Swell- should be capable of protection against swells up to 180% nominal for 0.7 ohms load >18,000 cycles.
- (e) MOV's tested per ANSI/IEEE C62.33-1982.
- (f) Minimum Single Pulse Surge Current Capacity per ANSI/IEEE C62041-1991's standard 8 X 20 microsecond current waveform, shall not be less than as follows:
 - 150,000 amps, L-N
 - 150,000 amps, L-G min. amps per phase 300,000 (L-N plus L-G)

150,000 amps, N-G
150,000 amps, L-L

- (g) Test system for repetitive sequential ANSI/IEEE C62.41 Category C3 waveforms. Minimum repetitive strikes of 1.2 X 50 microsecond, 20KV open circuit voltage and 8 X 20 microsecond, 10 KA short circuit current with no more than 10% degradation of clamping voltage at the specified surge current.
- (h) Provide an extended range noise tracking filter system between 50kHz and 100MHz with a minimum insertion loss ratio of 50:1 or 34 db over the entire range per NEMA LS-1, 1992, Section 2.2.11. UL 1283 Listed as an Electromagnetic Interference Filter. (Standard insertion loss data obtained utilizing MIL-STD-E220A 50 ohm insertion loss methodology).
- (i) Minimum continuous operating voltage of any component shall not be less than 115% of nominal operating voltage.
- (j) The primary suppression path shall be Line to Neutral.
- (k) All surge current devices shall incorporate low impedance plated busbars. No small gauge round wire, printed circuit boards, silicon avalanche diodes or plug-in connections are acceptable.
- (l) Each individual Selenium cell, MOV and capacitor shall be fused so that the failure of any component does not affect the operation or protection of the entire unit.
- (m) Provide in PVC/Fiberglass or metal enclosure NEMA rated suitable for the installed location.

2.3.2 Accessories

- (a) **Monitoring.** One set of status monitoring lights, that will provide visual indication of voltage present to the SPD. The lights shall also indicate when any value of less than 50% suppression protection is available from the SPD.
 - 1) An audible alarm with battery backup, indicating lights showing loss of power or with any value less than 50% suppression protection is available, a surge counter, and two sets of Form C contacts for remote monitoring.
 - 2) Visual status of suppression protection available, shown in a percentage from 0% to 100%, indication of the number of swells (voltage > 110% of nominal), surges (voltage > 130% of peak voltage), sags (voltage < 90% of nominal), and outages (power interruptions > 1 cycle) the device has encountered.

- (b) High Performance Interconnect. Dual shielded, triple insulated multi-core power conductor, UL approved.
- (c) System shall be capable of communicating remotely via Modbus TCP over Ethernet and a web interface via Ethernet.

2.4 Automatic Transfer Switch

- (a) Manufacturers
 - 1) ASCO.
 - 2) Russelectric.
 - 3) GE Zenith.
- (b) Air breaker, double throw interrupter type, electrically operated and mechanically held in both the normal and emergency positions. The switch operators shall be single solenoid or single motor operated and shall be momentarily energized by the sources to which the load is transferred.
- (c) Separate arcing contacts, with magnetic blowouts shall be provided. Interlocked molded case circuit breakers or interlocked contactors will not be accepted.
- (d) UL 1008 listed.
- (e) Switch shall be 3-pole, 200 amp, 480 volt rated with 25,000 amp withstand current rating (WCR) for 3 cycles at 480 volt. Upstream main breakers shall be coordinated with ATS manufacturer to achieve WCR rating.
- (f) Provide fully rated, solid, unswitched neutral terminal.
- (g) Manual switch operation: manually operated under load with door closed with either or both sources energized. Transfer time is same for electrical operation. Control circuit automatically disconnects from electrical operation during manual operation.
- (h) Switching arrangement: switch operator has programmed neutral position arranged to provide midpoint between 2 working switch positions with an intentional, controlled, timed pause during transfer at midpoint. Midpoint pause shall be adjustable from 0.5 to 30.0 second minimum, factory set at 2.0 seconds. Time delay shall occur for both transfer directions.
- (i) Solid state controls with repetitive accuracy setting of 2% or better over operating temperature range -20°C to 60°C. Voltage sensing shall be true RMS type and shall be accurate to +/- 1% of nominal voltage. Frequency sensing shall be accurate to +/- 0.2%. A four line, 20 character LCD display and keypad shall be integral part of the controller for viewing all available data and setting desired operational parameters. Nominal line voltage and frequency, single or three phase sensing, operating parameter protection, and transfer operating mode configuration shall be the only parameters not adjustable through display/keypad and shall rather use integral DIP switches on the controller.

- (j) Voltage sensing for each phase of normal source. Pick-up voltage adjustable from 85% to 100% nominal, and drop-out voltage adjustable from 75% to 98% pick-up value. Factory set for pick-up at 90% and drop-out at 85%.
- (k) Time-delay override of normal source voltage sensing delay transfer and engine start signals. Adjustable 0 to 6 seconds, factory set at 1 second.
- (l) Voltage/frequency lockout relay: prevents premature transfer. Voltage pick-up adjustable from 85% to 100%. Factory set to pick-up at 90%.
- (m) Pick-up frequency adjustable from 90% to 100% nominal. Factory set to pick-up 95%.
- (n) Retransfer time delay: adjustable from 0 to 30 minutes and factory set at 10 minutes. Provides automatic defeat of delay upon loss of voltage or sustained undervoltage of emergency source when normal supply has been restored.
- (o) Test switch: simulates normal source failure.
- (p) Switch-position pilot lights: indicate source to which load is connected and source available. Push to test, LED type in accordance with Section 16D.
- (q) Transfer switch override switch: overrides automatic retransfer control so ATS remains connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
- (r) Switch components shall be easily maintainable from front without removal of switch from its bucket within motor control center and without disconnecting the main power cables. Adequate safety barriers and baffles shall be provided and all components shall be clearly identified with nameplates.
- (s) Enclosure: NEMA 4X 316 stainless steel, secured enclosure shall have a dead front outer panel so that there are no controls, actuator arms, or disconnects accessible without opening outer door of enclosure. Switch status indications lights, pilot lights, and test buttons shall be housed on the inner enclosure and shall not be visible without opening the Outer Enclosure door. Enclosure shall conform to UL 508.
- (t) Heater: Within enclosure of units exposed to outdoor temperature and humidity conditions connect thermostat within enclosure to control heater.

1. 120-volt.

2.4.1 Micro Processor Based Metering Units

- (a) Each incoming line shall have a microprocessor based electronic metering unit with digital readout and key pad. Metering unit shall monitor phase amperes, phase-to-phase voltages, and phase-to-neutral voltages with one percent accuracy. Metering system shall also monitor and indicate megawatts, megavars, power factor, megawatt

demand and frequency. In addition, overvoltage/undervoltage, phase loss/unbalance/reversal protective functions shall also be available and user programmable. Furnish two NO/NC alarms and two NO/NC trip contacts. Fused potential transformers shall be included. Current transformers shall be as shown. Metering units shall be equipped with data communications modules capable of communication with the SCADA panel using Modbus protocol. Coordinate with SCADA panel supplier through the Contractor to determine Modbus protocol type. Metering units shall be door mounted.

2.4.2 External Hard Wired Signals

- (a) Provide dry contact for remote indication of utility power available.
- (b) Provide dry contact for remote indication of normal service (Westside Substation) failure.
- (c) Provide dry contact for remote indication of emergency service (Raymond Substation) failure.
- (d) Provide dry contact for remote indication of transfer switch in normal position.
- (e) Provide dry contact for remote indication of transfer switch in emergency position.

2.4.3 Nameplates

- (a) Factory install for each bucket and each individual device. Nameplates shall include equipment description populated from drawings. Use a minimum of 1/2 inch high lettering on 1-1/2 inch high label. Nameplates shall be plastic laminate securing fastened to equipment with screws. Use black lettering on white field.

2.4.4 Finishes

- (a) Finish: Manufacturer's standard gray finish over rust-inhibiting primer on phosphatizing-treated metal surfaces.

2.5 Pulse Width Modulation (PWN) Variable Frequency Drive (VFD)

(a) Manufacturers.

- i) Schneider Square D – Altivar 600 Series.
- ii) Allen Bradley – PowerFlex 753 Series.
- iii) No Substitutions allowed.

b) General:

- i) Ambient temperature -10 to 50 degrees Celsius.
- ii) Humidity: 5 to 95%, non-condensing.
- iii) cUL/UL approved or CSA certified and UL listed.
- iv) Factory wiring shall be labeled at each end with markers which correspond to the approved shop drawing wiring diagrams.

c) Input Power.

- i) 460 Volts Alternating Current (VAC) (+8%, -10%).
 - ii) 3-phase, 3-wire, any phase sequence.
 - iii) 60 Hertz (+/-5%).
 - iv) **Drive shall include surge protection. The surge protective device shall be listed per UL 1449 Third Edition (Sept 2009), Type 1 SPD (In=10kA), 200 kiloAmps (kA) short circuit current rating (SCCR) and have a voltage protection rating (VPR) of 3000Volts per UL 1449.**
 - v) Capable of withstanding line voltage transients up to 3000 volts in accordance with ANSI 37.90.1 and ANSI C62.41.
 - vi) Drive shall be constructed to limit line noise generated due to voltage distortion and line notch. Include as required to meet IEEE 519:
 - (1) Insulated Gate Bipolar Transistor (IGBT) switching.
 - (2) Direct Current (DC) Link Inductor.
 - (3) 3% Line Reactor. Coordinate with separate harmonic filter ahead of drive to assure that the operation of the drive is not impacted due to excessive impedance ahead of drive.
- d) Output Power.
- i) Match to motor.
 - ii) 3-phase, 3-wire.
 - iii) Sinusoidal wave, pulse width modulated wave form.
 - iv) Maximum output: 460 VAC.
 - v) 6 to 60 Hertz, adjustable.
 - vi) Frequency accuracy: +/- 1% of setting.
 - vii) Rate full load output current in excess of motor nameplate current and increase motor current due to harmonics.
 - viii) Output open and short circuit protection.
 - ix) Power transistors shall be IGBT's with Peak Inverse Voltage (PIV) ratings of 1200 volts minimum.
- e) Motor Performance.
- i) 0.5% speed regulation in manual or automatic speed control mode.
 - ii) 150% starting torque.
 - iii) 100% rated torque from 60 Hertz to specified turndown over 10:1 speed range.
- f) Drive features.
- i) Selectable library of routines for 4-20 milliamps direct current (mA_{dc}) follower circuitry to include output proportional to current, offset, slope, minimum clamp, and separate acceleration and deceleration adjustments.
 - ii) Design circuit to accept 4-20 mA_{dc} positive or negative signal, grounded or un-grounded.
 - iii) Automatic restart on nuisance shutdown for up to 5 successive attempts.
 - iv) Minimum Efficiency for constant torque applications.
 - (1) 100% rated speed and load – 95% or better.

- (2) 70% rated speed and 100% load – 94% or better.
- (3) 50% rated speed and 100% load – 93% or better.
- (4) 30% rated speed and 100% load – 91% or better.
- (5) 20% rated speed and 100% load – 87% or better.

- v) Include PI (proportional, integral) control function integral to drive.
- vi) 110% overload capacity for 60 seconds.

g) Short Circuit and Drive Input Protection:

- i) Instantaneous over-current trip shutdown set at 180% and 150% overload capacity for 60 seconds.
- ii) Under-voltage protection with automatic restart.
- iii) Input power circuit breaker with 65,000 amps interrupting capacity (AIC), labeled in accordance with UL Standard 489 with through the door operator.
 - (1) Provisions to lock in “OFF” position.
 - (2) Mechanical interlock to prevent opening cabinet door with disconnect in the “ON” position, or moving disconnect to the “ON” position with the door open.
 - (3) Auxiliary contact on main disconnect to isolate control power when control power fed from an external source.
 - (4) Barriers and warning signs on terminals that are energized with power disconnect “OFF”.

h) Internal Protective Features:

- i) Output phase sequence independent of input phase sequence.
- ii) Phase loss protection.
- iii) High or low sustained voltage shutdown.
- iv) 120 vac or 24 volts direct current (vdc) grounded control circuits.
- v) Anti-regenerative circuit to protect inverter during deceleration.
- vi) Transistor over-current and over-temperature protection.
- vii) Electrically isolated low voltage logic.
- viii) DC bus fuse protection.
- ix) MOV (metal oxide varistor) surge protection.

i) Inverter Adjustments

- i) Maximum Speed: 50 to 100% rated.
- ii) Minimum Speed: 6 to 70% rated.
- iii) Current limit: 10% to 150%.
- iv) Linear Acceleration: 3 to 300 seconds.
- v) Linear Deceleration: 3 to 300 seconds.
- vi) Torque boost.
- vii) Maximum voltage level.
- viii) Electronic thermal overload: 10 to 100% of drive current.
- ix) Carrier frequency: 2.2 to 8.0 kilohertz (kHz) adjustable.
- x) Up to three adjustable skip frequencies.

- xi) Selectable volts/Hertz patterns to include general purpose, variable torque, constant torque, constant horsepower, and programmable.
 - xii) Fault Recovery: Auto Restart.
 - xiii) Loss of Power: Auto Restart.
 - xiv) I/O Assignments: Field Adjustable.
- j) Inverter Diagnostic and Shutdown Protective Features:
- i) External fault.
 - ii) Low line voltage.
 - iii) High line voltage.
 - iv) Instantaneous current overload.
 - v) Internal over-temperature.
 - vi) Over-current stall.
 - vii) Over-voltage stall.
 - viii) Ground fault.
 - ix) Blown input fuse.
 - x) Control power supply failure.
- k) Inverter construction:
- i) Modular construction for ease of maintenance.
 - ii) Easily accessible from front.
 - iii) Construct boards of fire retardant materials in accordance with NEMA Grade FR4 specifications.
- l) External Signals.
- i) Provide communications module with EtherNet/IP protocol for data communications with plant supervisory control and data acquisition (SCADA) system.
 - ii) Capable of accepting two-wire or three-wire start/stop control contacts in the automatic mode.
 - iii) Accept 4-20 mAdc input speed reference with adjustable bias and gain.
 - iv) Accept 0-10,000 ohm potentiometer input speed reference.
 - v) Accept external safety shutdown signals as specified or shown on drawings.
 - vi) Provide dry contact for remote indication of drive run status.
 - vii) Provide dry contact for remote indication of common equipment fail alarm.
 - viii) Provide isolated 4-20 mAdc powered signal for remote indication of drive speed.
- m) Operator interface:
- i) Provide front of panel multifunction display/keypad, capable of controlling drive and setting drive parameters. Provide as a minimum with the following functions:
 - (1)Start

- (2) Stop
- (3) Reset
- (4) Increase/Decrease Speed Control
- (5) Manual or Remote Mode.

ii) Display shall indicate following parameters:

- (1) Control mode – manual or automatic.
- (2) Output frequency.
- (3) Output voltage.
- (4) Output current.
- (5) Motor RPM.
- (6) Alarms and Faults.

iii) Keypad functions shall include:

- (1) Menu driven.
- (2) Parameters stored in non-volatile memory.
- (3) Password or code protected.

n) Harmonic Filter Requirements (100-VFD-0101 and 100-VFD-0102)

i) Harmonic Filter System

- (1) Treat all of the characteristic low frequency harmonics generated by a 3-phase, 6-pulse rectifier load including the 5th, 7th, 11th, 13th, 17th, 19th, 23rd, 25th, etc.
- (2) Suppress 3-phase characteristic harmonics without tuning the filter or adjusting capacitors, inductors or other components.
- (3) Passive, series connected, low pass filter network consisting of inductors and capacitors with a series inductor to block source harmonics and prevent resonance. Insulated Gate Bipolar Transistor (IGBT) based active filters shall not be used. Stand alone harmonic traps shall not be used.
- (4) Accomplish harmonic attenuation without phase shifting loads against other harmonic sources.
- (5) Manufactured in the supplier's own manufacturing facility. Filters shall be fully tested prior to shipment.
- (6) Supplier shall provide evidence of relevant application experience upon request.
- (7) Suitable for use with one or more 6-pulse drives, whether the rectifier consists of diodes or Silicon-Controlled Rectifiers (SCR) and whether or not the drives have internal inductance such as line reactors or direct current (DC) link chokes. Extended warranty shall be optional.

- (8) The filter shall suppress characteristic harmonics to guaranteed levels provided that the power supply line voltage unbalance is between 0% and 1%. If the voltage unbalance is between 1% and 3%, per American National Standards Institute (ANSI) C84.1-1995, the total input harmonic distortion (THID) at any reduced load condition shall not exceed the full load THID by more than 50% (i.e.: if 5% THID at full load, then 7.5% THID at reduced load when voltage unbalance is >1%).

ii) Standard Features

- (1) Suitable for use on any three phase, 6-pulse SCR or diode rectified loads.
- (2) Suitable for use with either a single load or multiple non-linear loads.
- (3) Guaranteed harmonic distortion levels for all operating conditions from 50% load to 100% load.
- (4) For three phase, 6-pulse Variable Frequency Drive (VFD) system the full load input current harmonic distortion shall be limited to 8% THID.
- (5) True power factor - 0.98 lagging to 0.98 leading at the filter full load operating conditions and 0.95 leading at 80% load.
- (6) The harmonic filter shall not cause resonance with the power system.
- (7) The harmonic filter shall not attract harmonics from other loads which are connected upstream of the filter.
- (8) No adverse system interaction problems such as:
 - (a) System resonance.
 - (b) Overloading of filter by upstream harmonics.
 - (c) Overloading of filter due to the addition of non-linear loads elsewhere on the system (upstream of the filter).
- (9) The filter shall not cause the dc bus voltage (of a voltage source inverter) to increase by more than 5% when operated from nominal supply voltage.
- (10) Use of the filter shall result in VFD input current waveform that is consistent with the input current waveform of a drive using a line reactor of 3% minimum impedance.

iii) Basic Requirements

- (1) All internal filter wiring shall be copper.
- (2) Inductive component insulation systems: Class H (180 degrees Celsius).
- (3) Ambient temperature: -40 to +50 degrees Celsius (panel mounted construction).
- (4) Temperature rise: 115 degrees Celsius.
- (5) Full load efficiency: 98% minimum.
- (6) Enclosure: Open panel construction for integration into a single cabinet with the VFD National Electrical Manufacturers Association (NEMA) type 1 general purpose American National Standards Institute (ANSI).

- (7) Filter enclosure shall be fan cooled so as not to rely solely on convection air flow for cooling; fans to be front of enclosure accessible.
- (8) Capacitor contactor with adjustable pick up and drop out to remove the capacitor bank in the filter from the circuit based on motor current.
 - (a) Locate in VFD enclosure.
 - (b) Pick up current switch adjustable from 0 to 100% current range, factory set to 35%
 - (c) Drop out current switch adjustable from 0 to 100% current range, factory set to 20%.

o) Accessories

i) Indicating lights, 30.5mm:

- (1) LED Lamp.
- (2) Transformer type, Push to test.
- (3) Colored lens as specified.
- (4) Transformer rated for 120vac.

ii) Factory install on front of overall controller enclosure (100-VFD-0101 and 100-0102), unless otherwise indicated.

- (1) Operator keypad allowing full VFD control and programming.
- (2) VFD red "Stop", VFD green "Running", and VFD amber "Fault" Pilot Lights, push-to-test: NEMA ICS 2, heavy-duty type.
- (3) Local-Off-Remote selector switch: NEMA ICS 2, heavy-duty type.
- (4) Elapsed Time Meters: Heavy duty with digital readout in hours
- (5) Enclosure steel to be 12 gauge or thicker and have both lifting eyes and fork lift provision on the bottom.

p) Outdoor Enclosure

- i) NEMA 4X 316 stainless steel
- ii) Enclosure shall have a dead front outer panel, lockable, so that there are no controls or disconnects accessible without opening outdoor of enclosure.
- iii) Provide heating and cooling of enclosure for VFD to be suitable for outdoors with ambient temperature of -30 to 50 degrees Celsius and humidity of 5 to 95%, noncondensing.

3. EXECUTION:

3.1 Panelboards

3.1.1 Installation

- (a) Install panelboards and accessory items according to NEMA PB 1.1.

- (b) Mounting Heights: Top of trim 74 in. (1880 mm) above finished floor, unless otherwise indicated.
- (c) Mounting: Plumb and rigid without distortion box. Mount flush panelboards uniformly flush with wall finish.
- (d) Circuit Directory: Type directory to indicate installed circuit loads after balancing panelboard loads. Obtain approval before installing.
- (e) Install filler plates in unused spaces.
- (f) Provision for Future Circuits at Flush Panelboards: Stub four 1 in. (27 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in future. Stub four 1 in. (27 mm) empty conduits into raised floor space or below slab not on grade.
- (g) Wiring in Panelboard Gutters: Arrange conductors into groups, and bundle and wrap with wire ties after completing load balancing.

3.1.2 Identification

- (a) Identify field-installed wiring and components and provide warning signs as specified in Section 16C.
- (b) Panelboard Nameplates: Label each panelboard with engraved laminated-plastic or metal nameplates mounted with corrosion-resistant screws.

3.1.3 Grounding

- (a) Make equipment grounding connections for panelboards.
- (b) Provide ground continuity to main electrical ground bus.

3.1.4 Connections

- (a) 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.

3.1.5 Field Quality Control

- (a) Make insulation-resistance tests of each panelboard bus, component, and connecting supply, feeder, and control circuits.
- (b) Make continuity tests of each circuit.

- (c) Visual and Mechanical Inspection.
 - 1) Check circuit breaker for proper mounting and compare nameplate data to drawings and specifications.
 - 2) Operate circuit breaker to ensure smooth operations.
 - 3) Inspect case for cracks or other defects.
- (d) Balancing Loads: After Substantial Completion, conduct load-balancing measurements and make circuit changes as follows:
 - 1) Perform measurements during period of normal working load as advised by Engineer.
 - 2) Perform load-balancing circuit changes outside normal occupancy/working schedule of facility. Make special arrangements with OWNER to avoid disrupting critical 24 hr services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3) Recheck loads after circuit changes during normal load period. Record all load readings before and after changes and submit test records.
 - 4) Tolerance: Difference exceeding 20% between phase loads, within panelboard, is not acceptable. Rebalance and recheck as required to meet this minimum requirement.

3.1.6 Adjusting

- (a) Set field-adjustable pick-up and time-sensitivity ranges in accordance with Section 16B.

3.1.7 Cleaning

- (a) On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.2 Disconnects, Fuses and Circuit Breakers

3.2.1 Examination

- (a) Examine utilization equipment nameplates and installation instructions to verify proper fuse locations, sizes, and characteristics.
- (b) Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2.2 Installation

- (a) Install enclosed switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.
- (b) Install fuses in fusible devices as indicated. Arrange fuses so fuse ratings are readable without removing fuse.
- (c) Install enclosed switches and circuit breakers level and plumb.
- (d) Install wiring between enclosed switches and circuit breakers and control/indication devices.
- (e) Connect enclosed switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts according to equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.2.3 Identification

- (a) Install typewritten labels on inside door of each fused switch to indicate fuse replacement information.

3.2.4 Coordination Study

- (a) Where coordination study recommends changes in types, classes, features or ratings of equipment or devices specified in Section 16B from those indicated, make written request for instructions. Obtain instructions from ENGINEER before ordering equipment or devices recommended to be changed.

3.2.6 Adjusting

- (a) Set field-adjustable pick-up and time-sensitivity ranges in accordance with Section 16B.

3.2.7 Cleaning

- (a) Upon completion of installation, inspect OCPDs. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.3 Transformers

3.3.1 Installation

- (a) Comply with safety requirements of IEEE C2.

- (b) Arrange equipment to provide adequate spacing for access and for circulation of cooling air.
- (c) Identify transformers and install warning signs according to Section 16B-2.3.
- (d) Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.3.2 Grounding

- (a) Comply with NFPA 70 requirements separately derived systems for connecting to grounding electrodes and for bonding to metallic piping near transformer.
- (b) Comply with Section 16C.

3.3.3 Field Quality Control

- (a) Testing in accordance with Section 16A.

3.3.4

- (a) On completion of installation, inspect components. Remove paint splatters and other spots, dirt, and debris. Repair scratches and mars on finish to match original finish. Clean components internally using methods and materials recommended by manufacturer.

3.3.5 Adjusting

- (a) After installing and cleaning, touch up scratches and mars on finish to match original finish.
- (b) Adjust transformer taps and connections to provide optimum voltage conditions at utilization equipment throughout normal operating cycle of facility. Record primary and secondary voltages, tap settings or connections, and submit with test results.

3.4 Surge Protective Device

3.4.1 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 jobsite or classroom designated by the City for minimum mandays indicated, travel time excluded, for assistance during plant construction, plant startup, and training of the City's personnel for plant operation. Include:
 - i. 1/2 man-day for Installation and Testing Services.
 - ii. 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:
 - i. Voltage measurements from Line-to-Ground, Line-to-Neutral, Line-to-Line and Neutral-to-Ground (as applicable),
 - ii. Impulse injection to verify the system suppression voltage tolerances for all suppression paths. (Note: This testing is separate from any switchgear or other system tests. Completely disconnect the TVSS from the switchgear prior to any switchgear or other system tests, including any hi pot testing.)
 - iii. Record and compare test results to factory benchmark test parameters supplied with each individual unit.
 - iv. Submit a copy of the start-up test results and the factory benchmark testing results to the Engineer and the owner for confirmation of proper system function.

3.4.2 Installation

- (a) SPDs shall be installed on the load side of the main disconnects.
- (b) SPDs shall have a dedicated circuit breaker disconnect at the connection point in the electrical distribution equipment. Low impedance (HPI) cable shall be used to connect the SPD to the electrical distribution equipment. The total cable length between the electrical distribution equipment and the SPD shall be less than 10 feet.

3.4.3 System Warranty

- (a) The SPD system manufacturer shall warranty the entire system against defective materials and workmanship for a period of fifteen 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.

3.5 Automatic Transfer Switch

3.5.1 Examination

- (a) Verify location and layout of automatic transfer switch.
- (b) Verify that electrical power is available and of correct characteristics.

3.5.2 Installation

- (a) Install system and components in accordance with manufacturer's specifications.

- 3.5.3 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.

3.5.4 Field Quality Control

3.5.4.1 Representative of the Manufacturer

- (a) 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:

- i. 1/2 mandays for Installation Services for Automatic Transfer Switch.
- ii. 1/2 manday for Instructional Services for Automatic Transfer Switch.

(b) Test in accordance with Section 16A.

3.7 Variable Frequency Drives

3.7.1 Identification

- (a) Identify field-installed wiring and components and provide warning signs according to Section 16A.
- (b) Identify factory installed wiring within VFDs with wire markers at each end.
- (c) Identify components installed within and on the front of VFDs with laminated nameplates.

3.7.2 Installation

(a) Manufacturer's Field Services:

- 1) Supplier's or manufacturer's representative for equipment specified herein shall be present at job site or classroom designated by Owner for minimum workdays indicated, travel time excluded, to supervise final adjustment of system after installation is complete, system startup, and training of Owner's personnel for system operation. Include minimum of:
 - a. 2 man-days for Installation Services.
 - b. 1 man-day for Instructional Services.
 - c. 1 man-day for Post Startup Services.
- 2) Supplier or manufacturer shall direct services to system and equipment operation, maintenance, troubleshooting, and equipment and system related areas.
- 3) In addition to the services specified above, provide manufacturer's services as required to successfully complete systems demonstration as specified in 16A.

- (b) Installation and wiring of drive shall be by construction contractor.
- (c) Manufacturer shall provide field test personnel to initialize all equipment. A 3-phase harmonic analyzer shall be used to measure Total Demand Distortion (TDD) and Total Harmonic Distortion (THD) (Volt) levels to verify performance to specifications defined herein. Test reports shall be prepared for each point of test. Test reports shall be documented, signed, and dated. All tests shall be submitted to site manager.

VARIABLE FREQUENCY DRIVES (VFD)

Enclosure Tag Number	Associated Equipment Description and Tag Number		Encl. Rating*	Hp**	Equip Spec.	Mod e	Torque
100-VFD-0101	Pump No. 1	100-P-0101	NEMA 4X	45	15D	Volt/ Hertz	Variable
100-VFD-0102	Pump No. 2	100-P-0102	NEMA 4X	45	15D	Volt/ Hertz	Variable

* VFD and harmonic filter shall be installed in the same enclosure.

** Verify Motor Horsepower and Full Load Current with Equipment Supplied. Horsepower is based on Manufacturer A, if contractor selects Manufacturer B, Contractor shall coordinate the requirements for Manufacturer B (i.e. overcurrent protection, conduit, conductors, etc).

END OF THIS SECTION

IDOT TRAINING PROGRAM GRADUATE ON-THE-JOB TRAINING SPECIAL PROVISION (TPG)

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 5.

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.

LOCAL ROADS SPECIAL PROVISION FOR INSURANCE 107-4

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:

City of Naperville

Naperville Township

City of Aurora

The entities listed above and their officers, employees, and agents shall be indemnified and held harmless in accordance with Article 107.26.

LR 1030-2 LOCAL QUALITY ASSURANCE/QUALITY MANAGEMENT QC/QA

LR1030-2

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 type="checkbox"/>	Cores
<input checked="" type="checkbox"/>	Nuclear Density Gauge (Correlated when paving \geq 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."

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)



Storm Water Pollution Prevention Plan



Route	Marked Route	Section Number
North Aurora Road	FAU 1509	06-00133-00-BR
Project Number	County	Contract Number
XUXZ(984)	DuPage	61G79

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
7/28/2022

Print Name Title Agency
 Andy Hynes, PE, PTOE City Traffic Engineer City of Naperville

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:

This project is located along North Aurora Road in the City of Naperville, Naperville Township, and the City of Aurora, Illinois from just east of Pennsbury Lane and extends east to Frontenac Road. The gross and net length of the project is 1,985.00 feet (0.38 miles) for roadway and 3,724.90 feet (0.71 miles) for track. The project is located within Township 38N, Range 9E, Section 8 & 17 and has a Latitude of 41.781444 and a Longitude of -88.231694.

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 involves widening the North Aurora Road underpass under the Wisconsin Central (WCL) and Burlington Northern and Santa Fe (BNSF) Railways. The work consists of pavement removal; curb and gutter removal and replacement; roadway reconstruction, including pavement widening, channelization, sidewalk and multiuse path; grading; storm sewer and drainage structure adjustments and installation; stormwater detention culverts; pump station; maintenance of traffic; erosion control; landscaping; pavement markings; retaining wall; railroad shoofly; railroad bridge; utility coordination, relocation and adjustments; and all incidental and collateral work as necessary to complete the improvement.

C. Provide the estimated duration of this project:

The length of construction is assumed to be 36 months.

D. The total area of the construction site is estimated to be 19.7 acres.

The total area of the site estimated to be disturbed by excavation, grading or other activities is 12.3 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:

Before Construction : C = 0.50; After Construction: C = 0.51

F. List all soils found within project boundaries; include map unit name, slope information, and erosivity:

Site 1 – Drummer Silty Clay Loam (152A) & Varna Silt Loam (223B)
Site 5 – Drummer Silty Clay Loam (152A) & Chenoa Silty Clay Loam (614A)
Site 6&7 – Drummer Silty Clay Loam (152A)
Site 8&9 – Drummer Silty Clay Loam (152A) & Graymont Silt Loam (541B)

G. If wetlands were delineated for this project, provide an extent of wetland acreage at the site; see Phase I report:

Site 1 - 0.01 acres
Site 5 - 0.10 acres
Site 6 - 0.52 acres
Site 7 - 0.20 acres
Site 8 - 1.00 acres
Site 9 - 2.22 acres

H. Provide a description of potentially erosive areas associated with this project:

The existing and proposed drainage ditch to the south between the underpass and the east project limit.

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.):

Pre-Stage 1: Soil disturbing activities will consist of excavation to construct a stormwater detention storage chamber and pump station. A temporary soil retention system will be constructed.

Stage 1: Soil disturbing activities will consist of excavation to construct a temporary roadway with a lower roadway profile and regrading of the existing roadside.

Stage 2: Soil disturbing activities will consist of excavation and construction of embankments for a shoofly bridge and temporary WCL track. Temporary soil retention systems will be constructed.

Stage 3: Soil disturbing activities will consist of excavation to construct the temporary WCL siding track and temporary BNSF lead track. Temporary soil retention systems will be constructed.

Stage 4: Soil disturbing activities will consist of excavation for removal of the temporary WCL main track, shoofly bridge, and temporary soil retention systems, and construction of the BNSF lead track and the WCL siding and main tracks.

Stage 5: This stage involves removing the existing median east of Pennsbury Lane and replacing it with temporary pavement, but there aren't any erosive issues anticipated with these activities.

Stage 6: Soil disturbing activities will consist of excavation to construct the north side of the roadway and storm sewer system, which will impact the existing swale.

Stage 7: This stage involves constructing temporary pavement, but there aren't any erosive issues anticipated with this activity.

Stage 8: Soil disturbing activities will consist of excavation to construct the south side of the roadway and storm sewer system, which will impact the existing swale.

Stage 9: This stage involves constructing the remaining center 18' of the roadway, including the medians. There aren't any erosive issues anticipated with this activity.

The plan documents, hereby incorporated by reference, also contain site map(s) indicating drainage patterns and approximate slopes anticipated after major grading activities, areas of major soil disturbance, the location of major structural and nonstructural 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.

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:

City of Aurora
City of Naperville
Naperville Township

L. The following is a list of General NPDES ILR40 permittees within whose reporting jurisdiction this project is located:

City of Aurora
City of Naperville
Naperville Township

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:

Ferry Creek and Waubonsie Creek

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.

All wetland and surface water sites will be avoided. However, wetland buffers associated with Site 1 and Site 7 cannot be avoided due to their proximity to the existing North Aurora Road. The roadway will be widened and a sidewalk will be constructed within a portion of the wetland buffers, resulting in permanent buffer impacts. The impacted wetland buffers will be seeded with Class 4A Seed Mixture. The seed mix will be sown in the disturbed wetland buffers upon completion of final grading.

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

☐ 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

The wetland buffers at Site 1, Site 5, Site 6, and Site 7 will be permanently impacted.

P. The following pollutants of concern will be associated with this construction project:

☐ Antifreeze / Coolants

☒ Concrete

☒ Concrete Curing Compounds

☒ Concrete Truck Waste

☐ Fertilizers / Pesticides

☐ Paints

☐ Petroleum (gas, diesel, oil, kerosene, hydraulic oil / fluids)

☒ Soil Sediment

☐ Solid Waste Debris

☐ Solvents

☒ Waste water from cleaning construction equipments

☐ Other (Specify) _____

☐ Other (Specify) _____

☐ Other (Specify) _____

☐ Other (Specify) _____

☐ 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 checked="" type="checkbox"/> Geotextiles | <input type="checkbox"/> Temporary Mulching |
| <input checked="" type="checkbox"/> Permanent Seeding | <input type="checkbox"/> Vegetated Buffer Strips |
| <input 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:

Erosion Control Blankets will be used on erodible areas where temporary stabilization may be required, including heavy duty erosion control blanket on slopes steeper than 3:1.

Geotextiles will be used for inlet protection to prevent sediment from entering the drainage system, while still allowing rainwater to enter the catch basin.

Permanent Seeding will be utilized at the end of construction to re-establish the grass in areas where it has been disturbed due to construction activities.

Protection of Trees - Areas of trees, shrubs and other woody vegetation designated to remain undisturbed during any stage of construction shall be protected. Clearly delineate protected areas prior to clearing/grubbing or other soil disturbing activities.

Sodding provides for instant cover for immediate erosion control. It not only provides soil stabilization, but it acts as a filter for runoff. It will be utilized during construction for areas where seeding is not appropriate but immediate vegetative cover is required.

Temporary Erosion Control Seeding - This item will be applied to all bare areas every seven days to minimize

the amount of exposed surface area. Earth stockpiles shall be temporarily seeded if they are to remain unused for more than 14 days. Within the construction limits, areas which may be susceptible to erosion as determined by the Engineer shall remain undisturbed until full scale construction is underway to prevent unnecessary soil erosion. Bare and sparsely vegetated ground in highly erodible areas as determined by the Engineer shall be temporarily seeded at the beginning of construction where no construction activities are expected within seven days, regardless of when permanent stabilization is anticipated.

Describe how the stabilization practices listed above will be utilized after construction activities have been completed:

The contractor will be responsible for seeding all disturbed areas and ensuring that a minimum of 80% of all disturbed areas are vegetated one year following construction.

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 checked="" type="checkbox"/> Stabilized Trench Flow | |
| <input checked="" type="checkbox"/> Dust Suppression | <input type="checkbox"/> Slope Mattress | |
| <input checked="" type="checkbox"/> Dewatering Filtering | <input type="checkbox"/> Slope Walls | |
| <input type="checkbox"/> Gabions | <input checked="" type="checkbox"/> Temporary Ditch Check | |
| <input type="checkbox"/> In-Stream or Wetland Work | <input type="checkbox"/> Temporary Pipe Slope Drain | |
| <input type="checkbox"/> Level Spreaders | <input 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) | Erosion Control Mat |
| <input type="checkbox"/> Permanent Sediment Basin | <input checked="" type="checkbox"/> Other (Specify) | Temporary Sump Pit |
| <input checked="" type="checkbox"/> Retaining Walls | <input type="checkbox"/> Other (Specify) | |
| <input type="checkbox"/> Riprap | <input type="checkbox"/> Other (Specify) | |
| <input type="checkbox"/> Rock Outlet Protection | <input type="checkbox"/> Other (Specify) | |
| <input 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:

Refer to the Erosion Control Plan Sheets for the contract for the specific stabilization practices called out for temporary conditions.

Dust suppression will be used during construction activities to minimize the dust that becomes airborne and likely inhaled by residents and/or workers.

Perimeter Erosion Barrier - As soon as reasonable access is available to all locations where water drains away from the project, perimeter erosion barrier shall be installed as called out in this plan and directed by the Engineer. Silt fences shall be placed along the contour at the limits in an effort to contain silt and runoff from leaving the site. Silt fence shall not be installed in areas of concentrated flow such as across ditches. Silt fence should only be used as Perimeter Erosion Barrier in areas where the work area is higher than the perimeter. The use of silt fence at the top of the slope/elevations higher than the work area should always be avoided. If necessary, temporary fence should be utilized in these locations (where the top of slope/elevation is higher than the work area) in lieu of silt fence.

Retaining Walls- Retaining Walls shall be used as indicated on the plans to limit the areas excavation. Refer to the structural drawings for details and the plans for general layout of retaining walls.

Storm Drain Inlet Protection - Sediment filters will be placed in all open lid inlets, catch basins and manholes during construction and will be cleaned on a regular basis. Avoid using the INLET AND PIPE PROTECTION shown on the Highway Standard 280001. Straw bales and silt fence shall not be used as inlet and pipe protection. Inlet and pipe protection shall be comprised of Inlet Filters, Temporary Ditch Checks, Temporary Seeding and Temporary Erosion Control Blanket, as applicable, at all inlets, catch basins, and manholes for the duration of construction. Inlet filters shall be cleaned on a regular basis.

Stabilized Construction Exits - Stabilized Construction Exits or Entrances will be provided by the Contractor. The entrance shall be maintained in a condition which shall prevent tracking or flowing of sediment onto Public Right-Of-Way. Periodic inspection and needed maintenance shall be provided after heavy use and each rainfall event.

Stabilized Flow Line - The Contractor should provide to the Engineer a plan to ensure that a stabilized flow line will be provided during storm sewer construction. The use of a stabilized flow line between installed storm sewer and open disturbance will reduce the potential for the offsite discharge of sediment bearing waters, particularly when rain is forecasted so that flow will not erode. This work will not be paid for separately and will be included in the cost for STORM SEWERS, of the class, type and diameter specified. Lack of an approved plan or failure to comply will result in an ESC Deficiency Deduction.

Temporary Ditch Checks - Temporary ditch checks shall be placed in all ditches to reduce velocity of flowing water, thereby reducing scour and channel erosion, encouraging deposition of sediment and filtration in the created small ponding areas, and promoting infiltration where suitable soils are present. The temporary ditch check shall be periodically maintained and inspected to ensure it is working properly.

Erosion Control Mat – Erosion control mat will be placed in ditch bottoms along with flocculation powder as a temporary erosion control measure before the final stabilization is placed.

Temporary Sump Pit - The Contractor shall provide a temporary sump pit if unfiltered runoff needs to be pumped from the work area. A perforated vertical standpipe shall be placed in the center of the pit to collect filtered water. The standpipe will be a perforated 12 to 24 inch diameter corrugated metal or PVC pipe. Water is then pumped from the center of the pipe to a suitable discharge area. The pit will be filled with coarse aggregate meeting the requirements of IDOT standards for gradations of CA-2, CA-3 or CA-4. If water from the sump pit will be pumped directly to a storm drainage system, filter fabric will be wrapped around the standpipe to ensure clean water discharge. The installation, inspection, maintenance and materials will not be paid for separately but shall be considered included in the cost of the contract.

All work associated with installation and maintenance of Concrete Washouts is incidental to the contract.

All erosion control products furnished shall be specifically recommended by the manufacturer for the use specified in the erosion control plan prior to the approval and use of the product. The Contractor shall submit to the Engineer a notarized certification by the producer stating the intended use of the product and that the physical properties required for this application are met or exceeded. The contractor shall provide manufacturer installation procedures to facilitate the Engineer in construction inspection.

Describe how the structural practices listed above will be utilized after construction activities have been completed:

Once construction is completed and the vegetation has been established, the perimeter erosion barrier shall be removed. Areas disturbed by the removal will be stabilized with permanent stabilized methods as shown on the plans.

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:

Storm Water Management Controls will be implemented by reducing the flow rates before the storm water leaves the site. This will be accomplished by installing a restrictor manhole upstream of the connection to the City of Naperville storm sewer system.

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:

All management practices, controls and other provisions in this plan are in accordance with "IDOT Standard Specifications for Road and Bridge Construction", "DuPage County Stormwater Management Planning Committee", and the "Illinois Urban Manual".

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.

The contractor will be responsible for the inspection, maintenance, and repair of all sedimentation and erosion control measures. If the Engineer notices or is notified of an erosion or sedimentation deficiency, the Engineer will notify the Contractor to correct it. All maintenance of erosion control systems will be the responsibility of the Contractor until construction is complete and accepted by the Engineer after final inspection. All Offsite Borrow, Waste, and Use areas are part of the construction site and are to be inspected according to the language in this section and Section IV.

Inspection of all ESC measures shall be made at least once every seven days and within 24 hours of the end of each 0.5 inches or greater rainfall (including snowfall). Additionally during winter months, all measures should be checked after each significant snowmelt. Any necessary repairs or cleanup to maintain the effectiveness of said measures shall be made immediately. The project shall additionally be inspected by the Construction Field Engineer on a bi-weekly basis to determine that the erosion control efforts are in place and effective and if other erosion control work is necessary.

All ESC measures shall be maintained in accordance with the IDOT Erosion and Sediment Control Field Guide for Construction Inspection and IDOT's Best Management Practices – Maintenance Guide:<http://www.idot.illinois.gov/transportation-system/environment/erosion-and-sediment-control>

In addition, the following links may also be useful for maintenance:

Illinois Urban Manual (IUM): http://www.aiswcd.org/wp-content/uploads/2013/11/IUM_FM_2013_WEBSITE_hyperlinks.pdf

Best Management Practices (BMP): <http://www.idot.illinois.gov/transportation-system/environment/erosion-and->

sediment-control

Construction equipment shall be stored and fueled only at designated locations. All necessary measures shall be taken to contain any fuel or pollution runoff in compliance with environmental law and EPA Water Quality Regulations. Leaking equipment or supplies shall be immediately repaired or removed from the site. On a weekly basis, the Engineer shall inspect the project to determine whether erosion control efforts are in place and effective and if additional control measures are necessary. Sediment collected during construction by the various temporary erosion control systems shall be disposed on the site on a regular basis as directed by the Engineer and stabilized accordingly.

Protection of trees: Any protective measures which are knocked down shall be repaired immediately. Damaged trees shall be replaced with similar species. Trim any cuts, skins, scrapes, or bruises to the bark of the vegetation and utilize local nursery accepted procedures to seal damaged bark. Prune all tree branches broken, severed, or damaged during construction. Smoothly cut, perpendicular to the root, all cut, broken, or severed during construction, roots 1 inch or greater in diameter. Cover roots exposed during excavation with moist earth and/or backfill immediately to prevent roots from drying.

Temporary Erosion Control Seeding: All areas seeded with temporary seeding are to be inspected every 7 calendar days and after a storm event of 0.5 inches or greater (including snowfall). A visual inspection of this item is necessary to determine whether or not it has germinated. If the seed has failed to germinate, another application of seed may be necessary. If seed has been washed away or found to be concentrated in ditch bottoms, temporary mulch may have to be used to hold seed in place. Inspect other BMPs around the location of the temporary seeding to ensure the successful function of temporary erosion control seeding. Rills greater than 4 inches in depth shall be restored as quickly as possible on slopes steeper than 1V:4H to prevent sheet flow from becoming concentrated flow patterns.

Temporary Erosion Control Blanket: Repair damage due to water running beneath the blanket and restore when displacement occurs. Replace and re-staple all displaced temporary erosion control blankets immediately.

Perimeter Erosion Barrier: This item shall be inspected every 7 calendar days and after a storm event of 0.5 inch or greater (including snowfall). Repair when tears, gaps, leaning, or undermining occur and restore erosion barrier taut. Repair or replace any missing or broken stakes immediately. Sediment shall be removed if the integrity of the fencing is in jeopardy. Remove once permanent stabilization is established.

Temporary Ditch Checks: Remove sediment from the upstream side of the temporary ditch check when the sediment has reached 50% of the height of the structure. Repair or replace temporary ditch checks whenever tears, splits, unraveling, or compressed excelsior is apparent. Replace torn fabric mats to prevent water from undermining the temporary ditch check. Remove debris and garbage when observed. Lengthen temporary ditch checks if water is observed flowing around the ditch check.

Storm Drain Inlet Protection: This item shall be inspected every 7 calendar days and after a storm event of 0.5 inch or greater (including snowfall). Remove sediment from inlet filter basket when basket is 25% full or 50% of the fabric pores are covered with silt. Remove ponded water on road surfaces immediately. Clean filter if standing water is present longer than one hour after a rain event. Remove trash accumulated around or on top of filter. When filter is removed for cleaning, replace filter if any tear is present.

Stabilized Construction Exits: This item shall be inspected every 7 calendar days and after a storm event of 0.5 inch or greater (including snowfall). Replenish stone or replace exit if vehicles continue to track sediment onto the roadway from the construction site. Sweep sediment on roadway from construction activities immediately. Use street sweeping in conjunction with this BMP to remove sediment not removed by the stabilized construction exit.

Stabilized Flow Line: Follow approved maintenance plans provided by the Contractor to avoid the flow from eroding at the upstream and downstream ends of the storm sewer when it is under construction.

Erosion Control Mat: Repair damage due to water running beneath the mat and restore when displacement occurs.

Erosion Control Blanket: Repair damage due to water running beneath the blanket and restore and reseed when displacement occurs. Replace and re-staple all displaced erosion control blankets immediately.

Material Delivery and Storage: Document the various types of materials delivered and their storage locations in the SWPPP. Update the SWPPP when significant changes occur to material storage or handling locations when they have been removed. Cleanup spills immediately. Remove empty containers.

All offsite Borrow, Waste, and Use areas are part of the construction site and are to be inspected according to the language in this section.

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.

IEPA NOTICE OF INTENT (NOI)



Illinois Environmental Protection Agency

1021 North Grand Avenue East • P.O. Box 19276 • Springfield • Illinois • 62794-9276 • (217) 782-3397

Division of Water Pollution Control Notice of Intent (NOI) for General Permit

to Discharge Storm Water Associated with Construction Site Activities

This fillable form may be completed online, a copy saved locally, printed and signed before it is submitted to the Permit Section at the above address.

For Office Use Only

OWNER INFORMATION

Company/Owner Name: City of Naperville

Permit No. ILR10 _____

Mailing Address: 400 S. Eagle Street

Phone: 630-548-2958

City: Naperville

State: IL

Zip: 60540

Fax: _____

Contact Person: Andy Hynes, PE, PTOE

E-mail: hynesa@naperville.il.us

Owner Type (select one) City

MS4 Community: ☐ Yes ☐ No

CONTRACTOR INFORMATION

Contractor Name: TBD

Mailing Address: _____

Phone: _____

City: _____

State: _____

Zip: _____

Fax: _____

CONSTRUCTION SITE INFORMATION

Select One: ☒ New ☐ Change of information for: ILR10 _____

Project Name: North Aurora Road Reconstruction

County: DuPage

Street Address: Pennsbury Ln to Frontenac Dr

City: Naperville

IL

Zip: 60540

Latitude: 41

46

53.2

Longitude: -88

13

54.1

8&17

38N

9E

(Deg)

(Min)

(Sec)

(Deg)

(Min)

(Sec)

Section

Township

Range

Approximate Construction Start Date 3/1/2023

Approximate Construction End Date 11/1/2025

Total size of construction site in acres: 12.26

If less than 1 acre, is the site part of a larger common plan of development?

☐ Yes ☐ No

Fee Schedule for Construction Sites:
Less than 5 acres - \$250
5 or more acres - \$750

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

Has the SWPPP been submitted to the Agency?

☒ Yes ☐ No

(Submit SWPPP electronically to: epa.constilr10swppp@illinois.gov)

Location of SWPPP for viewing: Address: 400 S. Eagle Street

City: Naperville

SWPPP contact information:

Inspector qualifications:

Contact Name: Ben Vander Wal

P.E.

Phone: 847-407-5240

Fax: _____

E-mail: brvanderwal@transystems.com

Project inspector, if different from above

Inspector qualifications:

Inspector's Name: _____

Phone: _____

Fax: _____

E-mail: _____

TYPE OF CONSTRUCTION (select one)Construction Type Reconstruction

SIC Code: _____

Type a detailed description of the project:

This project involves widening the North Aurora Road underpass under the Canadian National and Burlington Northern and Santa Fe (BNSF) Railways. The work consists of pavement removal; curb and gutter removal and replacement; roadway reconstruction, including pavement widening, channelization, sidewalk and multiuse path; grading; storm sewer and drainage structure adjustments and installation; stormwater detention culverts; pump station; maintenance of traffic; erosion control; landscaping; pavement markings; retaining wall; railroad shoofly; railroad bridge; utility coordination, relocation and adjustments; and all incidental and collateral work as necessary to

HISTORIC PRESERVATION AND ENDANGERED SPECIES COMPLIANCE

Has the project been submitted to the following state agencies to satisfy applicable requirements for compliance with Illinois law on:

Historic Preservation Agency ☒ Yes ☐ NoEndangered Species ☒ Yes ☐ No**RECEIVING WATER INFORMATION**Does your storm water discharge directly to: ☐ Waters of the State or ☒ Storm SewerOwner of storm sewer system: City of NapervilleName of closest receiving water body to which you discharge: Ferry Creek & Waubonsie Creek

Mail completed form to: Illinois Environmental Protection Agency
Division of Water Pollution Control
Attn: Permit Section
Post Office Box 19276
Springfield, Illinois 62794-9276
or call (217) 782-0610
FAX: (217) 782-9891

Or submit electronically to: epa.constilr10swppp@illinois.gov

I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this 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. In addition, I certify that the provisions of the permit, including the development and implementation of a storm water pollution prevention plan and a monitoring program plan, will be complied with.

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))

Andrea Hynes
Owner Signature:

Andrea Hynes
Printed Name:

7/28/2022
Date:

City Traffic Engineer
Title:

Page of

INSTRUCTIONS FOR COMPLETION OF CONSTRUCTION ACTIVITY NOTICE OF INTENT (NOI) FORM

Submit original, electronic or facsimile copies. Facsimile and/or electronic copies should be followed-up with submission of an original signature copy as soon as possible. Please write "copy" under the "For Office Use Only" box in the upper right hand corner of the first page.

This fillable form may be completed online, a copy saved locally, printed and signed before it is submitted to the Permit Section at:

Illinois Environmental Protection Agency
Division of Water Pollution Control
Permit Section
Post Office Box 19276
Springfield, Illinois 62794-9276
or call (217) 782-0610

FAX: (217) 782-9891

Or submit electronically to: epa.constilr10swppp@illinois.gov

Reports must be typed or printed legibly and signed.

Any facility that is not presently covered by the General NPDES Permit for Storm Water Discharges From Construction Site Activities is considered a new facility.

If this is a change in your facility information, renewal, etc., please fill in your permit number on the appropriate line, changes of information or permit renewal notifications do not require a fee.

NOTE: FACILITY LOCATION IS NOT NECESSARILY THE FACILITY MAILING ADDRESS, BUT SHOULD DESCRIBE WHERE THE FACILITY IS LOCATED.

Use the formats given in the following examples for correct form completion.

	Example	Format
Section	12	1 or 2 numerical digits
Township	12N	1 or 2 numerical digits followed by "N" or "S"
Range	12W	1 or 2 numerical digits followed by "E" or "W"

For the Name of Closest Receiving Waters, do not use terms such as ditch or channel. For unnamed tributaries, use terms which include at least a named main tributary such as "Unnamed Tributary to Sugar Creek to Sangamon River."

Submission of initial fee and an electronic submission of Storm Water Pollution Prevention Plan (SWPPP) for Initial Permit prior to the Notice of Intent being considered complete for coverage by the ILR10 General Permits. Please make checks payable to: Illinois EPA at the above address.

Construction sites with less than 5 acres of land disturbance - fee is \$250.

Construction sites with 5 or more acres of land disturbance - fee is \$750.

SWPPP should be submitted electronically to: epa.constilr10swppp@illinois.gov. When submitting electronically, use Project Name and City as indicated on NOI form.

Page of

ARMY CORPS OF ENGINEERS PROGRAMMATIC GENERAL PERMIT ACKNOWLEDGEMENT



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, CORPS OF ENGINEERS
231 SOUTH LASALLE STREET
CHICAGO, ILLINOIS 60604-1437

December 18, 2019

Technical Services Division
Regulatory Branch
LRC-2019-936

THIS IS NOT A PERMIT

SUBJECT: General Permit Acknowledgement for proposed widening of North Aurora Avenue at Canadian National Railroad crossing in Unincorporated Naperville Township, DuPage County, Illinois (41.781458, -88.23171)

Andy Hynes
City of Naperville
400 South Eagle Street
Naperville, Illinois 60540

Dear Mr. Hynes:

This letter acknowledges your application for Department of the Army authorization. Your application has been assigned number LRC-2019-936.

As of March 1, 1995, through the issuance of a Programmatic General Permit, the DuPage County Stormwater Management (SWM) has been given authority to evaluate permit applications for activities requiring permits under Section 404 of the Clean Water Act. This authority was granted to the Stormwater Management in order to reduce the duplication of regulatory review by the two levels of government. The county's permit review process is performed in accordance with the DuPage County Countywide Stormwater and Floodplain Ordinance.

The SWM now has primary responsibility for the evaluation of your project, and we will coordinate with that office as required. If you have questions about the county process, you may contact Ms. Jenna Fahey at (630) 407-6728. If a Stormwater Management Permit is issued by the county, and this office concurs with its findings, a Department of the Army authorization will be issued at that time.

Please note that Section 401 Water Quality Certification has been issued by IEPA for this activity under the Programmatic General Permit. If you have any questions on this requirement, you may contact Mr. Darin LeCrone at IEPA Division of Water Pollution Control, Permit Section #15, by telephone at (217) 782-0610.

In the event that the Stormwater Management issues an incomplete permit letter during their review process, this office will subsequently withdraw your application and hold it in abeyance until such time a Stormwater Management Permit is issued for your project. At that time, you shall submit any final plans and changes to the original application submittal to this office and a Department of the Army authorization will then be issued.

If you have questions regarding the Corps of Engineers' requirements, please contact me by telephone at (312) 846-5545, or email at Brielle.K.Cummings@usace.army.mil.

Sincerely,



Digitally signed by
CUMMINGS.BRIELLE.K.153698161
2
Date: 2019.12.18 15:13:56 -06'00'

Brielle K. Cummings
Project Manager, McHenry/DuPage Counties
Regulatory Branch

Enclosure (s)

Copy Furnished:

DuPage County Stormwater Management (Jenna Fahey)
Kane/DuPage SWCD (Patrick McPartlan)
Huff & Huff, Inc. (Lailah Reich)

DUPAGE COUNTY STORMWATER PERMIT



DUPAGE COUNTY STORMWATER MANAGEMENT CERTIFICATION APPLICATION (1/2)

1. Community and Status Naperville <input type="checkbox"/> Non <input checked="" type="checkbox"/> Partial <input type="checkbox"/> Complete	2. Date of Application 	3. Stormwater Application No. (to be assigned by community) 1 9 2 5 0 0 1 0	4. DuPage County Tracking No. SM2019-0117												
5. Applicant: Name: Andy Hynes, P.E., P.T.O.E. - Deputy City Engineer Company Name: City of Naperville Address: 400 S. Eagle Street City, ST, Zip: Naperville, IL 60540 Phone: (630) 548-2958 Email: hynesa@naperville.il.us		6. Owner: Name: Same as applicant Company Name: _____ Address: _____ City, ST, Zip: _____ Phone: _____ Email: _____													
7. Description of Proposed Development: This project is for the reconstruction and widening of North Aurora Road from Pennsbury Lane to Frontenac Road to two lanes in each direction with a barrier median and constructing a new railroad bridge for the WCL/CN Railroad over North Aurora Road. Other work will include excavation, embankment, pump station, storm sewer, sidewalk, multi-use path, lighting, erosion and sediment control, and landscaping.															
8. Location of Development: Address: North Aurora Road Pennsbury Lane to Frontenac Road Municipality: Naperville, Naperville Twp, & Aurora Watershed Planning Area & Trib: Ferry Creek		9. Legal Description <table style="width: 100%;"> <tr> <td style="text-align: center;">17</td> <td style="text-align: center;">38N</td> <td style="text-align: center;">9E</td> </tr> <tr> <td style="text-align: center;">¼ Section</td> <td style="text-align: center;">Township</td> <td style="text-align: center;">Range</td> </tr> <tr> <td>PIN _____</td> <td>PIN _____</td> <td>PIN _____</td> </tr> <tr> <td>PIN _____</td> <td>PIN _____</td> <td>PIN _____</td> </tr> </table>		17	38N	9E	¼ Section	Township	Range	PIN _____	PIN _____	PIN _____	PIN _____	PIN _____	PIN _____
17	38N	9E													
¼ Section	Township	Range													
PIN _____	PIN _____	PIN _____													
PIN _____	PIN _____	PIN _____													
10. Check all of the conditions which apply: <table style="width: 100%;"> <tr> <td><input type="checkbox"/> Flood Plain</td> <td><input checked="" type="checkbox"/> Stormwater Detention</td> <td><input checked="" type="checkbox"/> Best Management Practices</td> <td><input checked="" type="checkbox"/> Soil Erosion & Sediment Control</td> </tr> <tr> <td><input checked="" type="checkbox"/> Wetland</td> <td><input checked="" type="checkbox"/> Wetland Buffer</td> <td><input type="checkbox"/> Riparian Buffer</td> <td></td> </tr> </table>				<input type="checkbox"/> Flood Plain	<input checked="" type="checkbox"/> Stormwater Detention	<input checked="" type="checkbox"/> Best Management Practices	<input checked="" type="checkbox"/> Soil Erosion & Sediment Control	<input checked="" type="checkbox"/> Wetland	<input checked="" type="checkbox"/> Wetland Buffer	<input type="checkbox"/> Riparian Buffer					
<input type="checkbox"/> Flood Plain	<input checked="" type="checkbox"/> Stormwater Detention	<input checked="" type="checkbox"/> Best Management Practices	<input checked="" type="checkbox"/> Soil Erosion & Sediment Control												
<input checked="" type="checkbox"/> Wetland	<input checked="" type="checkbox"/> Wetland Buffer	<input type="checkbox"/> Riparian Buffer													
11. Acknowledgement of On-Site Infiltration PCBMPs I acknowledge that I have used my best effort to identify zones for which on-site infiltration are prohibited for Post Construction Best Management Practices (PCBMPs) in accordance with the Ordinance (15-63.B) <table style="width: 100%;"> <tr> <td style="width: 40%;"> <i>Andy Hynes</i> Signature of Applicant </td> <td style="width: 40%;"> Andy Hynes Print Name </td> <td style="width: 20%;"> <i>10/22/19</i> Date </td> </tr> </table>				<i>Andy Hynes</i> Signature of Applicant	Andy Hynes Print Name	<i>10/22/19</i> Date									
<i>Andy Hynes</i> Signature of Applicant	Andy Hynes Print Name	<i>10/22/19</i> Date													
12. Freedom of Information Act (FOIA) I acknowledge that all architects' drawings, engineers' technical submissions and other construction-related technical documents containing stormwater management information submitted with this application may be made available for inspection or copying by the County, notwithstanding 5 ILCS 140/7(1)(k), upon the written request for such materials. Such productions will be restricted to the following parties: i) the Applicant ii) any subsequent owner of the subject property; or iii) any governmental unit having planning or drainage jurisdiction within 1 and ½ mile of the subject property. <table style="width: 100%;"> <tr> <td style="width: 40%;"> <i>Andy Hynes</i> Signature of Applicant </td> <td style="width: 40%;"> Andy Hynes Print Name </td> <td style="width: 20%;"> <i>10/22/19</i> Date </td> </tr> <tr> <td> <i>Andy Hynes / City of Naperville</i> Signature of Owner </td> <td> Andy Hynes Print Name </td> <td> <i>10/22/19</i> Date </td> </tr> </table>				<i>Andy Hynes</i> Signature of Applicant	Andy Hynes Print Name	<i>10/22/19</i> Date	<i>Andy Hynes / City of Naperville</i> Signature of Owner	Andy Hynes Print Name	<i>10/22/19</i> Date						
<i>Andy Hynes</i> Signature of Applicant	Andy Hynes Print Name	<i>10/22/19</i> Date													
<i>Andy Hynes / City of Naperville</i> Signature of Owner	Andy Hynes Print Name	<i>10/22/19</i> Date													
13. Statement of Opinion for Minimum Criteria for Stormwater Management I am a Professional Engineer under the employment of the Applicant. It is my professional opinion that the development meets the minimum criteria for stormwater management in accordance with the Ordinance (15-36) <table style="width: 100%;"> <tr> <td style="width: 40%;"> <i>Matthew Smith</i> Signature of Professional Engineer </td> <td style="width: 40%;"> Matthew Smith Print Name </td> <td style="width: 20%;"> <i>10/23/19</i> Date </td> </tr> </table>				<i>Matthew Smith</i> Signature of Professional Engineer	Matthew Smith Print Name	<i>10/23/19</i> Date									
<i>Matthew Smith</i> Signature of Professional Engineer	Matthew Smith Print Name	<i>10/23/19</i> Date													

____ Community Copy ____ DuPage County SM Copy ____ Applicant Copy

Page 1 of 2



DUPAGE COUNTY STORMWATER MANAGEMENT CERTIFICATION APPLICATION (2/2)

Community Tracking No: 1 9 2 5 0 0 1 0	DuPage County Tracking No: SM2019-0117
--	--

14. Statement of Opinion for Presence of Flood Plain, Wetlands, and Buffers (15-47-A.5)

<input type="checkbox"/> I acknowledge the presence of flood plain. <input checked="" type="checkbox"/> I deny the presence of flood plain.	<input checked="" type="checkbox"/> I acknowledge the presence of wetlands. <input type="checkbox"/> I deny the presence of wetlands.	<input checked="" type="checkbox"/> I acknowledge the presence of buffers. <input type="checkbox"/> I deny the presence of buffers.
<u>Matthew Smith</u> Signature of Qualified Professional Matthew Smith Printed Name	<u>10/23/19</u> Date <u>Lailah Reich</u> Signature of Qualified Professional Lailah Reich Printed Name	<u>10/23/19</u> Date <u>Lailah Reich</u> Signature of Qualified Professional Lailah Reich Printed Name

15. Soil Erosion & Sediment Control Submittal Requirements (15-50.B)

(For developments with less than 1 acre of land disturbance that are not part of a larger common plan)

I certify that the development meets the soil erosion and sediment control design criteria found in Article VII have been met.

Ben Vander Wal
 Signature of Qualified Designer
 Ben Vander Wal
 Print Name
10/23/19
 Date

16. Soil Erosion & Sediment Control Requirements (15-59.W) (For developments with land disturbing activities greater than 1 acre)

I acknowledge that the site complies with the IEPA NPDES ILR10 Permit.

Andy Hynes
 Signature of Applicant
 Andy Hynes
 Print Name
10/22/19
 Date

17. Acknowledgement of Required As-Built Plans (15-47.B)

I acknowledge that a record drawing signed by either a Professional Engineer or a Professional Land Surveyor depicting the as-constructed size, rim, and invert elevations of pipes, stormwater structures and culverts, and contours and flood storage volumes of all required basins of the major stormwater systems and minor stormwater systems shall be submitted for review and approval upon completion of the stormwater facilities.

Andy Hynes
 Signature of Owner
 Andy Hynes
 Print Name
10/22/19
 Date

18. Intentional Misrepresentation Under Penalty of Perjury

I declare that I have examined and/or made this application and rider, and it is true and correct to the best of my knowledge and belief. I realize that the information that I have affirmed hereon forms a basis for the issuance of the stormwater management certification(s) herein applied for and approval of plans in connection therewith shall not be construed to permit any construction upon said premises or use thereof in violation of any provision of any applicable ordinance or to excuse the owner or his successors in title from complying therewith. The Owner and Applicant each understand and agree to construct said improvement in compliance with all provisions of the applicable ordinances.

Andy Hynes
 Signature of Applicant
 Andy Hynes
 Print Name
10/22/19
 Date
Andy Hynes
 Signature of Owner
 Andy Hynes
 Print Name
10/22/19
 Date

DO NOT WRITE BELOW THIS LINE

19. Security (15-54)

Stormwater Facilities \$ _____
 Wetlands/Natural Area \$ _____
 SE/SC \$ _____
 Total \$ 0.00

20. Stormwater Fees

Community Review \$ _____
 DCSM Review \$ 6,894.50
 Fee-in-Lieu \$ 162,750.00
 Wetland BMP \$ _____

Seal/Stamp

Certifications expire December 31st of the third year of Certification or Authorization, whichever is earlier




21. Final Approvals (See Certification letter for special conditions and general conditions.)

Community Certification 2/10/23 LE for CCH
 Date Approved by/title
 County Authorization _____
 Date Approved by/title

____ Community Copy ____ DuPage County SM Copy ____ Applicant Copy

DUPAGE COUNTY BUILDING & ZONING GRADING PERMIT

	<p align="center">Building & Zoning Department Dupage County</p> <p align="center">BUILDING PERMIT</p> <p align="center">MISC-GRADE-23-000413</p>	<p><u>INSPECTIONS:</u> Erosion Control/Silt Fence Grading Final Inspection</p>
<p>Owner:</p> <p>Address: NORTH AURORA RD, NAPERVILLE 60563</p> <p>Permit Type: Grading Permit</p> <p>Proposed Project: Ex:fill Storm sewer replacement (North Aurora Rd and Un</p>		
<p align="center">This structure shall not be used, occupied, or furnished in whole or in part until a Certificate of Use & Occupancy is issued by the Building Division, where applicable. If no required inspection is scheduled at least every one hundred eighty (180) days, the permit will expire.</p> <p align="center">For Inspections, call 630-407-6700 Monday-Friday 8:00 a.m. - 4:00 p.m. All inspections require minimum 24 hour notice.</p>		
<p align="center">CARD MUST BE POSTED AT THE BUILDING SITE UNTIL FINAL APPROVAL</p>		
<p><i>James Stran</i> _____ Date Issued: <u>8/18/2023</u></p> <p>Building Official</p>		
		<p>There may be times you still need to contact your inspector for further requirements or questions.</p> <p align="center">Call JULIE at 811 or 1-800-892-0123 before you dig</p>

DUPAGE COUNTY HIGHWAY PERMIT INSURANCE REQUIREMENTS (PERMIT DOT2022-0312)

The general contractor shall provide a Certificate of Insurance, naming the "County of DuPage" as additional insured and "County of DuPage c/o Division of Transportation" as Certificate Holder, based upon the requirements of Art. 107.27 of IDOT's "Standard Specifications for Road and Bridge Construction" (latest edition) per the attached information and sample certificate. The description of the certificate should include the note; "The Certificate Holder is named as additional insured with respect to general and automobile liability for all work performed within DuPage County rights-of-way". In addition, the following items are required:

1. General and Automobile liability endorsements naming the "DuPage County, and Any and All Officers, Directors and Employees" as additional insureds to the policy; and
2. Cancellation/non-renewal endorsements for general and automobile liability stating the "County of DuPage c/o Division of Transportation" will be notified if such policy is cancelled. If the cancellation riders cannot be provided, the insured can provide a cancellation notice guarantee to the County per the attached sample (on the insured's letterhead); and
3. Aggregate amounts of the policy shall be: "Per Occurrence" and shall follow the totals specified in the [Division of Transportation Highway Permit Insurance Schedule](#). Combined "General Aggregate" needs to meet the required total amount OR a combination of the General Aggregate and Excess/Umbrella liability needs to meet that aggregate amount; and aggregate amounts for auto must follow the same schedule.
4. Waiver of Subrogation on Workers Compensation and General liability and Auto liability endorsements.
5. Primary and Non-contributory endorsements.
6. Proof of Workers Compensation coverage on Certificate of Insurance only; and
7. Policy numbers must be identified on all pages of the policy/endorsements and coincide with the Certificate of Insurance.

Please mail or email the completed documents to the Division of Transportation Department e-mail at: hwypermits@dupageco.org.

If you have any questions, contact the Department at 630/407-6900 (M-F 8 am to 4:30 pm, excluding holidays).

DOT Permit Requirements:

Construction and Utilities insurance requirements are the same.

Certificates of Insurance and Endorsements shall IDENTIFY the project by either address, Project name or #, naming both the property owner (if applicable) and “DuPage County, and Any and All Officers, Directors and Employees as Additional Insured’s”.

Contractor is responsible for same insurance requirements of any sub-contractors they hire.

All endorsements must have the appropriate policy number (usually upper right corner).

Type of Insurance required is the same however limits vary by the total amount of the project.

Type of Insurance	Project <\$25K	Project >\$25K-150K	Project >\$150K-1M	Project >\$1M
Worker Comp.	Statutory	Statutory	Statutory	Statutory
Employers Liability	\$500,000	\$1M	\$1M	\$1M
General Liability	\$500,000	\$1M	\$1M	\$2M
Auto	\$500,000	\$1M	\$1M	\$1M
Umbrella Excess	\$0	\$0	\$1M	\$4M

Additional Requirements:

The Contractor must submit the baseline work schedule and a list of sub-contractors with addresses and contact information to the DuPage County Division of Transportation when available to:

Director of Transportation – Christopher C. Snyder
DuPage County Division of Transportation
421 N. County Farm Road
Wheaton, IL 60187
Christopher.Snyder@dupageco.org

CITY OF AURORA STORMWATER CERTIFICATION



City of Aurora

Department of Public Works • 44 East Downer Place • Aurora, Illinois 60507-2067
Engineering Division • Office 630-256-3200 • Fax 630-256-3229

Kenneth Schroth, P.E.
Director of Public Works
City Engineer

Memorandum

Date: November 25, 2019

To: Tim Weidner, P.E.
Road & Bridge Coordinator
Public Works/Engineering Division

From: Souts Thavong, P.E, CFM
Engineering Division

**RE: City of Aurora Stormwater Permit Application Review
North Aurora Road Improvements-
Pennsbury Lane to Frontenac Road**

Hi Tim

I have reviewed the stormwater permit application for the above project; "City of Aurora Stormwater Management Permit Submittal, North Aurora Road (FAU Route 1509) Pennsbury Lane to Frontenac Road", with a date of October 2019, prepared by TranSystem Corporation. Preliminary engineering plan titled "Proposed Federal Aid Highway, FAU 1509 (North Aurora Road) Pennsburg Lane to Frontenac Road Reconstruction Section 06-00133-00-BR was used for references and was not reviewed in detail.

The stormwater permit application is found to be acceptable and no further submittal is required.

The following are noted:

1. For linear project (trail/roads), the total net impervious must be more than 1 acre (Article IV and V of the revised Kane County Stormwater Ordinance) for stormwater detention and BMPs to be required. The net new impervious areas (approximately 19,500 SF), that are located within the City limits, are less than 1 acre.
2. There are two small tributary areas that are located within the City of Aurora and within the project limits. The majority of the tributary areas that are in the project limits are located in Naperville Township and drain east toward Naperville Township. Underground detention with a pump station, located east of the RR track and in the City of Naperville will be constructed to address Naperville's SWM requirements.
 - a. The two tributary areas, tributary one, DP-2 has a tributary area of approximately 20,239 SF (CN 85). This tributary is located within the City limits. Under existing condition, this area drains west to the existing 15" storm sewer on North Aurora Road (in the City limits). Under proposed condition, this area will continue to drain west to the existing storm sewer. The total tributary under proposed condition, draining west is approximately 167,000 SF (CN 87), smaller than existing condition. The proposed flow to this storm sewer is less than the existing flow under existing condition.

printed on recycled paper

- b. The other tributary area, DP-3, has a tributary area about 34,000 SF (CN 88). This area drains to the existing 12" storm sewer located on the south side of North Aurora Road that eventually discharges to the pond in the Ashton Pointe Subdivision (located in City). A total of 26,000 SF (CN 88) of tributary is proposed to drain to this existing storm sewer. The proposed flow is less than the existing flow under existing condition.
- 3. There are not floodplain on site.
- 4. There is one existing wetland that are located within the City of limits, wetland site # 1. This wetland is north of North Aurora Road. Approximately 0.01 acre of wetland site # 1 is within the project limits and located within Naperville Township. The portion of wetland site #1 that is within the City is not in the project limit and will not be impacted.

Cc: Mark Phipps, P.E., New Development Coordinator, Engineering Division (via email)

IEPA WATER MAIN CONSTRUCTION PERMIT (NAPERVILLE)

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: NAPERVILLE (IL0434670)

Permit Issued to:
City of Naperville
400 South Eagle Street
Naperville, IL 60540

PERMIT NUMBER: 1251-FY2024

DATE ISSUED: June 20, 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: TranSystems Corporation

NUMBER OF PLAN SHEETS: eight

TITLE OF PLANS: "FAU 1509 (North Aurora Road) Pennsbury Lane to Frontenac Road Reconstruction"

APPLICATION RECEIVED DATE: May 21, 2024

PROPOSED IMPROVEMENTS:

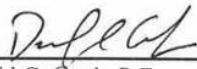
Install approximately 551 feet of 12-inch water main.

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. 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. The permit approval is for the Application, Schedule B, and 8 plan sheets received on May 24, 2024.

DCC:GAZ

cc: TranSystems Corporation
Elgin Regional Office
DuPage County Health Department



David C. Cook, P.E.
Manager Permit Section
Division of Public Water Supplies

IL 532-0168/PWS 065 Rev. 04-2007

STANDARD CONDITIONS FOR CONSTRUCTION/DEVELOPMENT PERMITS
ISSUED BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

The Illinois Environmental Protection Agency Act (Illinois Compiled Statutes, Chapter 111-1/2, Section 1039) 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.
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 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 Board of 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.

IEPA WATER MAIN CONSTRUCTION PERMIT (AURORA)

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: AURORA (IL0894070)

Permit Issued to:
City of Aurora
44 E Downer Place
Aurora, IL 60507

PERMIT NUMBER: 1322-FY2024

DATE ISSUED: July 26, 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: TranSystems Corporation

NUMBER OF PLAN SHEETS: 20

TITLE OF PLANS: "FAU 1509 (North Aurora Rd) Pennsbury Lane to Frontenac Road Reconstruction"

APPLICATION RECEIVED DATE: June 10, 2024

PROPOSED IMPROVEMENTS:

*** The installation of approximately 1,027 feet of 12-inch diameter watermain and 71 feet of 6-inch diameter watermain along North Aurora Road in Aurora, IL.*****

ADDITIONAL CONDITIONS:

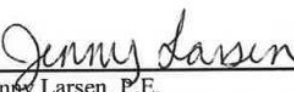
1. All water mains shall be satisfactorily disinfected prior to use pursuant to Ill. Adm. Code, Title 35, Subtitle F, Section 602.310. Two consecutive sets of samples collected at least 24 hours apart must show the absence of coliform bacteria. The samples must be collected from every 1,200 feet of new 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.

AURORA (IL0894070)
PERMIT NUMBER: 1322-FY2024
DATE ISSUED: July 26, 2024
Page 2

2. The permit approval is for the Application, Schedule A, Schedule B, and 20 plan sheets received on June 10, 2024 and additional information received on July 5, 2024.

JML:LKW

cc: TranSystems Corporation
Elgin Regional Office
DuPage County Department of Public Health



Jenny Larsen, P.E.
Working Supervisor, Permit Section – Unit B
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 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.

**CN SPECIFICATION HC05121 – STRUCTURAL STEEL FABRICATION FOR RAILWAY
BRIDGES (MODIFIED)**

**SPECIFICATION HC05121
STRUCTURAL STEEL FABRICATION
FOR RAILWAY BRIDGES
(MODIFIED)**

SZ

OFFICE OF THE CHIEF ENGINEER - STRUCTURES
CANADIAN NATIONAL RAILWAY
EDMONTON, ALBERTA
January 12, 2010

GENERAL CONDITIONS

~~The general conditions of the purchase order and all parts of Section HC01000 shall apply equally to this Specification.~~

PART 1 - GENERAL

1.1 Work Included

- .1 The work shall include all members required to complete the steel superstructure as shown on the drawings and as specified herein.
- .2 This work shall generally include supply, fabrication, assembly, loading and blocking of the following:
 - .1 plate girders, including shear connectors
 - .2 stiffeners,
 - .3 diaphragms,
 - .4 jacking beams,
 - .5 floor beams, spacer beams and stringers,
 - .6 bottom and top cross bracing,
 - .7 gusset plates,
 - .8 lifting devices,
 - .9 inspection catwalks and inspection bars,
 - .10 all shop and field high strength connection bolts,
 - .11 shop welds
 - .12 trainman's walkway grating, handrail, support structures and field connection hardware
 - .13 deck plates and deck drains
 - .14 grillages and shim plates
 - .15 deck joint cover plates
 - .16 fibre optic support brackets
 - .17 all other members required to complete the steel superstructure as shown on the drawings and specified herein.
 - .18 all labour, material and equipment required to load and block the steel superstructure on Railway cars for transport.
- ~~.3 Work included in a specific project will be listed in Section HC01000 of the Specifications.~~

1.2 Work Excluded

- .1 Substructure construction, off-loading of the bridge spans, removal of existing spans and erection of new spans and other associated materials at the bridge site.
- .2 Track materials (ties, tie plates, rails, guardrails, crushed rock ballast, spacer bars, hook bolts and hardware) will be supplied by others.

1.3 Related Work Specified Elsewhere

- .1 Fixed and expansion bridge bearings.

1.4 Reference Specifications, Standards and Guidelines

- .1 Perform work in accordance with the requirements of this Specification and the latest versions of following documents:
- .1 AREMA Chapter 15 (2009) - Steel Structures
 - .2 CSA G40.20/G40.21-04 (R2009) - Structural Quality Steel
 - ASTM A709/A709M-09a - Standard Specification for Structural Steel for Bridges
 - A588/A588M-05 - Standard Specification for High-Strength, Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
 - A572/A572M-07 - Standard Specification for High-Strength, Low-Alloy Columbium-Vanadium Structural Steel
 - A500/A500M-09 - Standard Specification for Cold-Formed Welded and Sea
 - A36/A36M-08 - Standard Specification for Carbon Structural Steel
 - .3 ASTM A325-09a, Type 3 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - .4 ASTM F1554-07a - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
 - .5 CSA W59-03 (R2008) - Welded Steel Construction (Metal Arc Welding)
 - AWS D1.5/D1.5M:2008 - Bridge Welding Code

- | | | | |
|-----|------|------------------------|--|
| | AWS | A5.29/A5.29M:2010 | - Specification for Low-Alloy Steel Electrodes for Flux Cored Arc Welding |
| .6 | CSA | W47.1-09 | - Certification of Companies for Fusion Welding of Steel |
| .7 | ASTM | B833-09 | - Standard Specification for Zinc and Zinc Alloy Wire for Thermal Spraying (Metallizing) for the Corrosion Protection of Steel |
| | AWS | C2.23-03/SSPC-CS 23.00 | - Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel |
| | AWS | C2.18-93 | - Guide for the Protection of Steel with Thermal Sprayed Coatings of Aluminum and Zinc and Their Alloys and Composites |
| .8 | ASTM | A123-09 | - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products |
| .9 | ASTM | A153-09 | - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware |
| .10 | ASTM | B695-04 (2009) | - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel |
| .11 | CNR | Standard Details | - S1, S2, S3, S4, S5, S6, S7, S8, S10 |
| .12 | CNR | TD-05-L1 | - Location for Bridge Name |
- .2 The Fabricator shall insure that the steel fabricator's foreman and welding supervisor have a copy of the specifications and AREMA Chapter 15; and are readily available for CN Inspectors' reference.

1.5 Source Quality Control

- .1 Prior to fabrication provide the Engineer with two copies of steel producer certificates, in accordance with CSA G40.20 (ASTM A6) for all steel supplied by Contractor.
- .2 Provide the Engineer with two copies of Charpy V-notch certified test reports prior to the start of fabrication.
- .3 Materials and fabrication will be subjected to inspection by Engineer or by organization appointed by Engineer. Provide suitable facilities and cooperate fully with inspection organization and Engineer in carrying out inspection and tests required.
- .4 Fabricator shall submit to CN's appointed Inspection Engineer for review and approval of material traceability reports and non-destructive test results carried out as part of internal quality assurance in the plant.

1.6 Identification of Correspondence and Shop Drawings

- .1 Clearly identify all shop drawings and correspondence submitted to the Engineer with the project title as it appears on the Railway's drawing title block including subdivision and mileage.

1.7 Shop Drawings

- .1 Submit shop drawings for review by the Engineer before any shop work is commenced. Shop Drawings are to be submitted in electronic "PDF" format. These can be sent via email or deposited on to CN's FTP site.
- .2 Clearly indicate shop and erection details including cuts, copes, connections, holes, bearing plates, threaded fasteners, and welds. Indicate welds by CSA / AWS welding symbols.
- .3 All changes in material from that specified shall be underlined in red on all prints submitted for review.
- .4 After review, provide corrected drawings in electronic "PDF" format. These can be sent via email or deposited on to CN's FTP site.
- .5 No alterations shall be made to any reviewed plan without the written consent of the Engineer.
- .6 Correctness of all shop drawings irrespective of any review by the Engineer shall be the responsibility of the Fabricator.
- .7 As-built shop drawings shall be submitted in electronic form. Electronic form shall be submitted on a CD disk in two different formats - ADOBE ACROBAT "PDF" and AUTOCAD "DWG".

- .8 As-built shop drawings in electronic form shall be delivered to the Railway Company as soon as the shop fabrication is completed, drawings shall be addressed to:

CANADIAN NATIONAL RAILWAYS

George Nowak, P. Eng
Senior Structural Engineer
10229 – 127th Avenue,
Floor 2 Building "B",
Engineering - Structures,
Edmonton, Alberta
T5E 0B9

- .9 Drawings shall be drawn to the same system (Metric or Imperial) as the Railway Company's drawings.
- .10 Any materials ordered with the exception of material supplied by CN prior to the review of the shop detail drawing shall be at the Fabricator's risk.
- .11 Final payment will not be issued unless all plans are delivered to the Railway Company.
- .12 Each job shall be considered separately. Complete sets of shop drawings for each bridge location, clearly identified as to Subdivision, Mileage and name of crossing are to be submitted for the Engineer's review. Detail plans for each bridge location shall be complete with all sizes of materials indicated for each set.

1.8 Method of Payment

- ~~.1 Submit Lump Sum Prices on the "Request for Quotations" for fabrication, loading and blocking for each span.~~
- ~~.2 The Lump Sum for fabrication shall include loading and blocking to CN approval on railcars.~~

PART 2 - PRODUCTS

2.1 Materials

- .1 **General requirements for steel:**
- .1 Steel shall be in accordance with CSA G40.21 or ASTM A709, A588, A572, A500 and A36.
- .2 Grade and types, Fracture Critical Members:

- .1 CSA G40.21 Grade 350AT Category 5, A709 Grade 50WF3
 - .1 Plate girder webs and flanges,
 - .2 Stringers, floor beams and jacking beams (made from steel plate)
- .2 CSA G40.21 Grade 350AT Category 3, A709 Grade 50WF3
 - .1 Stringers, floor beams and jacking beams (from rolled sections)
 - .2 Connections between floor beams and main girders.
 - .3 End bearing stiffener plates
- .3 Grade and Types, Non-Fracture Critical Members:
 - .1 CSA G40.21 Grade 350A, 350W, (A588, A709, A572 and A36 with minimum actual yield strength of 50 ksi)
 - .1 Bracing
 - .2 Struts
 - .3 Intermediate and horizontal stiffeners
 - .4 Knee bracing
 - .5 Deck plates
 - .6 Walkway brackets
 - .7 Columns/posts
 - .8 Jacking beams when used solely for jacking and not part of a floor system
 - .9 Gusset plates
 - .10 All other miscellaneous components
 - .2 CSA G40.21 Grade 300W (A572, A36, A500 Grade B with minimum actual yield strength of 42 ksi)
 - .1 Secondary members to be galvanized as specified on the drawings
- .4 When ordering steel from the Mill, state that it will be used for railway bridge construction.
- .5 Furnish to the Railway Company's Shop Inspector mill test reports, properly correlated to all steel sections to be used for steel construction under this specification.
- .6 Before the start of fabrication, supply to the Railway Company the results of the low temperature Charpy impact tests made in accordance with CSA G40.21 (ASTM A709). Three test pieces for thickest plate of each heat of web and flange plates in the main girders shall be taken. The tests shall be taken at the temperature of -30 deg. C (-22 deg F) and shall have the following guaranteed minimum average level of energy absorption:
 - .1 Category 5 material - **34 Joules (25 ft-lbs)**
 - .2 Category 3 material - **27 Joules (20 ft-lbs)**

- .3 For ASTM designated steels, impact test requirements will be as per Zone 3 service temperatures of Table 15-1-14 of AREMA Chapter 15 for Fracture Critical Members, and will be as per Zone 3 service temperatures of Table 15-1-2 for NonFracture Critical elements.
- .7 Material for Charpy specimens shall be supplied to the Railway Company for their inspection when requested.
- .8 All identification and erection marks shall be located on surfaces, which will not be visible in the completed structure.
- .9 Fabrication shall be carried out in the Fabricator's own plant, the use of sub-contractors for all or portions of the fabrication will only be considered unless applied for in writing by the Fabricator and subsequently approved in writing by the Engineer. The Fabricator shall be fully responsible for the quality of work and shall bear all additional costs related to work being carried out at the sub-contractors plant such as additional quality inspections, shipment, etc.
- .2 **High strength bolts, nuts and washers:** bolts to ASTM A325 Type 3, nuts to ASTM A563-C3 Grade DH3 and washers to ASTM F436 Type 3. Galvanized bolted items may be used when approved by the Engineer. Bolt tightening shall be provided by means of the turn-of-nut method.
- .3 **Anchor bolts, washers and nuts:** anchor bolts to ASTM F1554, Grade 105 and supplied with UNC threads as shown on Drawing S3m/S3i. Steel plate washers shall be of sufficient area to completely cover each hole, with a minimum yield strength of 250 MPa (36 ksi). Nuts shall be specified as ASTM A563, heavy-hex style, to accommodate overlapping of threads due to metallized coatings. Anchor bolts, washers and nuts shall be galvanized.
- .4 **Welding:**
 - .1 Welding of principal members shall be performed by automatic or semi-automatic submerged arc process, in accordance with CSA Standard W59 Welded Steel Construction or AWS D1.5.

Gas metal-arc, electrogas, and electroslog welding are not permitted.

Welds between the web and flange plates shall be made in the flat position, except that 8 mm (5/16") fillet welds may be made in horizontal position.

The fabrication of steel members designated herein or on design plans as fracture critical members and the materials making up those members shall be in accordance with the requirements set forth in AREMA Manual for Railway Engineering, Chapter 15,

Section 1.14 - Fracture Critical Members. All welding for fracture critical members shall be in accordance to AWS D1.5, Section 12.

- .2 Welding electrodes and fluxes shall conform to the latest revised editions of:
 - .1 CSA W48 / AWS D1.5 for submerged arc welding
 - .2 CSA W48 / AWS D1.5 for manual welding
 - .3 AWS A5.29 / A5.29M for flux cored arc welding

The deposited weld metal shall have atmospheric corrosion properties and Charpy V-Notch impact resistance properties similar to the parent (base) metal being welded.

The electrodes for manual welding shall be low-hydrogen Type E55018-C3 (E8018-C3).

The electrode for flux core welding shall be Low Hydrogen E8XTX-Ni1 (E7XT8-Ni1).

Arc strikes and tack welds, which will not be incorporated into the final welds as shown on the approved drawings, will not be permitted. Tack welds are to be not longer than 70 mm (2 ¾"), not closer than 500 mm (20") and no larger than 5mm (3/16").

- .3 Exact shop welding procedures, including weld sizes, stress relief treatment, types of electrodes, flux, current, and sequence of welding shall be submitted for the Engineer's review. Any standard sheets submitted for review shall be marked up to indicate clearly the type of weld to be used for every particular application. The welding procedures used shall be indicated on Fabricator's shop drawings by cross-referencing them with the standard sheets submitted.

All joints and procedures shall be approved by the Canadian Welding Bureau in accordance to CSA W59 or AWS D1.5.

- .4 All welding shall be done by Operators qualified under the provisions of the CSA Standard W47.1, Division 1 or AWS D1.5.
- .5 Butt welds of tension flange plates shall be stress-relieved in accordance with procedure described in Clause 5.12 of CSA Standard W59 or Section 4.4 of AWS D1.5.
- .6 Fillet welds between flange and web plates and between end stiffeners and web plates will be NDT tested.

Flange and web butt welds will be inspected (after stress relieving when applicable) by approved radiographic and ultrasonic methods and approved before assembly of flanges to the web. Standards of acceptance for radiographic, ultrasonic or magnetic

particle examination of welds shall be as specified in CSA Standard W59, Clause 12.5 / AWS D1.5, Section 4.4.

Railway Company will arrange and pay for the radiographic, ultrasonic or magnetic particle tests, except that the cost of inspection of any welding repairs entailed in the fabrication will be at the expense of the steel fabricator.

.5 Shear Connectors

- .1 Shear connectors shall be as specified and tested in accordance with AREMA Chapter 15, Clause 1.7.9.3.
- .2 Diameter, length and spacing of the shear connectors shall be as indicated on the drawings.
- .3 Shear connectors shall be as manufactured by Nelson Stud Welding Division of KSM of Canada Ltd., or approved equal.

2.2 Grating

- ~~.1 Grating for Inspection Catwalks shall be Standard Flowforge Steel Grating Type 30-102M, size of bearing bars 38mm x 3.2mm as manufactured by Fisher & Ludlow, or approved equal.~~
- ~~.2 Grating for Trainman's Walkways shall be Heavy Duty Flowforge Steel Grating Type HD 38 H4, size of bearing bars 38mm x 9.5mm at 60mm o/c and cross bars at 102mm o/c, as manufactured by Fisher & Ludlow, or approved equal. Supply of the grating shall include saddle clips and 13mm bolts.~~
- ~~.3 Grating panels shall be fully banded.~~
- ~~.4 Grating panels shall be welded to angle retainers.~~
- ~~.5 Grating shall be hot dipped galvanized and cut to the dimensions shown on the drawings. All welds shall be wire brushed clean and coated with "Z.R.C. Cold Galvanizing Compound" supplied by Kerry Industrial Supplies, Agincourt, Ontario, or other approved liquid galvanizing material. The material shall be applied in strict accordance with Manufacturer's specifications.~~
- ~~.6 Gratings shall be fabricated and installed in such a manner that the cross bars in each grating runs continuously in the same direction.~~

2.3 Handrails

- .1 Handrails shall be of tubular round steel, hot-dipped galvanized after fabrication as detailed on the drawings.

2.4 Hot Dip Galvanizing

- .1 All steel except anchor bolts, where called for on the drawing as being hot-dip galvanized shall be executed after fabrication of the element and shall be in accordance with ASTM A123 and shall have a minimum mass of zinc coating of 610 g/m² (2 oz/ft²).
- .2 ASTM F1554 Anchor bolts shall be galvanized by the following methods:
Grade 105: Zinc Hot Dip to ASTM A153 Class C
- .3 Galvanized nuts shall be tapped oversize according to ASTM A563 and shall meet the requirements of supplementary Requirement S1 of ASTM 563. Excess hot-dip galvanizing on threaded portions shall be removed by centrifuging or air blasting immediately upon withdrawal; flame chasing is prohibited.
- .4 Prior to galvanizing all steel components shall be surface prepared in accordance with SSPC-SP10.

~~2.5 Metallization~~

- ~~.1 The following areas shall be zinc metallized with a minimum coating of 0.25mm in accordance with AWS C2.23-03/SSPC CS 23.00:~~
 - ~~.1 Girder ends, to the extent shown on the drawings,~~
 - ~~.2 Top surface and sides of the top flange, Deck Plate Girders only.~~

~~2.6 Painting of Metallized Surfaces~~

- ~~.1 Apply 2 coats of PPG Amercoat 385 to the metallized areas at the girder ends. Minimum dry film thickness per coat shall be 3 mils (75 microns). Color shall be Ameron RT1405 (Reddish Brown).~~

2.7 Identification of Span

- .1 Apply, where shown on the drawings, a 8" x 12" (200mm x 300mm) span identification plate. The plate shall be installed using two 3/8" (10mm) diameter stainless steel cap screws in accordance with Drawing TD-05-L1 attached to these specifications.
- .2 The plate and screws will be supplied by the Railway.

2.8 Fibre Optic Ductwork

- .1 Supply and deliver fibre optic ductwork on each side of the main girders as detailed. Fibre optic ducts shall be 4" x 4" fabricated from 14 gauge galvanized sheet steel as manufactured by Hovey Industries and

distributed by IEC Holden Inc., or approved equal. The ducts shall be supplied in minimum lengths of 3 feet.

- .2 Ducts shall be supplied with field assembly bolts required for a complete installation in the field by the Railway.
- .3 Ducts shall be supplied with removable covers permitting the installation of fibre optic cable.
- .4 At each main girder, at the end of the span the Fabricator shall supply two 45 degree elbows (one downward and one upward) in order to permit burial of the duct approximately 2 feet into the embankment.

2.9 **Bearing Levelling Pads**

- .1 The Fabricator shall supply and place levelling pads where indicated on the drawings.
- .2 Levelling pads shall be laminated fabric rubber such as Fabreeka, Sorbtex or equivalent.
- .3 The levelling pads, where indicated, shall be fully adhered with a waterproof adhesive compatible with the pad.

PART 3 - EXECUTION

3.1 ~~Work Schedule~~

- ~~.1 **PROVIDE WITH THE TENDER A DETAILED WORK SCHEDULE** in increments of not more than one week. The detailed schedule shall be in a clear, concise, bar chart form and shall clearly indicate the fabrication periods and sequences of operations of each item of work in sufficient detail so the Engineer can determine the feasibility of the program and monitor the progress of the work. A copy of the acceptable work schedule form is attached to these specifications. The work schedule must be submitted with your quotation in order for your tender to be considered.~~
- ~~.2 When establishing the work schedule conform to the mandatory delivery date called for in the "Delivery" clause of the "Instructions to Bidders".~~
- ~~.3 Interim reviews of work progress based on schedule submitted by the Fabricator will be conducted as decided by the Engineer and schedule updated by the Fabricator in conjunction with approval of the Engineer.~~
- ~~.4 Delivery date must be met otherwise damages will be assessed by the Railway and charged to the Fabricator.~~

3.2 **Fabrication Procedures and Tolerances**

- .1 Fabrication procedures and tolerances shall be in accordance with Chapter 15, Part 3 of the AREMA Manual, unless stated otherwise in the specifications or on the drawings.
- .2 Shearing of plates shall only be permitted on edges of secondary material which will be welded; all edges of primary material must be machine flame cut or, if sheared, must be planed to a depth of 1/4" (6mm).
- .3 Flange material preheating:
 - .1 Flange material thicker than 1 1/2" (40mm) and up to 2 3/8" (60 mm) shall be preheated to 150 deg F (65 deg. C) before flame cutting or welding.
 - .2 Flange material thicker than 2 3/8" (60 mm) shall be preheated to 225 deg. F (107 deg C) before flame cutting or welding.
- .4 All holes must be drilled from the solid or sub-punched a maximum 11/16" (18 mm) diameter and reamed.
- .5 Steel templates with hardened bushings will not be required for drilling holes in gussets and bracing with 4 holes or less.
- .6 Camber in girders shall be as indicated on the drawings. Deviation from camber in girders shall not be permitted.
- .7 Bottom flanges of girders over bearings shall be true and square. Maximum measured deviation at outside edge of bearing plates shall not exceed 1/25" (1mm).
- .8 Deviations from straightness of main girders shall not exceed 1/8" (3 mm).
- .9 Submit request for approval of flange splices, other than as called for on the drawings, with tendering documents.
- .10 Field connections and bolts for deck joint cover plate:
 - .1 Supply all bolts for shop and field connections as called for on the drawings.
 - .2 The Fabricator shall supply additional high strength connection bolts for field assembly. The number of field high strength bolts of each size and length furnished in excess of the nominal number required shall be 5% plus 5. The number of nuts and washers of each size and type furnished in excess of the nominal number required shall be 5%.
 - .3 All shop and field connections shall be slip-resistant (friction-type) using High Strength bolts.
 - .4 Bolts shall conform to ASTM Specification A325 Type 3, with matching nuts to ASTM A563-C3 Grade DH3 and washers to ASTM F436 Type 3.

- .5 Contact surfaces shall be thoroughly cleaned of all weld deposits and dirt prior to assembly of components in order to obtain the desired friction component.
- .6 Tightening of high strength bolts shall be executed by the turn-of-nut method as specified under Chapter 15, Part 3, Clause 3.2.3 of the AREMA.
- .11 Assembly:
 - .1 For spans called for on the drawing or specification as being shipped completely assembled:
 - .1 Spans shall be shipped entirely shop assembled complete with bearing assemblies except for the following items:
 - .1 Walkway brackets shall be bolted to the spans in the field by others.
 - .2 Grating shall be secured to the brackets in the field by others.
 - .3 Railings shall be shop assembled in units for each span.
 - .4 Deck joint cover plates shall be installed in the shop to ensure a snug fit along the profile of the deck plate and shall be match marked and supplied loose for installation in the field by the Railway.
 - .5 Cap beam connection plates and filler plates shall be bolted to cap beams as indicated.
 - .2 For spans called for in the drawing or specification as being shipped knocked down:
 - .1 Shop assembly of spans shall ensure good fit of all parts, including bearings, and match marking of all parts. Ship completely knocked down for assembly in the field as follows:
 - .1 Diaphragms shall be supplied with connection angles loosely bolted.
 - .2 Floor beams to be connected to girders shall be supplied with connection angles loosely bolted.
 - .3 All other floor beams shall be supplied loose with bolts for connecting in the field by others.
 - .4 Gusset plates and connecting angles shall be permanently bolted to the girders.
 - .5 Walkway brackets and grating shall be supplied loose.
 - .6 Railings shall be shop assembled in units for each span.
 - .7 Deck joint cover plates shall be installed in the shop to ensure a snug fit along the profile of the deck plate and shall be match marked and supplied loose for installation in the field by the Railway.
 - .3 For inspection purposes, all bolts must have their snug tight positions marked by the Fabricator prior to final tightening.
 - .4 All remaining miscellaneous steel pieces should be bundled and clearly marked as called for on the identification of pieces drawing.

- .12 Cleaning:
 - .1 Commercial blast clean inside and outside of main girders and its connections prior to the assembly.
 - .2 Commercial blast clean outside of main girders after assembly has been completed.
 - .3 Commercial blast cleaning shall be executed in accordance with SSPC-SP6.
 - .4 Remove heavy deposits of oil or grease by Solvent Cleaning to SSPC-SP1.

3.3 Inspection

- ~~.1 CN shall arrange for an additional inspection by an independent inspection firm under a separate contract. This will be in addition to the Fabricator's Quality Assurance Program referred to herein.~~
- .2 The Fabricator shall notify CN and the Inspector of the scheduled date for beginning fabrication.
- .3 The Fabricator shall perform the inspections to verify that welds meet the quality requirements of the current edition of the CSA Standard W59 (AWS D1.5).
 - .1 All non-destructive testing performed by the Fabricator shall be done by personnel qualified under CSA Standard W59 (AWS D1.5).
 - .2 The Fabricator shall submit to the Engineer, in triplicate, copies of all inspections and weld testing reports.
 - .3 Butt welds in flange and web joints are to be completed, inspected, and accepted before the flange to web tee joint is made.
 - .4 Welds requiring repairs shall be retested after repairs are made, at the expense of the Fabricator.
- .4 Non-destructive testing to be arranged and paid for separately by CN:
 - .1 All welds shall be visually inspected.
 - .2 All butt welds in flange splices in tension zones shall be Radiographic Tested (RT) inspected 100% after stress relieving.
 - .3 All other butt-welds in flange and web splices shall be 100% RT.

- .4 All flange to web fillet welds are to be Magnetic Particle Tested (MT) 50% concentrated at the centre of the girders, at every stop and start location and repair location.
- .5 All bearing stiffener to flange welds of girders and beams shall be Ultrasonically Tested (UT) tested 100%.
- .6 All joints to be RT inspected will be ground flush on both sides, and shall be free of paint, scale and grease. The direction of grinding shall be perpendicular to the length of the weld.

3.4 **Weight Information**

- .1 The **TOTAL WEIGHT** of each fully assembled span shall be indicated at the end of the bottom flange of the span. The weight shall be stencilled on the material with a minimum 100 mm (4") high yellow waterproof letters. The weight shall be indicated in Imperial units.
- .2 For all members or components that are shipped unattached to the spans, these members shall show the weight of these individual members or components on a metal tag attached thereto.

3.5 **Protective Blocking**

- .1 Provide protective blocking for lifting and transportation. Exercise care during fabrication and transportation so as not to damage span and, in particular, to avoid notches to edges of members, which may cause cracks due to fatigue stresses.
- .2 The use of welded attachments of any type, the field drilling or burning of holes, in any member, for shipping, or any other purpose is strictly forbidden.
- .3 Bolts shall not be loosened or removed from attachments in order to facilitate shipping.

3.6 **Loading for Shipment**

- .1 Each span should be marked and tagged indicating the Span Number.
- .2 Mark end of girder to identify which end will be pointing west or north when erected in the bridge by marking "West" or "North" on the top of the top flange at the end of each girder.
- .3 Loading on the rail cars will be done with the West or North ends of all spans pointing to the same end of the rail car.

- .4 The Fabricator shall supply and install the necessary blocking to fully support the span during shipment.
- .5 Four (4) weeks prior to shipping, the fabricator shall provide CN for review and approval four (4) copies of loading and blocking scheme drawings, which shall be stamped and signed by a Professional Engineer.
- .6 The Fabricator shall supply all material (including bolsters or swivel blocks under spans) and labour required to load and block the spans or girders to meet the Association of American Railroads (AAR) open top loading rule requirements.
 - .1 Load securements shall be capable of withstanding 3 times the object weight in the longitudinal direction, and 2 times the object weight in the lateral and vertical directions.
 - .2 Tie downs shall consist of 1" minimum diameter rods or plates only. The use of tie down cables or wires is strictly prohibited.
 - .3 Spans or girders over 50 feet in length can be shipped on flat cars and the fabricator shall then request flat cars from CN's customer service when undertaking necessary transport arrangements.
 - .4 For spans being shipped knocked down, the fabricator shall load and block each main girder individually on separate railcars.
 - .5 Spans or girders are to be shipped in the vertical position.
- .7 All field connection bolts, nuts, and washers shall be packed in 5-gallon (20 litre) metal cans and clearly labelled. The label will show mile and subdivision, the type and quantities of fasteners each can contains and the name and address of the receiver. The cans shall be strapped to a wooden pallet.
- .8 Walkway grating panels shall be strapped in bundles of 5 or 10 pieces with steel strapping. The steel strapping must be cushioned so as not to come in direct contact with the grating panel.
- .9 Walkway support structure materials shall be strapped to wooden pallets or shipped in steel drums or shall be strapped in bundles of not more than 2000 pounds each.
- .10 Shipping instructions shall accompany the bill of loading to ensure that the spans arrive on site, pointing in the correct direction for erection.
- .11 The Fabricator shall obtain a clearance for dimensional loads from the Engineer prior to shipment of the span(s).

3.7 **Identification of Pieces**

- .1 All members or components shall be identified on a metal tag attached thereto.
- .2 The metal tag shall have the following information:
 - .1 Bridge location (Mileage and Subdivision)

- .2 "Mark" as indicated on the drawings.
- .3 "Weight" in lb. of the individual members
- .3 The metal tags shall be have the following characteristics:
 - .1 Tag format type no. 90, 18 gauge
 - .2 Dimension: 2 1/2 x 2 3/4"
 - .3 Tag information shall be engraved with min. 1/2" high letters.
 - .4 Metal bands shall be used to attach the tags to the components.

*****END OF SECTION*****

ENBRIDGE AT BNSF CROSSING APPLICATION REQUIREMENTS



Crossing Application Form

In order to properly conduct an analysis on the requested crossing the following general information and appropriate data sheets are required to be completed.

Steps:

1. Complete the *Crossing Application – General Information* document for each crossing application
2. Add and complete the *Data Sheet – Equipment or Vehicle with Tires* for EACH piece of equipment
3. Add and complete the *Data Sheet – Equipment with Tracks* for EACH piece of equipment
4. Return fully completed general information and data sheets and any other pertinent information

Applicant Information

Applicant/Company Name:	City of Naperville
Applicant Contact Person Name:	Andy Hynes, P.E., P.T.O.E.
Email:	HynesA@naperville.il.us
Phone Number:	630-548-2958
Applicant Reference/File Number:	P401060092
Certificate of Insurance Liability:	Contractor to provide insurance

Design Firm Information

Company Name:	TranSystems
Contact Person Name:	Ben Vander Wal
Email:	brvanderwal@transystems.com
Phone Number:	847-407-5240

Contractor Information

Company Name:	TBD
Contact Person Name:	
Email:	
Phone Number:	

Details

Description and Purpose of Crossing:			
Existing pipeline crossing at BNSF Lead Track (Eola Yard) at station 2742+60. The track is being reconstructed/shifted as part of this project.			
Location Indicator (legal land description, PIN, etc.)			
BNSF Lead Track Station 2742+60 on BNSF right-of-way. PIN 07-17-506-002.			
GPS Coordinates:			
N=1861444.99, E=1011700.89			
Duration:	Temporary <input checked="" type="checkbox"/>	Permanent <input type="checkbox"/>	
Start Date:	9/1/22	End Date:	12/31/24
Equipment or Vehicle with Tires:	Yes <input checked="" type="radio"/>	No <input type="radio"/>	Datasheet: <input type="text"/>
Equipment with Tracks:	Yes <input checked="" type="radio"/>	No <input type="radio"/>	Datasheet: <input type="text"/>

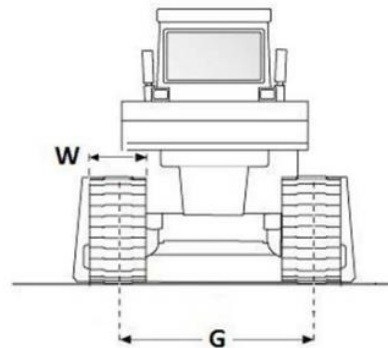
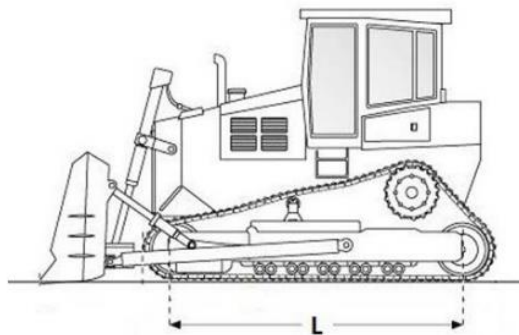
Save Form

Reset Form

Data Sheet – Equipment with Tracks

Complete this data sheet for each piece of equipment with tracks.

Equipment with Tracks		INDICATE UNITS	
Manufacturer:	Caterpillar		
Model:	320		
Equipment Description:	Hydraulic Excavator		
Fully Loaded Gross Vehicle Weight:	50265	LBS	▼
	Track Shoe Width (refer to W below)	Track Length on Ground (refer to L below)	Track Gauge (on center) (refer to G below)
Units	IN ▼	IN ▼	IN ▼
Track	unknown	144	95



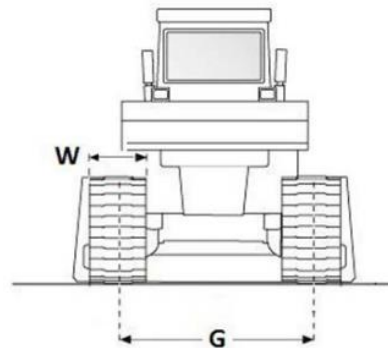
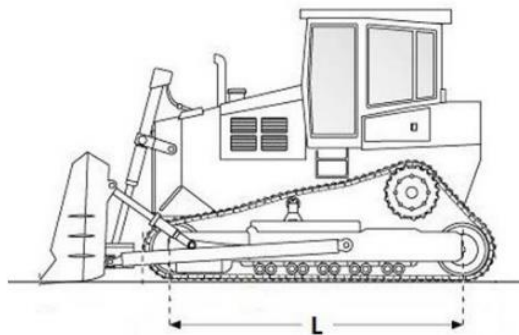
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Data Sheet – Equipment with Tracks

Complete this data sheet for each piece of equipment with tracks.

Equipment with Tracks		INDICATE UNITS	
Manufacturer:	Caterpillar		
Model:	973		
Equipment Description:	Crawler Loader		
Fully Loaded Gross Vehicle Weight:	54899.6	LBS	▼
	Track Shoe Width (refer to W below)	Track Length on Ground (refer to L below)	Track Gauge (on center) (refer to G below)
Units	Select Units ▼	IN ▼	Select Units ▼
Track	unknown	115	82



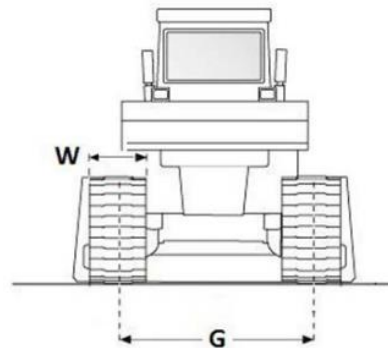
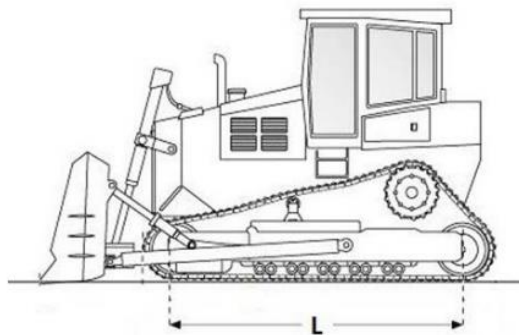
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Data Sheet – Equipment with Tracks

Complete this data sheet for each piece of equipment with tracks.

Equipment with Tracks		INDICATE UNITS	
Manufacturer:	Caterpillar		
Model:	D6		
Equipment Description:	Bulldozer		
Fully Loaded Gross Vehicle Weight:	48788	LBS	▼
	Track Shoe Width (refer to W below)	Track Length on Ground (refer to L below)	Track Gauge (on center) (refer to G below)
Units	IN ▼	IN ▼	IN ▼
Track	24	117	76



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Enbridge Crossing Application Requirements

Great Lakes Region Liquid Pipelines



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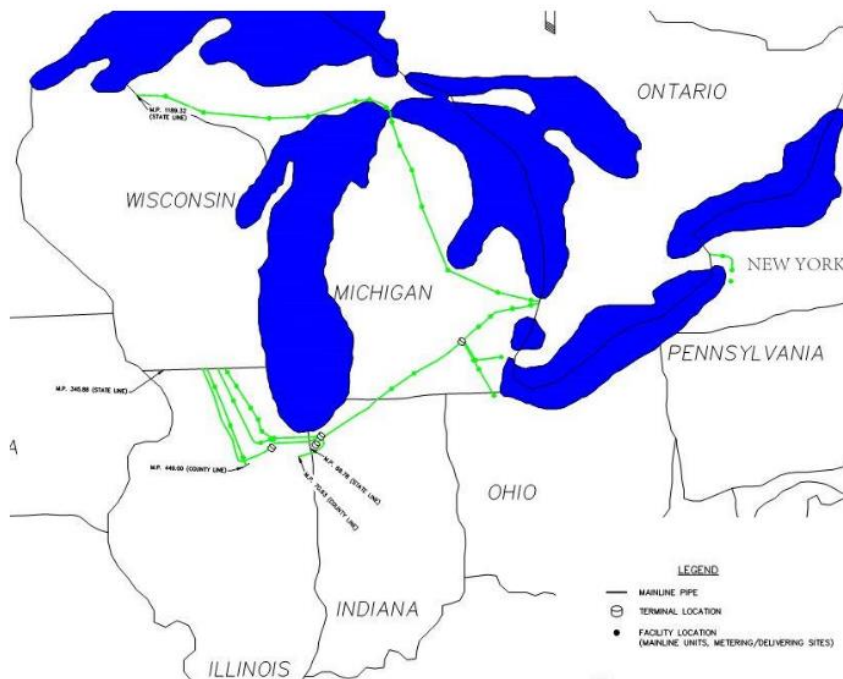
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PURPOSE

The intent of this document is to provide clear and consistent requirements for any Crossing Applicant to protect people, the environment and Enbridge's assets.

SCOPE

The requirements provided in this document are only applicable to Enbridge's liquid pipeline assets in Northern Illinois, Indiana, Michigan, Northern Ohio and Western New York as illustrated in the diagram below:



DEFINITIONS

Crossing Applicant – Is the facility owner or their representative including but not limited to: landowners, utility owners, pipeline/utility contractors, engineers, architects, surveyors, general contractors and their sub-contractors, real estate developers, brokers and agents, lending officers and title underwriters, and local, state and federal governmental entities.

Open Cut – A trench methodology wherein access is gained to the required level underground for the proposed installation, maintenance or inspection of a pipe, conduit or cable. The excavated trench is then backfilled and the surface is restored.



Horizontal Bore (HB) – Meets ALL of the following:

- a) The designed horizontal distance of the crossing shall be less than or equal to 500ft in length; AND
- b) The depth of the installation shall be limited to 25ft to the center (cross-section) of the pilot hole and measured to the corresponding surface location; AND
- c) Straight alignment in the horizontal plane; AND
- d) Pilot bit is steerable and trackable.

Horizontal Directional Drill (HDD) – An HDD is an HB that DOES NOT meet all of the criteria for an HB. An HDD will always meet d but may not meet all of: a, b and c above.

Directional Micro-tunneling/Direct Pipe – Installation of the pipe section by using a thrusting device to provide force on a section of carrier pipe.

Right-of-Way – Land with limited and specific uses that is conveyed by a right-of-way easement (sometimes called a grant), license, lease, or other legal agreement by a current or past property owner to Enbridge. Enbridge's right-of-ways vary in width and in most cases are used to construct, operate, protect, inspect, maintain and/or replace one or more pipelines and its facilities.

Utilities – Includes but not limited to steel and plastic pipelines, overhead or underground power and communication cables, roads, railways and drainage systems.

APPLICATION PROCESS

The Crossing Applicant must submit a written request, either by completing the Crossing Application Form or a letter with equivalent information, together with the applicable drawing(s) to the Enbridge Land Services department as set out in the *Contact Us* section of this document.

The drawing(s) must be prepared in accordance with the minimum standards as set out in the *Drawing Requirements* section of this document.

Written consent from Enbridge must be obtained for any activity listed in this document prior to the start of work.

After submitting the request, Enbridge will review the proposed installation and/or temporary activity in order to ensure that the proposed work will not pose a risk to existing or future Enbridge pipelines and/or facilities, as well as, to ensure that any access required to existing pipelines and/or facilities for maintenance or in an emergency situation will not be impeded.

Applications that do not meet the requirements outlined in this document will require further technical evaluation, which will likely require an additional 4 to 6 week review period prior to Enbridge rendering a decision.

While Enbridge will review and attempt to work with the Crossing Applicant, there is no guarantee that Enbridge will approve the crossing or use of its right-of-way.

NOTE: Incomplete drawings and/or an incomplete application will be rejected back to the Crossing Applicant.



DRAWING REQUIREMENTS

The following represents the minimum information that is required to be shown on the drawing(s) in order for Enbridge to review your application. Dimensions, in imperial units, must be shown on the drawing(s) and all Enbridge facilities must be field verified prior to being added to the drawings.

All as-builts of the permanent installations shall be submitted to Enbridge not less than 12 months after construction is complete.

Note: At the discretion of the Enbridge representative, a sketch and/or marked up aerial may be sufficient.

PERMANENT INSTALLATIONS

All permanent installation drawings to contain the following:

1. Plan Number, including any revision number and the respective date;
2. North Arrow;
3. Scale;
4. Legend;
5. Location indicator including: legal land description, PIN, GPS coordinates;
6. Plan view of whole quarter section or affected area including:
 - a. Lot lines, road limits;
 - b. Proposed facilities (including curbs, footing, guard rails, guy wires, poles, fences, etc.) with tie dimensions to lot survey line preferably along pipeline and/or right-of-way boundary;
 - c. Location of cathodic test lead terminals (if applicable);
7. Cross section view and/or profile view including:
 - a. For surface structures, show profile along pipeline(s);
 - b. For underground facilities show profile along pipeline;
 - c. Property lines, pipeline(s) and depth of cover;
 - d. All underground facilities must maintain an even elevation across the entire width of right-of-way except for gravity type facilities or those facilities installed by HDD;
 - e. Drill path plan for HB/HDD installations; including alignment and entry/exit angles (required to be outside of Enbridge's right-of way);
 - f. Unsupported span (in feet) of Enbridge pipeline for open cut installations (i.e. Trench width);
8. Crossing Angle;
9. Crossing location clearly identified;
10. Identify all affected Enbridge facilities/right-of-way(s) and pipeline markers; Enbridge facilities shall be field verified;
11. Method of Installation (**Refer to Permanent Installations section below*);
12. Minimum Clearance (**Refer to Permanent Installations section below*);
13. Grading profile along the length of the Enbridge pipeline if grading over the pipeline;



14. Facility specifications:

- a. PIPE/CABLE:
 - i. Pipe diameter;
 - ii. Pipe material;
 - iii. Product conveyed;
 - iv. Cathodic protection system (if applicable);
 - v. Cable size;
 - vi. If cable is within a conduit, conduit material;
 - vii. Cable voltage.
- b. ABOVE GRADE INSTALLATIONS (i.e. ROAD, PATH, PARKING LOT, etc.):
 - i. Dimensions of road/path/parking lot, etc.;
 - ii. Cover at ditch;
 - iii. Cover at center of road/path/parking lot, etc.;
 - iv. Minimum cover from top of traveled surface to top of pipeline;
 - v. Surface material;
 - vi. Road/path type/usage;
 - vii. Changes to right-of-way;
 - viii. Maximum temporary grade removal.
- c. OVERHEAD POWER:
 - i. Pole number(s);
 - ii. Location of pole/guy wire/anchors/etc.;
 - iii. Method of installation of pole/guy wire/anchors/etc.;
 - iv. Horizontal clearance to pipe from proposed pole/guy wire/anchors/etc.;
 - v. Vertical clearance to ground/grade;
 - vi. Depth and size of foundations;
 - vii. Refer to Appendix A for additional requirements.
- d. DRAINAGE TILE
 - i. Location of tile.

TEMPORARY ACTIVITIES

All temporary drawings to contain the following:

1. Plan Number, including any revision number and the respective date;
2. North Arrow;
3. Scale;
4. Legend;
5. Location indicator including: legal land description, PIN, GPS coordinates;
6. Plan view of whole quarter section or affected area;
7. Temporary activities location clearly identified;
8. Identify all affected Enbridge facilities/right-of-way(s) and/or easement ownership. Enbridge facilities shall be field verified;
9. Facility specifications:



- a. WORKSPACE
 - i. Location;
 - ii. Measurement of workspace;
 - iii. Purpose.
- b. GEOPHYSICAL
 - i. Charge layout (units/lines);
 - ii. Type and material specification of source;
 - iii. Charge weight per hole;
 - iv. Distance from Enbridge right-of-way.
- c. EQUIPMENT CROSSING
 - i. Complete the Crossing Application Form.

CONTACT US

Please send all applications to the following:

Enbridge – Great Lakes Region
Land Services Department
222 Indianapolis Blvd, Ste. 100
Schererville, IN 46375
GLR.crossings@enbridge.com

ONE CALL

Prior to commencing any ground disturbance activities a "One-Call" must be placed by calling **811**.

In the states where Enbridge operates in, the following are the individual state notification services:

Illinois	J.U.L.I.E.	800-892-0123
Indiana	I.U.P.P.S.	800-382-5544
Michigan	MISS DIG	800-482-7171
Ohio	O.U.P.S	800-362-2764
New York	Dig Safely	800-962-7962

GENERAL CONSTRUCTION REQUIREMENTS

1. A One Call must be placed prior to the commencement of any ground disturbance. Enbridge's representative must be contacted at least 72 hours prior to any activities near, over or close to any Enbridge pipeline or right-of-way. No work may commence without their presence or prior approval.
2. Crossing Applicant shall ensure that all work associated with their application complies with local, state and federal rules, laws and regulations.
3. Enbridge pipelines shall be positively identified (i.e. daylighted) prior to any ground disturbance. The design shall be amended as necessary in order to maintain the required minimum clearances.



4. Contact Enbridge for remarking a pipeline if Crossing Applicant believes existing markers to be inadequate for any reason, including disturbance during construction.
5. Crossing Applicant shall ensure its field crews performing the crossing work have copies of the Enbridge approved crossing application and letter of agreement.
6. If applicable, all Enbridge signage and test stations shall be protected during construction. Should any of these need relocation due to construction, this work shall only be performed by or under the supervision of an Enbridge representative and at the cost of the Crossing Applicant.
7. There shall be no storage of material, equipment or parking over any Enbridge pipeline. Should soil stockpiles be required to be placed close to any Enbridge pipeline, the Enbridge representative shall be contacted first in order to approve placement (a minimum of five (5) feet from any Enbridge pipeline and limited height shall be five (5) feet above grade).
8. Below grade structures shall not be allowed within the Enbridge right-of-way or within ten (10) feet of any Enbridge pipeline and shall require further technical evaluation.
9. No existing trees within ten (10) feet of any Enbridge pipeline shall be removed without the presence of an Enbridge representative. Due to potential root entanglement issues and coating damage on the pipeline, tree removal at less than ten (10) feet from the pipeline may have to be completed by an Enbridge approved contractor at the cost of the Crossing Applicant.
10. Crossing Applicant to provide designs related to Earth Retention System (ERS) or sheet piling occurring within the Enbridge right-of-way or within twenty-five (25) feet of any Enbridge pipeline for further technical evaluation.
11. Regarding any heavy lifting in close proximity to any Enbridge pipeline;
 - a. Rigging shall be properly maintained, checked, rated and sized correctly for intended load.
 - b. No heavy lifts shall be directly over or swing over any Enbridge pipeline if excavated at the time.
 - c. If heavy lifts shall be over any buried pipeline, the area above the pipeline shall be matted in case of a dropped load.
12. Burning within fifty (50) feet of any Enbridge pipeline shall require further technical evaluation.
13. For subdivision development, there shall be no property lines allowed within the Enbridge right-of-way. Enbridge right-of-way to be used as green space and not subdivided into the adjacent properties.

EXCAVATION AND BACKFILL

1. When installing any utility across or within close proximity to any Enbridge asset, an Enbridge representative must be on site. If, for any reason, the Enbridge representative:
 - a. Is required to leave the work site,
 - b. Has concern for pipeline integrity, or
 - c. Has a concern for safety or security of Enbridge's assets;

The Enbridge representative may instruct the Crossing Applicant to "STOP WORK". The activity shall not recommence until the Enbridge representative returns or the situation in question has been resolved.

2. Excavation equipment shall only use buckets without teeth, or the bucket teeth shall be protected by a flat bar, while excavating to within twenty-four (24) inches of an Enbridge pipeline. If ground conditions require the use of buckets with teeth then approval shall be obtained from the Enbridge representative prior to use.



3. At no time shall mechanical excavating equipment be operated within twenty-four (24) inches of an Enbridge pipeline. If required, the final twenty-four (24) inches of soil around an Enbridge pipeline shall be removed by hand exposure, water washing, or other non-mechanical means.
4. Should the excavation that includes the pipeline be left open overnight, steel traffic plates and an orange safety fence shall be utilized in order to protect the public, the environment and Enbridge assets.
5. At any location where the pipeline is exposed, the construction schedule must allow Enbridge to inspect the condition of the pipeline and perform any necessary maintenance.
6. Any Enbridge pipeline shall not in any manner be used as a platform while it is excavated.
7. When practical, during backfilling, use all native soil excavated from the trench to restore the original ground profile. If this is not practical, then importing clean material (i.e. sand, clay, etc.) to reinstate the subgrade support beneath the pipeline to the conditions that existed before the excavation is acceptable.
8. Backfill shall be completed with the following method:
 - a) Backfill and compact in no greater than six (6) inch lifts up to the 3 o'clock and 9 o'clock positions (bottom half) on pipeline to ensure pipe is well supported;
 - b) After site evaluation of soil type, location and potential overhead traffic, backfill and compact in one (1) to two (2) feet (no greater than two (2) feet) lifts above the 3 o'clock and 9 o'clock positions to achieve final/original finished grade;
 - c) To ensure effective compaction (95% Proctor), recommended equipment includes plate compactors, vibratory tampers and small drum rollers.
9. If flowable fill is used as backfill material, there shall be no fly ash as a component and fill not to exceed a strength of one hundred (100) psi.

EQUIPMENT USE

Rollers

The use of vibratory rollers shall require a minimum of five (5) feet of compacted cover above any Enbridge pipeline.

Cranes

Cranes working in close proximity to any Enbridge pipeline shall adhere to the following requirements:

- a) Cranes and associated rigging shall be properly maintained, checked, rated and sized correctly for intended load;
- b) The crane shall not be set up within ten (10) feet of any Enbridge pipeline;
- c) The outriggers shall not be set up within ten (10) feet of any Enbridge pipeline;
- d) No heavy lifts shall be directly over or swing over an Enbridge pipeline if excavated at the time;
- e) Outrigger pads that are appropriately sized shall be utilized;
- f) The crane boom shall not extend over above grade Enbridge facilities during lifting operations;
- g) If heavy lifts shall be over a buried Enbridge pipeline, the area above the pipeline shall be matted in case of a dropped load;
- h) If applicable, the location of the crane shall be coordinated with the ERS design/open excavation to ensure that the construction equipment surcharge load does not exceed design values.

Any cranes that are required to be operated above an Enbridge pipeline will require further technical evaluation.



Scrapers

Usage of scrapers or pan type tractors are NOT PERMITTED in the Enbridge right-of-way or within ten (10) feet of an Enbridge pipeline (measured from centerline).

Dozers

Usage of dozers with ripper teeth are NOT PERMITTED in the Enbridge right-of-way or near any Enbridge pipeline.

Hammering

Usage of manually-operated jack hammers or hoes equipped with jack hammers are NOT PERMITTED within ten (10) feet of any Enbridge pipeline.

SITE RESTORATION

1. All landscaping within any Enbridge right-of-way shall be limited to grass or similar. There shall be no trees allowed within Enbridge's right-of-way or within twenty-five (25) feet of any Enbridge pipeline, whichever is the greater distance.
2. The site shall be restored to its original condition except for expressly agreed upon exceptions.
3. Unless approved by Enbridge, there shall be no reduction in final grade or drainage alteration over any Enbridge pipeline.

PERMANENT INSTALLATIONS

BELOW GRADE UTILITIES VIA OPEN CUT

1. Crossing angle for installations must be within:
 - a. Forty-five and ninety (45-90) degrees (with preference for as close to ninety (90) degrees as possible);
OR
 - b. If the crossing angle is designed to be less than forty-five (45) degrees but the proposed installation follows or parallels an existing utility corridor then the lower crossing angle may be approved;
2. Crossing installations of cathodically protected steel pipes and/or electrical power above 480V AC will require further technical evaluation.

Installations Above An Enbridge Pipeline

1. A minimum clearance of twenty-four (24) inches (measured from outside of pipe to outside of pipe) shall be achieved.
2. Utility warning tape shall be utilized twelve (12) inches below grade, in accordance with A.P.W.A. Uniform Color Code, and in the bottom of the trench (color coded to corresponding Enbridge pipeline).
3. If an aggregate base is utilized at the bottom of the proposed trench, two layers of geotextile material shall be initially added.
4. For installations that are not heavy grade; they shall be installed in conduit casing (Schedule 80 minimum or equivalent) or concrete encasement (dyed red if electrical) with tracer wire. This shall be maintained at a



minimum of ten (10) feet to each side of any Enbridge pipeline (measured from outside of pipe) or the entire width of the Enbridge right-of-way, whichever is the greater distance.

Installations Below An Enbridge Pipeline

1. A minimum clearance of thirty-six (36) inches (measured from outside of pipe to outside of pipe) shall be achieved.
2. Appropriate measures shall be taken to prevent trench/pipe settlement. Special care must be taken to ensure that the compaction between the utility and the Enbridge pipeline is sufficient to mitigate settlement and voids.
3. Maximum Enbridge pipeline unsupported span is twenty (20) feet. If maximum unsupported span is exceeded then the application will require further technical evaluation.

BELOW GRADE UTILITY VIA TRENCHLESS TECHNOLOGIES (HB, HDD AND MICRO-TUNNELING/DIRECT PIPE)

1. A minimum clearance of three (3) feet shall be achieved for HB.
2. A minimum clearance of ten (10) feet shall be achieved for HDD.
3. Clearance is measured by the closest edge of bore path (largest reamer used) to closest edge of pipeline.
4. No blind boring shall be allowed. Both the Enbridge pipeline and the bore head shall be positively identified (i.e. potholed) in order to verify clearances. If this cannot be met then the application requires further technical evaluation.
5. The Crossing Applicant's proposed installation shall be designed to go below the deepest Enbridge pipeline. If this cannot be met then the application requires further technical evaluation.
6. Crossing installations of cathodically protected steel pipes and/or electrical power above 480V AC will require further technical evaluation.
7. Directional Microtunnelling/Direct Pipe crossing applications shall require further technical evaluation.

ABOVE GRADE INSTALLATIONS (INCLUDING ROADS, RAILWAYS, ETC.)

1. A minimum clearance of five (5) feet shall be achieved for roadways.
2. A minimum clearance of eight (8) feet shall be achieved for railways.
3. A minimum clearance of five (5) feet shall be achieved for ditches.

Note: Even if the above minimum clearances are met any property improvements, including but not limited to, structures, pathways, sidewalks, driveways, roadways, parking lots, railways, airport runways and ditches to be installed and/or constructed on or near an Enbridge right-of-way shall require further technical evaluation.

Signs and Fence Post Installations

1. Where possible, no post shall be installed within five (5) feet of an Enbridge pipeline (measured from nearest edge of pipe to closest edge of post).



2. Fence crossings, where possible, shall be at an angle between sixty and ninety **(60-90)** degrees (with preference for as close to ninety **(90)** degrees as possible).
3. Fences parallel to an Enbridge pipeline shall be at least ten **(10)** feet from the pipeline (measured from centerline).
4. No masonry, brick, or stone fences shall be installed on any Enbridge right-of-way.

DITCH RESTORATION/ROAD MAINTENANCE (RE-PAVING ROAD)

Road maintenance limited to the following is permitted:

1. Repaving with a maximum allowed milling of six **(6)** inches; AND
2. Adding fill that does not exceed two **(2)** feet in depth of the travelled portion of an existing road; AND
3. Where the work does not include road widening, excavation or ditch lowering.

All proposed existing pavement removal over any Enbridge pipeline shall be completed by dozer, shovel excavator or similar construction machinery. No hammering removal methodology shall be allowed within ten **(10)** feet of any Enbridge pipeline.

If these criteria are not met, then further technical evaluation is required.

OVERHEAD POWER INSTALLATION

Crossing applications shall require further technical evaluation.

DRAINAGE TILE CROSSING ENBRIDGE PIPELINES

A minimum vertical clearance of twelve **(12)** inches for perpendicular pipe crossings shall be maintained.

The following types of drainage tile applications shall require further technical evaluation:

1. Drainage well applications;
2. Other methods of water removing/de-watering;
3. Drainage tile that parallels any Enbridge pipeline within twenty **(20)** feet (measured from centerline of pipeline).



TEMPORARY INSTALLATIONS/ACTIVITIES

TEMPORARY WORKSPACE

Crossing applications shall require further technical evaluation.

GEOPHYSICAL (INCLUDING BLASTING, SEISMIC, ETC.)

Any geophysical activities occurring within six hundred (**600**) feet of any Enbridge pipeline will require further technical evaluation.

TEMPORARY EQUIPMENT CROSSINGS

1. If the minimum cover over an Enbridge pipeline is less than forty-eight (**48**) inches, then the crossing will require further technical evaluation;
2. If the minimum cover over an Enbridge pipeline is forty-eight (**48**) inches then the weight of the heaviest piece of equipment shall not exceed **22,000lbs** per axle (Wheeled) or **100,000 lbs** (Tracked);
3. Site conditions (such as damp soil, snow, etc.), as determined by the Enbridge Representative, shall require matting (six (**6**) inches minimum) or temporary ramps (refer to Appendix B) to be installed by the Crossing Applicant.

Note: At the discretion of the Enbridge representative, matting or temporary ramps may be required regardless of conditions. If an aggregate base is utilized two layers of geotextile material shall be initially added.

4. Crossings shall be at an angle between forty-five and ninety (**45-90**) degrees (with preference for as close to ninety (**90**) degrees as possible).

APPENDIX A: POWERLINE DATA REQUIREMENTS

The following information is required for each powerline near an Enbridge pipeline:

1. Powerline circuit number/ID number/name.
2. System voltage (line to line).
3. Sketch of the tower configuration, showing the positions of all conductors (phase conductors, shield wires), including:
 - a. Vertical separation between conductors,
 - b. Average height of conductors, or height of conductors at the tower and at mid-span,
 - c. Horizontal separations between conductors,
 - d. Phase arrangement (i.e. A-B-C top-bottom for each circuit) and
 - e. East and West circuits.
4. Shield wire information:
 - a. Shield wire size, type (material),
 - b. Shield wire resistance (ohm/mile) and
 - c. Are shield wires continuous or segmented.
5. Tower grounding:
 - a. Typical grounding details (drawing or sketch), if grounding electrodes are used,
 - b. Tower foundation details (suspension towers only), to estimate the resistance of the "natural grounding" provided by the tower foundation,
 - c. Grounding resistance of each tower, if known,
 - d. Average tower grounding resistance to remote earth, if known and
 - e. Details of counterpoise.
6. Average separation between the towers.
7. Locations and details of any phase transposition along the common right-of-way (pipeline chainage or GPS coordinates of the transposition towers or marking on the drawings). Please indicate the phase arrangement at each transposition tower.
8. Phase current loading:
 - a. Peak annual,
 - b. Peak projected,
 - c. Average annual,
 - d. Average projected and
 - e. Emergency (on one circuit, when the second circuit is shut down).
9. Line-to-ground fault currents:
 - a. At beginning of common right-of-way:
 - i. Total fault current,
 - ii. Fault current contributions from the North and
 - iii. Fault current contributions from the South.
 - b. At middle of common right-of-way:
 - i. Total fault current,



- ii. Fault current contributions from the North and
 - iii. Fault current contributions from the South.
 - c. At end of common right-of-way:
 - i. Total fault current,
 - ii. Fault current contributions from the North and
 - iii. Fault current contributions from the South.

10. Line-to-ground fault duration:

- a. minimum (primary protection) and
- b. maximum (backup protection).

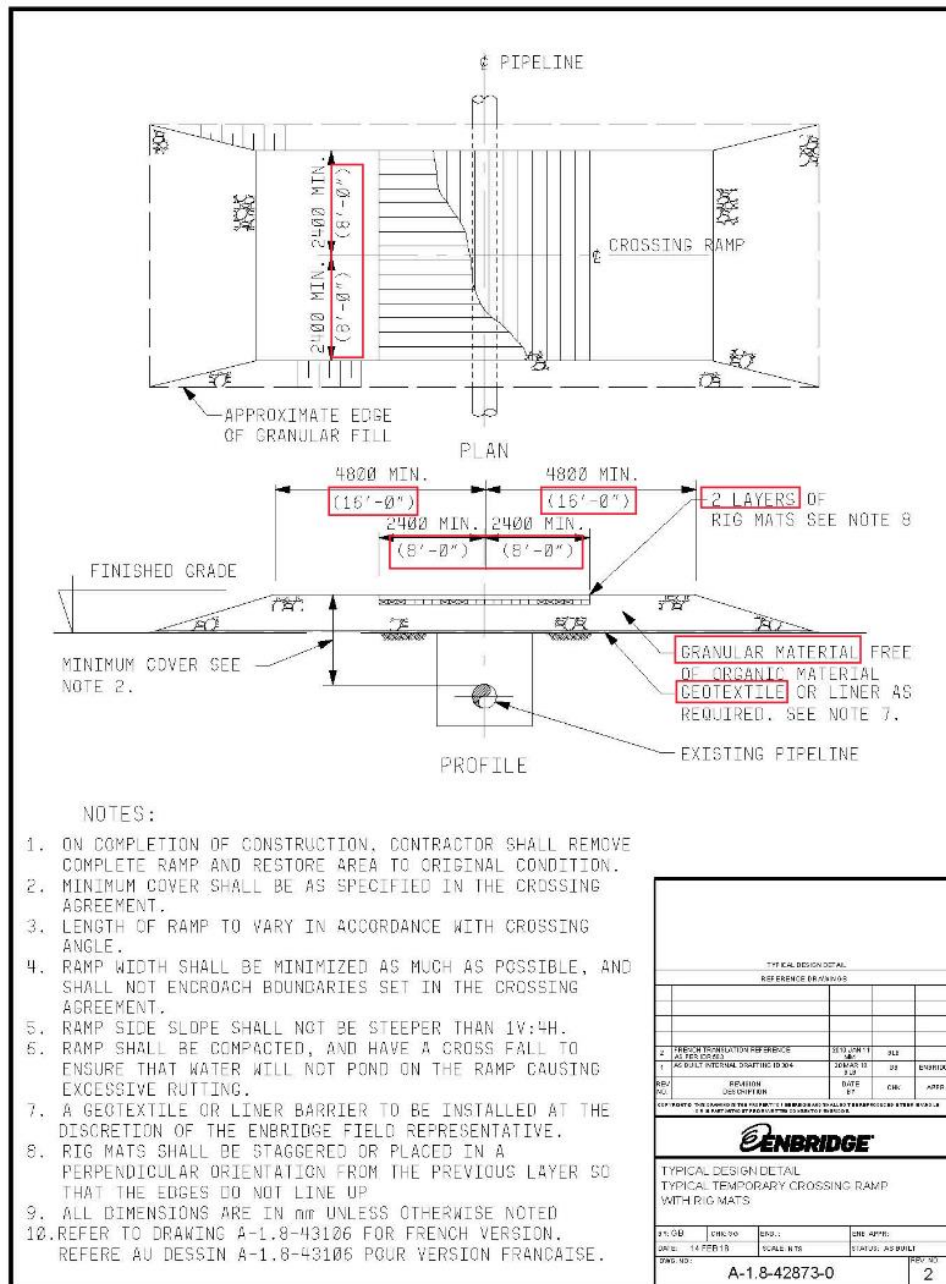


FIGURE 2
Typical Crossing Ramp – Earth and Rig Mat

KINDER MORGAN GUIDELINES FOR DESIGN AND CONSTRUCTION NEAR KINDER MORGAN OPERATED FACILITIES



Guidelines for Design and Construction near Kinder Morgan Operated Facilities

Name of Company: NGPL

The list of design, construction and contractor requirements, including but not limited to the following, for the design and installation of foreign utilities or improvements on NGPL (Company) right-of-way (ROW) are not intended nor do they waive or modify any rights Company may have under existing easements or ROW agreements. Reference existing easements and amendments for additional requirements. This list of requirements is applicable for Company facilities on easements only. Encroachments on fee property should be referred to the Land and Right-of-Way Department.

Design

- Company shall be provided sufficient prior notice of planned activities involving excavation, blasting, or any type of construction on Company's ROW to determine and resolve any location, grade or encroachment problems and provide protection of our facilities and the public before the actual work is to take place.
- Encroaching entity shall provide Company with a set of drawings for review and a set of final construction drawings showing all aspects of the proposed facilities in the vicinity of Company's ROW. The encroaching entity shall also provide a set of as-built drawings showing the proposed facilities in the vicinity of Company's ROW.
- Only facilities shown on drawings reviewed by Company will be approved for installation on Company's ROW. All drawing revisions that effect facilities proposed to be placed on Company's ROW must be approved by Company in writing.
- Company shall approve the design of all permanent road crossings.
- Encroaching entity shall, at the discretion of the Company, incorporate Heath ATI "sniffer" Gas Detection Units in the design of paved areas or "Green Belt" areas of Company ROW. The units shall be installed per Company Standard [TYP- V-0100-B010 – Gas Detection Unit for Pipelines Located under Asphalt or Concrete Parking Areas](#).
- Any repair to surface facilities following future pipeline maintenance or repair work by Company will be at the expense of the developer or landowner.
- The depth of cover over the Company pipelines shall not be reduced nor drainage altered without Company's written approval.
- Construction of any permanent structure, building(s) or obstructions within Company pipeline easement is not permitted.
- Planting of shrubs and trees is not permitted on Company pipeline easement.
- Irrigation equipment i.e. backflow prevent devices, meters, valves, valve boxes, etc. shall not be located on Company easement.
- Foreign line, gas, water, electric and sewer lines, etc., may cross perpendicular to Company's pipeline within the ROW, provided that a minimum of two (2) feet of vertical clearance is maintained between Company pipeline(s) and the foreign pipeline. Constant line elevations must be maintained across Company's entire ROW width, gravity drain lines are the only exception. Foreign line crossings below the Company pipeline must be evaluated by Company to ensure that a significant length of the Company line is not exposed and unsupported during construction. When installing underground utilities, the last line should be placed beneath all existing lines unless it is impractical or unreasonable to do so. Foreign line crossings above the Company pipeline with less than two (2) feet of clearance must be evaluated by Company to ensure that additional support is not necessary to prevent settling on top of the Company natural gas pipeline.
- A foreign pipeline shall cross Company facilities at as near a ninety-degree angle as possible. A foreign pipeline shall not run parallel to Company pipeline within Company easement without written permission of Company.
- The foreign utility should be advised that Company maintains cathodic protection on their pipelines. The foreign utility must coordinate their cathodic protection system with Company's. At the request of Company, foreign utilities shall install (or allow to be installed) cathodic protection test leads at all crossings for the purposes of monitoring cathodic protection. The Company Cathodic Protection (CP) technician and the foreign utility CP technician shall perform post construction CP interference testing. Interference issues shall be resolved by mutual agreement between foreign utility and Company. All costs associated with the correction of cathodic protection problems on Company pipeline as a result of the foreign utility crossing shall be borne by the foreign utility for a period of one year from date the foreign utility is put in service.



Guidelines for Design and Construction near Kinder Morgan Operated Facilities

- The metallic foreign line shall be coated with a suitable pipe coating for a distance of at least 10-feet on either side of the crossing unless otherwise requested by the Company CP Technician.
- AC Electrical lines must be installed in conduit and properly insulated.
- DOT approved pipeline markers shall be installed so as to indicate the route of the foreign pipeline across the Company ROW.
- No power poles, light standards, etc. shall be installed on Company easement.

Construction

- Contractors shall be advised of Company's requirements and be contractually obligated to comply.
- The continued integrity of Company's pipelines and the safety of all individuals in the area of proposed work near Company's facilities are of the utmost importance. Therefore, contractor must meet with Company representatives prior to construction to provide and receive notification listings for appropriate area operations and emergency personnel. **Company's on-site representative will require discontinuation of any work that, in his opinion, endangers the operations or safety of personnel, pipelines or facilities.**
- The Contractor must expose all Company transmission and distribution lines prior to crossing to determine the exact alignment and depth of the lines. A Company representative must be present. In the event of parallel lines, only one pipeline can be exposed at a time.
- Company will not allow pipelines to remain exposed overnight without consent of Company designated representative. Contractor may be required to backfill pipelines at the end of each day.
- A Company representative shall do all line locating. A Company representative shall be present for hydraulic excavation. The use of probing rods for pipeline locating shall be performed by Company representatives only, to prevent unnecessary damage to the pipeline coating.
- Notification shall be given to Company at least 72 hours before start of construction. A schedule of activities for the duration of the project must be made available at that time to facilitate the scheduling of Company's work site representative. Any Contractor schedule changes shall be provided to Company immediately.
- Heavy equipment will not be allowed to operate directly over Company pipelines or in Company ROW unless written approval is obtained from Company. Heavy equipment shall only be allowed to cross Company pipelines at locations designated by Company. Contractor shall comply with all precautionary measures required by Company to protect its pipelines. When inclement weather exists, provisions must be made to compensate for soil displacement due to subsidence of tires.
- Excavating or grading which might result in erosion or which could render the Company ROW inaccessible shall not be permitted unless the contractor/developer/owner agrees to restore the area to its original condition and provide protection to Company's facility.
- A Company representative shall be on-site to monitor any construction activities within 25-feet of a Company pipeline or aboveground appurtenance. The contractor **shall not** work within this distance without a Company representative being on site. Only hand excavation shall be permitted within a minimum of 18-inches (refer to state specific rules/regulations regarding any additional clearance requirements) of Company pipelines, valves and fittings. However, proceed with extreme caution when within three (3) feet of the pipe.
- Ripping is only allowed when the position of the pipe is known and not within 10-feet of Company facility unless Company representative is present.
- Temporary support of any exposed Company pipeline by Contractor may be necessary if required by Company's on-site representative. Backfill below the exposed lines and 12-inches above the lines shall be replaced with sand or other selected material as approved by Company's on-site representative and thoroughly compacted in 12-inches lifts to 95% of standard proctor dry density minimum or as approved by Company's on-site representative. This is to adequately protect against stresses that may be caused by the settling of the pipeline.



Guidelines for Design and Construction near Kinder Morgan Operated Facilities

- No blasting shall be allowed within 1000-feet of Company's facilities unless blasting notification is given to Company including complete Blasting Plan Data. A pre-blast meeting shall be conducted by the organization responsible for blasting.

Company shall be indemnified and held harmless from any loss, cost of liability for personal injuries received, death caused or property damage suffered or sustained by any person resulting from any blasting operations undertaken within 500-feet of its facilities. The organization responsible for blasting shall be liable for any and all damages caused to Company's facilities as a result of their activities whether or not Company representatives are present. Company shall have a signed and executed Blasting Indemnification Agreement before authorized permission to blast can be given.

No blasting shall be allowed within 300-feet of Company's facilities unless blasting notification is given to Company a minimum of one week before blasting. *(Note: covered above)* Company shall review and analyze the blasting methods. A written blasting plan shall be provided by the organization responsible for blasting and agreed to in writing by Company in addition to meeting requirements for 500-feet and 1000-feet being met above. A written emergency plan shall be provided by the organization responsible for blasting. *(Note: covered above)*

- **Any** contact with any Company facility, pipeline, valve set, etc. shall be reported immediately to Company. If repairs to the pipe are necessary, they will be made and inspected before the section is re-coated and the line is back-filled.
- Company personnel shall install all test leads on Company facilities.
- Burning of trash, brush, etc. is not permitted within the Company ROW.

CONTRACTOR REQUIREMENTS (COMMONWEALTH EDISON)

Description: The Contractor shall be aware that Commonwealth Edison requires specific guidelines for construction operations when working inside the COMED Permanent Easements shown on the Plat of Highways and in the plans. The following guidelines are as follows.

ComEd Contact. A ComEd T&S individual will be provided as a single point of contact during the duration of the construction period. Please contact Tina Kowalczyk at 224-244-1826 a minimum of 48 hours prior to the start and upon completion of the project.

ComEd Insurance Requirement. Contractor should be aware that ComEd has certain requirements for the types of insurance policies and minimum limits of coverage. These will be made available to the Contractor upon request. (See Available Reports).

Easement Requirements.

1. The property may be used for the purposes of the improvements to N. Aurora Road, as submitted in the plan set entitled, STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION PLANS FOR PROPOSED FEDERAL AID HIGHWAY FAU 1509 (NORTH AURORA ROAD) PENNSBURY LANE TO FRONTENAC ROAD RECONSTRUCTION SECTION NO.: 06-00133-00-BR PROJECT NO.: XUXZ(984) DUPAGE COUNTY C-91-424-19, dated 11/7/2024.
2. The Contractor will be held responsible for maintenance of the roadway and drainage improvements for the duration of the contract. This includes keeping the ROW free of garbage, debris, and any third-party dumping. If third-party dumping occurs on or around the agreement area, Contractor must notify ComEd immediately or be held responsible for cleanup of any illegally dumped materials.
3. **Contractor shall provide a KMZ file of the newly installed roadway and drainage improvements located on ComEd owned property.**
4. No hazardous materials, including petroleum products, may be stored, used, or transferred on ComEd property.
5. In the event of a leak/spill on ComEd property, Contractor must notify ComEd within 24 hours and provide a written report within 5 business days.
6. ComEd anticipates that any leaks, spills, overflow, or similar will be addressed immediately by the Contractor at their expense, including any adverse impacts to the surrounding ComEd ROW.
7. Without prior authorization from ComEd, Contractor is not permitted to develop the unpaved areas or change the grade of the subject property in any ways other than what was submitted in this request. This includes activities of adding gravel to ComEd property and other fill-in activities.
8. Good housekeeping must be maintained at all times in the easement area on the ComEd property.
9. Contractor is responsible for the maintenance of any onsite stormwater management system and drainage at the subject property and will be held responsible for any adverse drainage issues that arise for the duration of the easement. Inlet filters must be placed on all storm sewer structures on ComEd property and must be properly maintained throughout the course of construction.

Construction Project Requirements.

10. All construction equipment must be free of leaks, and any leaks of oils or chemicals that occur must be immediately cleaned up and reported to the appropriate agencies as needed.

11. Daily equipment inspections must be conducted to verify proper working condition before equipment use on ComEd property. Written records of equipment inspections must be available to ComEd upon request.
12. No construction, demolition, or equipment staging is permitted on ComEd's property during construction activities.
13. Concrete washout activities are prohibited on ComEd property.
14. Vehicle and equipment fueling is prohibited on ComEd property.
15. A spill kit of appropriate size must be present and accessible at all times during construction activities on ComEd property.
16. In the event that drain tiles are damaged, Contractor shall repair or replace, as appropriate, the damaged drain tiles and accept responsibility for any adverse drainage issues and related damages that may arise.
17. ComEd shall provide written authorization for the discharge from excavation dewatering activities on ComEd property. If approved, dewatering activities must be conducted in accordance with Illinois Urban Manual (IUM) guidelines.

Excavation, Spoil and Materials

18. If the project requires removal of soil or waste from ComEd property, this must be removed by a ComEd Environmental Contractor of Choice (ECOC) and taken to a ComEd approved landfill. It is prohibited to dispose of any like material at a Clean Construction or Demolition Debris (CCDD) landfill. A list of ECOCs is enclosed with this letter.
19. Hydrovac spoils are not permitted to be reused on ComEd property and must be disposed in accordance with the above requirement.
20. Grading of excess soil is not permitted on ComEd property.
21. If the project requires additional soil and gravel, only certified "clean" fill shall be used. The source of the clean fill must be approved by ComEd. For approval, the following conditions must be met.
 - a. A certificate of virgin material must be obtained from the source of any aggregate material.
 - b. Soils must be certified clean by the source and/or analyzed every 500 cubic yards for total concentrations of the comprehensive suite of parameters listed in Title 35 Illinois Administrative Code (35 IAC) Part 740, Site Remediation Program (SRP) Appendix A, Target Compound List (TCL), and verified to meet the Illinois Environmental Protection Agency's (IEPA's) Clean Construction or Demolition Debris Fill Operations and Uncontaminated Soil Fill Operations standards (35 IAC Part 1100), Maximum Allowable Concentrations (MACs).
22. Stratification of soil horizons is required for all excavation and backfilling activities.
23. All soil and dewatering activities must be managed in accordance with IUM guidelines.
24. No construction debris or spoils may be stored on ComEd property post-construction.
25. Environmental sampling is not permitted on ComEd property without approval and guidance from ComEd. Any environmental sampling must be conducted by a ComEd ECOC.

Environmental Regulations and Permits.

26. All applicable regulations must be followed, including implementation of a Stormwater Pollution Prevention Plan (SWPPP) and an SESC Plan to minimize sediment pollution in stormwater runoff, as well as any other required practices. If the plans change, a revision must be sent to ComEd.

27. All applicable environmental permits must be obtained, including Wetlands and National Pollutant Discharge Elimination System (NPDES) stormwater permits as required under the Clean Water Act, as well as any other applicable environmental permits.
- 28. Contractor must submit copies of all required environmental permits to ComEd prior to project start, including an IEPA NPDES ILR10 Construction Permit.**
29. Requirements of all permits must be followed which could include site monitoring, reporting, and restoration extending well beyond the construction time period.
30. Contractor must follow all applicable environmental laws and regulations including those not specifically mentioned herein.

Wetlands Requirements (For ALL Identified and Potential Wetlands)

31. Based on information provided by the City of Naperville and a review of ComEd resources, wetlands are present on the ComEd property within the proposed permanent easement area. However, no impacts to the wetlands are proposed by the project and the City of Naperville has obtained a Letter of No Permit Required from the U.S. Army Corps of Engineers. City of Naperville has also obtained a DuPage County Stormwater Management Certification for the project for work within the wetland buffer and adjacent to the wetland.
- 32. Where wetlands are identified on ComEd property, ComEd requires that environmental oversight inspections are conducted, at the Contractor's expense, by a Wetlands Professional approved by ComEd. Written records of environmental inspections must be available to ComEd upon request.**
33. Discharging from excavation dewatering activities on ComEd property is prohibited within 100 feet of a wetland or waterway. It must be containerized for offsite disposal.
34. ComEd requires matting or low ground pressure equipment (less than 7 psi loaded) be utilized for access through wetlands during construction and maintenance activities.
35. Contractor must follow all federal, state, and local wetlands requirements, including United States Army Corps of Engineers and DuPage County regulations and guidelines.
36. Contractor shall provide a KMZ file of wetlands located on the ComEd ROW.

Condition of Property.

37. Contractor must provide documentation of current property conditions before improvements are started (e.g. Phase I, topographic maps, surveys, photographs).
38. Any damage to ComEd's property caused by the Contractor will be repaired at the Contractor's expense.
39. Contractor must provide full restoration of the site to the original condition when the project is complete including seeding as necessary.
- 40. Contractor must provide documentation (including photographs) that the property is returned to its original condition after completion of the project and restoration.**

Transmission Requirements.

1. ComEd shall retain rights for wire blowout, wire overhang, wire crossings and structure placement.
2. ComEd shall retain rights for approval of the location and height of any above ground appurtenances on the above-mentioned property. Preliminary lighting locations were reviewed as part of this project. Any additional installations or deviations from the plans submitted must be reviewed by ComEd before installation.
3. Subsurface utility installations and excavations shall be a minimum of fifteen (15) feet away from any transmission structure foundation. Edge of road easement shall be a

minimum of fifty (50) feet away from any transmission structure foundation. Any revisions required to meet this condition shall be performed.

4. No material or equipment should enter into the above mentioned fifteen (15) foot buffer area around each structure.
5. The Contractor may not place excavated spoil within the 15-foot restriction zone at any time. Spoil piles must be no taller than 5'. Under no circumstances may any vehicle drive on top of spoils.
6. The Contractor cannot change grade within the right-of-way without review and approval by ComEd Transmission Lines Engineering to ensure that ComEd NESC safety clearances are not violated.
7. The Contractor must ensure that with any earthwork performed on ComEd property, the existing drainage is not affected, and storm water does not pool on the ROW or adjacent properties.
8. There shall be no spreading of leftover excavation spoils on the ComEd Transmission ROW.
9. The Petitioner's equipment cannot exceed fourteen (14) feet in height when traversing the right-of-way.
10. The Contractor cannot leave construction equipment and materials on ComEd property when there is no work activity.
11. The Contractor must be made aware that ComEd use heavy equipment and cannot be held responsible for any damage to the Contractor's facilities that may occur due to the Company's right to access our property to operate and maintain new and existing transmission and distribution facilities.
12. The Contractor cannot place obstructions on ComEd's property that will restrict our ability to access, operate and maintain existing and future transmission and distribution facilities.
13. Transmission Engineering requires that the Contractor's proposed facilities on ComEd's property be designed for HS20 axle loading per AASHTO highway specifications in order to withstand ComEd construction traffic.
14. The Contractor is responsible for its own research and implementation, if necessary, of cathodic protection and grounding of the proposed facilities at the sole cost of the petitioner.
15. The Contractor and/or its contractor are advised that if heavy snow, rains and/or a large amount of water enters the excavation site and/or pooling occurs within the excavation site, the Overhead Transmission engineering department must be contacted for further instructions.
16. The Contractor must place barriers if the excavated area must remain open overnight.
17. When working in the vicinity of ComEd's electric transmission lines during the installation, OSHA requires a minimum fifteen (15) feet working clearance distance must be maintained between the booms, arms or other parts that can be raised on the equipment for the Contractor and ComEd's existing 138,000 volt electric transmission conductors, and a minimum twenty (20) feet working clearance distance must be maintained between the booms, arms or other parts that can be raised on the equipment for the Contractor and ComEd's existing 345,000 volt electric transmission conductors. Under no circumstances should truck beds be raised underneath ComEd transmission lines. This note should be added to any construction drawings.
18. It is suggested that the Contractor ground any exposed pipe and/or equipment during all work on the ComEd right-of-way to protect against induced voltages.
19. If the Contractor determines a line outage will be required to safely work within the vicinity of the existing Overhead Transmission facilities, a minimum of a 16-week prior notifications is required. The outage dates cannot be guaranteed due to system concerns and/or weather conditions. However, every effort will be made to accommodate the contractors need date. Any costs incurred by ComEd to support shall

be reimbursed by the Contractor. Outages on the overhead transmission facilities will not be permitted between the months of May 15 and September 15.

20. Upon completion of Contractor's project, the Contractor must remove any equipment, construction debris and material from the right-of-way and restore any other disturbed areas of the right-of-way to their pre-construction condition.

Basis of Payment: Excavation work within the ComEd Permanent Easements will be measured separately for payment as "Earth Excavation (Special)". See special provision for "Earth Excavation (Special)" in these special provisions for additional information.

ONEOK PROTECTION GUIDELINES

EXHIBIT C

PROTECTION OF THE PIPELINES AND EASEMENTS OF ONEOK

ONEOK PARTNERS INTERMEDIATE, L.P. as the owner and operator of pipelines (by and through its direct and indirect subsidiaries or Affiliates) (collectively "ONEOK")), is dedicated to protecting the environment, the public, contractors, and employees. The following requirements and guidelines for encroachment on the easements of ONEOK are established to comply with governmental regulations and to reduce the risk of damage to ONEOK's pipelines. Deviations from the following requirements may be requested, in writing and **must** be approved and permitted by ONEOK.

A party desiring to construct, install or otherwise place or permit any object, natural or artificial to be placed within the Easement Area is hereinafter referred to as the "Encroacher."

General Requirements:

1. A plan and profile with sufficient detail depicting the relationship between ONEOK's pipeline, existing grade, grade during construction, final grade, and all surface and underground encroachments (a "**Construction Plan**") must be provided to ONEOK's engineering department for evaluation and approval. If the encroachment is part of a development that will eventually result in the construction of a private dwelling, or any industrial building, or place of public assembly within fifty (50) feet of the pipeline, then the Encroacher must agree to provide the pipeline with a minimum depth of cover of 36" within the confines of the legal description for which the permit is written, and also to provide a registered plat at the Encroacher's expense of the centerline of the pipeline with respect to the Encroacher's planned improvements.
2. After acquiring approval of a Construction Plan, the Encroacher must give at least **forty-eight (48) hours** notice by calling the appropriate state One-Call telephone number before starting any individual excavation or other construction work in or near ONEOK's easement.
3. ONEOK's easement must be kept clear of such things as trees, shrubs, ponds, culverts, driveways, rock or brick fences, retaining walls, lateral lines, septic tanks, lagoons, dikes, bridges, canals, levees, burn piles, trash dumps, feeders, pole barns, hay barns, carports, garages, trailers, tanks, buildings, homes or any inhabitable structures, or other obstructions that are not specifically permitted.
4. ONEOK permits the encroachment only to the extent it may do so by law.
5. No utilities or roads shall run parallel to the ONEOK pipeline within the easement.
6. An authorized ONEOK representative must be present during excavation within twenty-five (25) feet of an ONEOK facility or pipeline and will be deemed to be present if proper notice was given under this Agreement and appointment set for ONEOK representative to be present.
7. Blasting within five hundred (500) feet of a ONEOK pipeline is subject to evaluation and prior approval by ONEOK.
8. ONEOK personnel shall review construction drawings for facilities planned near or crossing ONEOK's easement. All construction drawings shall have a note that reads as follows: "**WARNING-High Pressure Natural Gas Pipeline or Natural Gas Liquids Line, Contact the state's "One-Call" system and ONEOK at 1-888-844-5658 before digging.**"
9. Changes in grade that could cause loss of cover or erosion on the easement are forbidden. Provisions to prevent erosion shall be incorporated into the plans of the encroachment.
10. Markers and signs must not be obstructed, removed, or damaged; however, any signs damaged or removed during construction and or operations shall be replaced per ONEOK's specifications.
11. Transportation of construction equipment longitudinally over ONEOK's pipeline is not permitted. A perpendicular construction crossing that provides a minimum of thirty-six (36) inches of cover, and as

further described below in the Surface Construction Requirements, below, must be used to gain access to job sites.

12. Future repairs to ONEOK's easement or ONEOK's pipeline, which are required due to the activities of the Encroacher, are to be performed at the expense of the Encroacher.
13. Pipeline rerouting, lowering, encasing, etc., will be done by ONEOK, or ONEOK's contractor, and will be paid for by the Encroacher. The Encroacher must pay the estimated costs of such operations in advance.
14. Storage of equipment or materials on ONEOK's Pipeline Easements is prohibited.
15. Ground cover over the facility shall not be reduced and after completion of the encroachment, the ground cover shall be restored by the Permittee as nearly as reasonably possible to its condition prior to the construction.

Equipment Restrictions:

1. The use of scrapers or pan-type tractors for soil removal within ten (10) feet of ONEOK's pipeline is prohibited.
2. The use of vibratory rollers or sheepsfoot rollers within five (5) feet of ONEOK's pipeline is prohibited. ONEOK will address the best available technique at a reasonable cost given the specific circumstances at the time.
3. If reasonable, teeth covers shall be used on excavating equipment to reduce the chance of damaging ONEOK's pipeline; however, the heavy equipment operator must dig no closer than one foot from the top, bottom, or sides of the pipeline, or greater if required by federal, state, or local regulation.
4. Track equipment shall not turn directly over ONEOK's pipeline.

Surface Construction Requirements:

1. Roads shall cross as close to ninety degrees (90°) to ONEOK's pipeline as possible. In the event Encroacher will place upon or cross the easement with a load exceeding 20,000 pounds per axle and over 8" nominal diameter pipe or larger, Encroacher shall install the approved facilities as required by ONEOK to ensure the continued safety and integrity of the pipeline. By way of example and not to be construed as a limitation, in the event Encroacher will place upon or cross the easement with a load exceeding 20,000 pounds per axle and on 8" nominal diameter pipe or larger, ONEOK may require the placement of wooden ties for temporary crossings and/or constructing a concrete cap. In addition, ONEOK agrees to install signage containing a "High Pressure Natural Gas Pipeline" warning adjacent to any roadway under which the pipeline is located. Crossings shall be constructed in accordance with the standard parameters established by ONEOK for all road crossings, unless otherwise specifically approved by ONEOK in writing.
2. At no time will (i) the removal of the existing earth cover from over the ONEOK pipeline(s) such that ONEOK would be in violation of any existing law, regulation or order be permitted (ii) the cover be allowed to be less than thirty-six inches (36"), except to the extent prior written approval is granted by ONEOK, or (iii) an increase in the existing earth cover cause the total to exceed ten (10) feet over the pipeline(s).
3. Temporary construction crossings for heavy equipment access to job sites shall cross as close to ninety degrees (90°) to ONEOK's pipeline as possible and provide a minimum of ten (10) feet of earth cover or temporary bridges to be approved by ONEOK. Provisions to prevent rutting and erosion shall be used.
4. Structures such as manholes and catch basins cannot be located within ONEOK's easement.
5. Overhead power lines or other such crossings must maintain a twenty-five (25) foot clearance above the entire breadth of ONEOK's easement, and cross as close to ninety degrees (90°) as possible.
6. In the event the permittee is a wind farm, the rotor blades must maintain a seventy-five foot (75') clearance above the entire breadth of ONEOK's easement.

7. Poles, guy wires, etc. cannot be located within the boundaries of ONEOK's easement.
8. Fence posts must be located a minimum of ten (10) feet horizontal distance from ONEOK's pipeline.

Underground Construction Requirements:

1. Crossings shall be made as close to ninety degrees (90°) to ONEOK's pipeline as possible.
2. Crossings shall be made under the existing line with a clearance of one and one-half (1.5) times the diameter of the largest pipe, but with at least two (2) feet of separation from ONEOK's pipeline.
3. Except for portions of crossings installed by boring, a six (6) inch wide warning tape must be installed twelve (12) to eighteen (18) inches above non-metallic lines across the entire width of ONEOK's easement. For crossings installed by boring, markers will be installed at the boring ends and Encroacher will sign the crossing. No tape will be installed between boring markers.
4. Warning signs, where practical, identifying the owner, type of service, and emergency phone numbers shall be placed at each edge of the easement crossing.
5. Fiber optics cables shall be encased in non metallic conduit within ONEOK's easement.
6. Power lines must be installed in a non-metallic conduit; however, if a metallic conduit must be installed, cathodic protection will be required. Notwithstanding anything herein to the contrary, underground alternating current (AC) electrical cables with a metallic outer sheath or bare concentric neutral installed within a twenty foot corridor, ten feet on each side of the pipeline, should be placed in an insulating conduit or jacket such as reinforced fiberglass, polyethylene or polyvinyl chloride pipe. Cables energized to 600 volts or more should cross a minimum of 3 feet below the pipeline if practical, be incased in concrete if practical, and color coded red, across the entire right-of-way width. If it is practical to encase the cable in concrete, then six (6) inches of red concrete must protect the top of the conduit; however, in these instances concrete may be omitted if forty-eight (48) inches of clearance is maintained. The cable crossing should be clearly and permanently marked on each side of the right-of-way, if practical.
7. Metallic pipe crossings shall have corrosion test leads installed on both pipes at their intersection, if deemed necessary by Permittee and ONEOK engineers.
8. Bore pits must be ten (10) feet or more from ONEOK's pipeline(s). The crossing point must be exposed at least two (2) feet deeper than the bottom of the pipeline to verify sufficient clearance of the boring tool.
9. Open trench crossings must be made across only one pipeline at a time. The trench must meet OSHA requirements. Temporary piping supports may be required.
10. Backfilling shall be performed in such a manner that the pipeline is not subjected to impact damage or excessive stresses, and no large lumps of frozen soil, rocks, gravel, or like materials shall be backfilled directly onto the pipe. No foreign substances, such as welding rods, cans, ropes, skids, brush or trees, are to be placed in any excavation on ONEOK's easement.

CONTRACTOR REQUIREMENTS (WCL)

1 SPECIAL PROVISIONS

RELATIVE TO FLAGGING AND OTHER PROTECTION OF RAILROAD COMPANY TRAFFIC AND FACILITIES DURING CONSTRUCTION ADJACENT AND ABOVE, ON OR ACROSS, THE PROPERTY OF, OR ON, ABOVE AND BENEATH THE TRACKS OF THE WCL

The Licensee shall, before entering upon the property of Railroad Company for performance of any work, secure a fully executed right of entry license from Railroad Company's Engineering Manager or their authorized representative for the occupancy and use of Railroad Company's property. Licensee shall confer with Railroad Company relative to requirements for railroad clearances, operation and general safety regulations.

Prior to any entry onto Railroad Company's property, employees and/or contractor(s) of Licensee doing work 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 contractor(s) of Licensee 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 contractor(s) of Licensee 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 the Licensee and/or their contractor when contacting e-Rail Safe 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 contractor(s) of Licensee 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 contractor(s) of Licensee who will operate on-track machinery or those who will provide protection for other employees and/or contractor(s) of Licensee 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.

WCL

- d. "Potential to foul a live track" is considered, at a minimum, to be working within twenty-five feet of the track; or as otherwise to be determined by CN Design & Construction Department.

The employees, contractor(s), 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 Licensee and/or their contractor from Railroad Company's property at any time for any reason.

Licensee and/or any contractor engaged on their behalf, shall at all times conduct work in a manner satisfactory to the Engineering Manager of Railroad Company, or their authorized representative, and shall exercise care so as to not damage the property of Railroad Company, or that belonging to any other grantees, licensees, permittees or tenants of Railroad Company, or to interfere with railroad operations.

Engineering Manager of Railroad Company, or their authorized representative, will at all times have jurisdiction over the safety of railroad operations. The decision of the Engineering Manager or their authorized representative as to procedures which may affect the safety of railroad operations shall be final, and Licensee and/or their contractor shall be governed by such decision.

All work shall be conducted in such a manner as will assure the safety of Railroad Company. Railroad Company's authorized representative shall have the right, but not the duty, to require certain procedures to be used or to supervise the work on Railroad Company's property.

Should any damage occur to Railroad Company property as a result of the authorized or unauthorized operations of Licensee and/or their contractor and Railroad Company deems it necessary to repair such damage or perform any work for the protection of its property or operations, the Licensee and/or their contractor, as the case may be, shall promptly reimburse Railroad Company for the actual cost of such repairs or work. For the purpose of these Special Provisions, actual cost shall be deemed to include the direct cost of any labor, materials, equipment, or contract expense plus Railroad Company's current standard additives in each instance.

If the work requires the construction of a temporary grade crossing across the track(s) of Railroad Company, Licensee and/or their contractor shall make the necessary arrangements and execute Railroad Company's temporary grade crossing agreement for the construction, protection, maintenance, and later removal of such temporary grade crossing. The cost of such temporary grade crossing construction and later removal shall be prepaid to Railroad Company. Additional costs for repairs, maintenance or protection will be paid within thirty (30) days upon receipt of bill(s) therefore.

Licensee and/or their contractor shall at no time cross Railroad Company's property or tracks with vehicles or equipment of any kind or character, except at such temporary grade crossing as may be constructed as outlined herein, or at any existing and open public grade crossing. Operation over such crossing shall be at the direction and method of Railroad Company's Engineering Manager or their authorized representative.

Railroad Company may, at Licensee's and/or their contractor's sole cost, risk and expense, furnish whatever protective services it considers necessary, including, but not limited to, flagger(s), inspector(s), and stand-by personnel. Flagging protection, inspection services, or standby personnel required by Railroad Company for the safety of railroad operations because of work being conducted by Licensee and/or their contractor, or in connection therewith, will be provided by Railroad Company and the cost of Licensee and shall be prepaid to Railroad Company by Licensee and/or their contractor. Flagging protection, inspection services, or standby personnel, necessary or provided in excess of prepayment amounts will be billed at the proper rates and will be promptly paid by overnight delivery.

In the event Railroad Company is unable to furnish protective services at the desired time or on the desired date(s), or if Licensee's prepayment for such services is exhausted and not replenished by Licensee and/or their contractor, Licensee and/or their contractor shall not perform any work on Railroad Company's property until such time and date(s) that appropriate Railroad Company services can be made available and/or appropriate prepayment is received. It is understood that Railroad Company shall not be liable for any delay or increased costs incurred by Licensee and/or their contractor owing to Railroad Company's inability or failure to have appropriate protective services available at the time or on the date requested.

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Licensee and/or their contractor shall request and secure flagging protection by written notice to Railroad Company using CN's "Request for Flagging Services" form. This form must be submitted at least ten (10) working days in advance of proposed performance of any work or access to Railroad Company's property.

Flagging protection will be required during any operation involving direct and potential interference with Railroad Company's tracks or traffic. This may include but is not limited to fouling of railroad operating clearances, reasonable proximity of accidental hazard to railroad traffic, work within twenty-five (25) feet horizontally of the nearest centerline of any railroad track, any work over any railroad track, or in any other condition that Railroad Company deems protective services necessary, which may include work on or off Railroad Company's property more than twenty-five (25) feet from the nearest centerline of any railroad track, such as any equipment extension (including but not limited to a crane boom) that will reach or has the potential to reach within twenty-five (25) feet of any track.

Licensee and/or their contractor shall request, prepay, and secure Railroad Company signal facility locates by written notice to Railroad Company along with submission of CN's "Request for Flagging Services" form at least ten (10) working days in advance of proposed performance of any work or access to Railroad Company property. Notice to Railroad Company does not fulfill or satisfy any other notification requirements for utility locates for non-railroad facilities.

Railroad Company may require that prior to digging, trenching, or boring activities on or near Railroad Company property, or beneath any railroad track, an on-site meeting be conducted with Railroad Company's Signal Department representative. No digging, trenching or boring activities shall be conducted in the proximity of any known buried Railroad Company signal cables without Railroad Company's Signal Department representative being present.

The rate of pay for Railroad Company employees will be the prevailing hourly rate for not less than eight (8) hours for the class of labor at regular rates during regularly assigned work hours, and at overtime rates outside of regular hours and in accordance with Labor Agreements or Schedules plus Railroad Company's current standard additives in each instance.

Wage rates are subject to change, at any time, by law or agreement between Railroad Company and employees, and may be retroactive because of negotiations or a ruling by an authorized Governmental Agent. If the wage rates are changed, Licensee and/or their contractor shall pay on the basis of the new rates and/or additives.

No digging, trenching, or boring on Railroad Company property shall be conducted without Railroad Company's written approval of the plans that were furnished to Railroad Company's Engineering Manager at least thirty (30) in advance of the excavation.

The following temporary clearances are the minimum that must be maintained at all times during any operation on or adjacent to Railroad Company property:

Vertical: 22'-0" (7.00 m) above top of highest rail within 12'-0" (3.81 m) of the centerline of any track

Horizontal: 12'-0" (3.81 m) from centerline of the nearest track, measured at right angles thereto

If lesser clearances than the above are required for any part of the work, Licensee and/or their contractor shall secure written authorization from Railroad Company's Engineering Manager for such lesser clearances in advance of the start of that portion of the work.

No materials, supplies, or equipment will be stored within twenty-five (25) feet from the centerline of any railroad track, measured at right angles thereto.

Licensee and/or their contractor will be required upon the completion of the work to remove from within the limits of Railroad Company's property all machinery, equipment, surplus materials, false work, rubbish or temporary buildings, and to leave said property in a condition satisfactory to the Engineering Manager of Railroad Company or their authorized representative.

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Nothing in these Special Provisions shall be construed to place any responsibility on Railroad Company for the quality or conduct of the work performed by Licensee and/or their contractor hereunder. Any approval given or supervision exercised by Railroad Company hereunder, or failure of Railroad Company to object to any work done, material used, or method of operation shall not be construed to relieve Licensee and/or their contractor of any obligations pursuant hereto or under the License these Special Provisions are appended to.

Accepted: _____

Print Name: _____

Date: _____

WCL

ADDITIONAL CONTRACTOR REQUIREMENTS (WCL)

Description: The Contractor shall be aware of additional WCL requirements for construction operations when working inside the WCL right-of-way. The following guidelines are as follows.

A PERMANENT EASEMENT AGREEMENT and TEMPORARY EASEMENT AGREEMENT was made by and between Wisconsin Central Ltd., a Delaware corporation registered with the Illinois Secretary of State's Office and authorized to conduct business in the State of Illinois ("Grantor" or "WCL"), and: the CITY OF NAPERVILLE, a political subdivision of the State of Illinois and home rule unit of local government; the CITY OF AURORA, a political subdivision of the State of Illinois and home rule unit of local government; and NAPERVILLE TOWNSHIP, a political subdivision of the State of Illinois, jointly and severally (together referenced herein as "Grantee" also referenced as the "Road Authority").

Interference. The construction, repair, maintenance, reconstruction, and operation of the Project Roadway Improvements and the performance of the Road Authority Related Work for the Bridge Project Improvements on the Easement Premises shall be undertaken in such a manner as to avoid injury to persons or damage to the property of Grantor, and to avoid any interference with Grantor's railroad operations.

Flagging and Other Costs. Except as provided below, no activities shall be conducted by Contractor on any portion of the Easement Premises or Grantor's rail corridor or property that is within twenty-five (25) feet of any active railroad track, except in the presence of a flagman. In any case where a flagman or flagmen are required in connection with the presence of individuals on Grantor's rail corridor or the Easement Premises, Contractor shall provide as much advance notice as possible prior to any entry upon the Easement Premises. Grantor shall arrange for the presence of the flagman or flagmen as soon as practicable after receipt of such notice from Grantee but not later than ten (10) business days after receipt of such notice from Grantee. Grantee shall cause Grantor to be reimbursed, within sixty (60) days following Grantee's receipt of each bill therefor, Grantor's costs in arranging for and providing the flagman or flagmen, which shall be billed to Grantee at Grantor's then applicable standard rate. The estimated cost of one flagger as of the Effective Date is two thousand five hundred dollars (\$2,500) for an eight-hour day. Notwithstanding the foregoing, Contractor's and Road Authority's employees may enter upon the Easement Premises to conduct inspections without a Right of Entry Agreement provided that all such activities are governed by a railroad flagger if Contractor's or Road Authority employees have the potential to be within twenty-five feet (25') of an active railroad track.

In the event of a substantial risk of imminent personal injury or death or substantial property damage (an "**Emergency**"), the Contractor or the Road Authority shall provide WCL with such telephone, email, text or other notice as is practicable given the nature and extent of the Emergency and the Contractor and the Road Authority may enter the property owned by WCL to address the Emergency prior to the arrival of the flaggers. In such event, the WCL shall provide a flagger as soon as practicable for the work required by the Emergency. In all cases, the maintenance, repairs, and replacements, as the case may be, shall be performed in accordance with all applicable laws.

Testing. Neither Contractor nor Grantee shall perform invasive testing of the Easement Premises without prior notice and request for approval from Grantor. Any such request shall be promptly responded to by Grantor and shall not be unreasonably withheld.

Compliance with Environmental Laws. Grantee and Contractor shall strictly comply with all federal, state and local environmental Laws in its use of the Easement Premises, including, but

not limited to, the Resource Conservation and Recovery Act, as amended (RCRA), the Clean Water Act, the Oil Pollution Act, the Hazardous Materials Transportation Act, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Toxic Substances Control Act (collectively referred to as the "Environmental Laws"). Grantee and Contractor shall not maintain a "treatment," "storage," "transfer" or "disposal" facility, or "underground storage tank," as those terms are defined by Environmental Laws, on the Easement Premises. Grantee shall not release or suffer the release of "hazardous waste" or "hazardous substances", as "hazardous waste" and "hazardous substances" may now or in the future be defined by any Environmental Laws.

Coordination of Activities

Prior to commencement of any Road Authority (City of Naperville) Related Work, a pre-construction meeting shall be held among the representatives of the Road Authority, the Contractor, IDOT, WCL, and the Road Authority's contractor(s) for the purpose of coordinating the Road Authority Related Work and the WCL Related Work to be performed hereunder at which time a schedule for the performance of the such work shall be agreed upon and adopted by IDOT and the Contractor.

The Parties agree to act reasonably to coordinate their respective work. The Road Authority Related Work shall at all times be staged and performed so that WCL has uninterrupted use of the WCL Property for the provision of freight rail service and maintenance of WCL's railroad facilities. Under no circumstances shall the Contractor cause any train delays or interference with WCL operations not authorized in advance and in writing by WCL in the performance of the Road Authority Related Work, and the Contractor shall not unduly delay or interfere with the performance of WCL Related Work and shall take all steps reasonably necessary or requested by WCL to facilitate WCL's Related Work.

WCL agrees to cooperate with the Road Authority and the Contractor in the performance of the Road Authority Related Work. WCL shall not unduly delay or interfere with the Contractor in performing the Road Authority Related Work and shall take all steps reasonably necessary or requested by the Road Authority or the Contractor to facilitate the Road Authority Related Work.

The Contractor shall remove all machinery, surplus materials, falsework, rubbish and temporary buildings from any property owned by WCL and any WCL rights-of-way upon completion of the Road Authority Related Work and to leave real property owned by WCL and WCL rights-of-way in a neat and clean condition that they were in prior to the Road Authority Related Work.

Construction

Pursuant to 820 ILCS 130/1 et seq., if any WCL Related Work is performed by other than WCL forces, the provisions of the Illinois Prevailing Wage Act, "an act regulating wages of laborers, mechanics and other workers employed in public works by the state, county, city or any public body or any political subdivision or by anyone under contract for public works" shall apply. The Act requires contractors and subcontractors to pay laborers, workers and mechanics performing services on public works projects no less than the "prevailing rate of wages" (hourly cash wages plus fringe benefits) in the county where the work is performed. Pursuant to 820 ILCS 130/4, WCL is hereby notified that the prevailing rate of wages are revised by the Department of Labor and are available on the Department's official website.

Permits, approvals, utilities

The Road Authority and/or the Contractor shall be solely responsible for obtaining all permits, approvals, and utility relocations legally required for the Road Authority Related Work, provided, however, that WCL shall cooperate with the Road Authority in its efforts to obtain such permits or utility relocations and the Road Authority shall reimburse or pay WCL for any cost incurred by WCL in assisting with such permit, approval or utility relocation. Such cooperation shall include ordering utilities and other non-railroad entities using or occupying the property owned by WCL to relocate their facilities from such property at their sole cost to the extent necessary for the Project and to the extent that WCL is permitted to require relocation under the applicable agreement authorizing such use or occupation; provided, however, that such facilities do not unreasonably interfere with the Road Authority Related Work and such relocations do not damage or otherwise adversely affect WCL.

Except in cases of Emergency, as described under Right of Entry, the Contractor shall provide not less than ten business days' notice of the need for flaggers and WCL shall schedule them accordingly. For the purposes of this Agreement, a "Business Day" is defined as any day shown on the calendar that is not a federal holiday.

Nothing in this Agreement shall be construed to allow the Road Authority or the Contractor to allow a third party to install or operate any utility or facility on any portion of WCL Property without WCL's express written approval, which may be withheld for any reason or no reason.

WCL's Special Provisions governing contractors attached to and made a part of this Agreement as **WCL Special Provisions** must be adhered to any time representatives of the Road Authority or Contractor are on any WCL Property for the purposes set forth in this Agreement.

WCL shall, at the expense of the Road Authority or the Contractor, provide flaggers and other suitable personnel as WCL deems necessary to accommodate the Road Authority Related Work. Except in the case of an Emergency, as set forth under Right of Entry, the Road Authority's contractor(s) shall notify WCL at least ten (10) Business Days in advance of needing flagging services and WCL shall make reasonable efforts to furnish the services of such flagger or flaggers when requested.

WCL's authorized representative(s) shall have full authority concerning the operations of the railroad and the Road Authority's contractor(s) must comply with WCL's representatives' directions regarding any matter impacting the operations of the railroad. The Road Authority's contractor(s) shall not perform any work on the WCL Property without authorization to do so from the railroad flaggers.

Prior to commencement of Road Authority Related Work or WCL Related Work, a pre-construction meeting shall be held among the representatives of IDOT, the Road Authority, WCL, and the Contractor for the purpose of coordinating the work to be performed for the Bridge Project Improvements at which time a schedule for the performance of Road Authority Related Work and WCL Related Work shall be agreed upon and adopted by the Road Authority and WCL.

Right of Entry

Except in cases of Emergency as defined below, not less than seven (7) calendar days prior to entering upon the WCL Property or any other property owned by WCL for the purposes set forth in this Agreement, the Contractor shall execute and deliver to WCL's Chief Engineer, or his or her designee, a Right of Entry Application in the form attached and incorporated in the

RAILROAD RIGHT-OF-WAY ENTRY PERMIT (WCL) special provision along with evidence of all of the insurance required by such form. Provided, however, that the Contractor's and Road Authority's employees may enter property owned by WCL to conduct inspections without a Right of Entry Agreement provided that all such activities are governed by a railroad flagger if Contractor's or Road Authority employees have the potential to be within twenty-five feet (25') of an active railroad track.

Except in case of a substantial risk of imminent personal injury or death or substantial property damage (an "Emergency"), the Contractor must give WCL not less than ten (10) Business Days prior written notice to enable WCL to arrange for proposed work and for the flaggers. In the event of an Emergency, the Contractor or the Road Authority shall provide WCL with such telephone, email, text or other notice as is practicable given the nature and extent of the Emergency and the Contractor and the Road Authority may enter the property owned by WCL to address the Emergency prior to the arrival of the flaggers. In such event, the WCL shall provide a flagger as soon as practicable for the work required by the Emergency. In all cases, the maintenance, repairs, and replacements, as the case may be, shall be performed in accordance with all applicable laws.

Insurance

Prior to its entry upon WCL Property or any other property owned by WCL for the Road Authority Related Work, the Contractor shall obtain or cause its contractors to obtain insurance which includes the requirements set forth on the Right of Entry Application attached and incorporated in the RAILROAD RIGHT-OF-WAY ENTRY PERMIT (WCL) special provision. WCL shall be named as an additional insured on all policies described in the RAILROAD RIGHT-OF-WAY ENTRY PERMIT (WCL) special provision except Worker's Compensation and Automobile Liability policies. WCL shall be a named insured on the Railroad Protective Liability Policy.

RAILROAD RIGHT-OF-WAY ENTRY PERMIT (WCL)



Diane R Lewis
Public Works Officer (IL, IA, PA)

17641 S Ashland Ave
Homewood IL, 60430
T 708-332-3557
Email: Diane.Lewis@cn.ca

Right of Entry Information

Cost is \$1000.00 for application

Railroad Company requires everyone (contractor, consultants, etc.) working on Railroad Company property to have a Right-of-Entry (ROE) License Agreement. ROE license agreement applications are handled by email. Once Railroad Company receives the information requested below, and if application is approved, Railroad Company will draw up a ROE License Agreement, and will forward electronic copy by email for applicant's execution. ROE License Agreement will be delayed if Railroad Company receives the required documents separately, incomplete, or inaccurate. Railroad Company will return a fully executed digital copy of the ROE License Agreement by email for Applicant's files and records. 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. Please contact Railroad Company a minimum of three (3) weeks prior to the project start date.

Please use this form and return by email to submit application request for a Right of Entry agreement.

Legal Name of contractor -

Contact name -

Contact email -

Street Address -

City, State, Zip -

Telephone -

Reason for ROE - RR Bridge replacement, grading, sub-ballast

Duration of ROE (Include start and finish dates) -

Location of project (City, State) with nearest railroad milepost or crossing id number - North Aurora Road - Naperville, IL. LEIGHTON 21.50

Will there be subcontractors on this project (list all subs) -

Does your work require a traffic shift in opposing lane over a railroad at-grade crossing -

Include a map showing the project location

Email the completed form to: Diane.Lewis@cn.ca

**Note: Fully executed ROE may take up to 3+ weeks to obtain
Safety Training Required**

ALL contractor personal will have to comply with CN safety requirements including and before entering upon the property of the Railroad for performance of any work, secure permission from the Engineering Superintendent of the Railroad Company or his authorized representative for the occupancy and use of the Railroad's property and shall confer with the Railroad relative to requirements for railroad clearances, operation and general safety regulations. Outside contractors and subs, who are not employed by CN or doing work for CN, are required to register with www.contractororientation.com and complete the basic safety and security tests. Contractor Orientation provides the basic safety, security and PPE requirements for CN. You may find more information on registering with contractor orientation on the contractor orientation website. Once you register, follow the CN links and you will be required to take the course labeled [CN Contractor Security / Safety Course](#).

EXCEPTION: CN 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.

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: Diane Lewis
17641 S Ashland Ave
Homewood IL, 60430
715.332-3557 (office)
Diane.Lewis@cn.ca

The policy must not contain 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, and 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: Diane Lewis
17641 S Ashland Ave
Homewood IL, 60430
715.332-3557 (office)
Diane.Lewis@cn.ca

- E. Pollution Insurance – AS REQUIRED AND DETERMINED BY PROJECT.
 - 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:

CN 24-Hour Emergency Contact Number:

1-800-465-9239

Cable Locates:

CN utilities are not part of Digger's Hotline. **Please request a cable locate by using the Flagging - Cable Locate Form. \$975.00 Fee.**

Flagging Protection:

Rates: ~~\$2,500.00~~ ~~\$1,700.00~~ for each basic day (up to 8 hours, includes 2 hours to set up flags)
\$275.00 for each overtime hour
Weekend or Holiday work is \$275.00 per hour with an ~~8~~¹⁰ hour minimum or
~~\$2,750.00~~ ~~\$2500.00~~ plus any overtime.

Flagging must be **prepaid** based on the estimated number of days needed.

Usually only one flagman is required at the work site.

Flagman protection is required when there is any work being done within 25 feet of the centerline of the closest rail, but if you will be using cranes with booms larger than 25' but are working away from

the ROW, flagman protection will be required, just in case a crane topples over and violates that 25' rule.

CN's US Flagging group is the contact for arranging flagman protection on your upcoming project. CN requires at least a ten business day notice prior to the start of work, so arrangements can be made through our flagging contractor. Please complete the attached form and send to the address below along with prepayment. The sooner the form is sent to CN, the more likely you will get a flagger for the days you request.

CN – US Flagging
17641 S. Ashland Ave
Homewood, IL 60430
Phone: (248) 914-9695
Email: Flagging_US@cn.ca

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER 	CONTACT NAME: _____ PHONE (A/C, No, Ext): _____ FAX (A/C, No): _____ E-MAIL: _____ ADDRESS: _____ INSURER(S) AFFORDING COVERAGE: _____ NAIC #: _____ INSURER A: _____ INSURER B: _____ INSURER C: _____ INSURER D: _____ INSURER E: _____ INSURER F: _____
INSURED 	

COVERAGES

CERTIFICATE NUMBER:

REVISION NUMBER: 1

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADD L	SUB R	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
X	GENERAL LIABILITY COMMERCIAL GENERAL LIABILITY CLAIMS-MADE X OCCUR	Y	Y		EFF DATE	EXP DATE	EACH OCCURRENCE \$5,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$10,000,000 PRODUCTS - COM/OP AGG \$
X	AUTOMOBILE LIABILITY ANY AUTO ALL OWNED AUTOS	Y	Y		EFF DATE	EXP DATE	COMBINED SINGLE LIMIT (Ea accident) \$1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
X	UMBRELLA EXCESS LIAB	Y	Y		EFF DATE	EXP DATE	EACH OCCURRENCE \$5,000,000 AGGREGATE \$10,000,000 DED RETENTION \$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y	Y		EFF DATE	EXP DATE	OTHER MIN STATUTORY

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Certificate holder is an additional insured under all policies on this certificate including Commercial General Liability and Umbrella Liability.
A Waiver of Subrogation applies in favor of the Certificate Holder for all policies on this certificate including Commercial General Liability and Umbrella Liability.
50 foot railroad exclusion is removed through CG 2417 10 01

CERTIFICATE HOLDER

CANCELLATION

CERTIFICATE HOLDER Illinois Central Railroad Company and its Parents Wisconsin Central, Ltd. Attn: Nick Burwell 17641 S Ashland Homewood, IL 60430	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE
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ACORD 25 (2010/05)

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REQUEST FORM FOR FLAGGING AND CABLE LOCATE (WCL)

Page 1 of 2

CN Request for Flagging Services and Cable Location 10-2023

Project Information:	
Please fill in each cell for processing	
Is this a new project?	
List CN Project # (Example SO# 123456, Network# R1234, PSC-132):	
Contractor's Right of Entry (ROE), License, Permit #:	
Date of Agreement for ROE, License or Permit:	
Termination Date of Agreement for ROE, License or Permit (If Applicable):	
Does the scope of work include underground, piling, excavation or other activities which would require a Railroad Cable Locate? Note: railroad cables and fibers are not part of any state utility locate programs. If a contractor shows up on site to perform work that requires a cable locate and it was not requested, the flagger will shut down the project	
Does your project require vehicular traffic to be shifted out of its intended lane against the current of traffic at a railroad grade crossing?	
Railroad Subsidiary (listed on your agreement):	
<p>Licensee and/or their contractor shall request, prepay, and secure Railroad Company signal facility locates by written notice to Railroad Company along with submission of CN's "Request for Flagging Services" form at least, 10 business days in advance of proposed performance of any work or access to Railroad Company property.</p> <p>Notice to Railroad Company does not fulfill or satisfy any other notification requirements for utility locates for non-railroad facilities.</p> <p>You must have an agreement with a CN railroad subsidiary, such as a Right of Entry, Permit, License or Formal Agreement in addition to any necessary flagging before you may enter CN property.</p>	
Flagging Protection Schedule:	
Requested Dates for Flagger Protection: Dates requested are subject to Flagging Co. availability and any project needing a cable locate will need 10 days minimum advance notice. This should be considered when requesting dates for flagging.	
Estimated Duration (in days) for Flagger:	
Estimated Work Schedule (example Mon. – Sat.)	
Daily Start Time / End Time (example 0700 to 1700 etc.): (Flagger start and end time may vary based on type of protection required)	
Flagging Protection Location:	
Railroad Mile Post (MP):	
Railroad Subdivision:	
Project's Location (Street location/intersection):	
Project - City / State:	
Project Description (example HDD, Jack and Bore, Encroachment, Underground or Overhead Pipeline / Wireline crossing, etc.):	
Location for flagger to report:	
Field Contact Person(s):	1 st Alternate
Mobile Phone Number(s):	1 st Alternate
Email Address(s):	

CN REQUEST FOR FLAGGING SERVICES AND CABLE LOCATION			
Billing Information:			
Company Name:			
Contact Name:			
E-Mail:			
Billing Address:			
City/State:			
ZIP Code:			
Company Phone:			
Electronic Payment Instructions		Payment Information	
Financial Institution	HARRIS TRUST AND SAVINGS BANK 311 WEST MONROE, CHICAGO, IL	Customer Number (if available)	
Account Name	Grand Trunk Western	CN Contact	
Account	274-733-5	Service Requested (Flagging MP, Request Date)	
US ROUTING (ABA)	071 000 288		
Remittance Details	nfcashmanagement@cn.ca	Prepayment Amount	
Please send payment remittance details and copy of this flagging request to nfcashmanagement@cn.ca			

Before Flagging Service is provided:
CN required online training must be completed before Flagging Protection will be scheduled.
Prepayment must be received before Flagging Protection will be scheduled.
There is an 8-hour minimum per day. The base rate for Flagging Protection is \$2,500.00 prepayment rate per day : this includes 3 overtime hours for flagger to set up/take down protection if needed. Additional overtime hour must be prepaid at the rate of \$275.00 per hour. Weekends and Holidays must be prepaid at the overtime rate with a \$2,750.00 / 10 hour minimum. (Rates Effective October 1, 2023.)
If additional days of flagging protection are required, they must be prepaid in advance.
Any prepayment not used can be refunded.
Railroad Cable Location must be prepaid, the cost is \$975.00 per locate.

This completed form must be sent with a map, confirmation of electronic prepayment, and proof of insurance to US_Flagging@cn.ca

CN Flagging Department

US Flagging
T: **248-914-9695**
17641 South Ashland Ave.
Homewood, IL 60430
US_Flagging@cn.ca

I, _____, agree to pay for flagging and/or cable locate services as requested _____
Print Name
Signature

CONTRACTOR REQUIREMENTS (BNSF)



Contract Number: BF-20170672

EXHIBIT C

CONTRACTOR REQUIREMENTS

1) General

- A. The Contractor must cooperate with BNSF RAILWAY COMPANY, hereinafter referred to as "Railway" where work is over or under on or adjacent to Railway property and/or right-of-way, hereafter referred to as "Railway Property", during the construction of the Project.
- B. The Contractor must execute and deliver to the Railway duplicate copies of the Exhibit "C- 1" Agreement, in the form attached hereto, obligating the Contractor to provide and maintain in full force and effect the insurance called for under Section 3 of said Exhibit "C- 1". Questions regarding procurement of the Railroad Protective Liability Insurance should be directed to Rosa Martinez at Marsh, USA, 214-303-8519.
- C. The Contractor must plan, schedule and conduct all work activities so as not to interfere with the movement of any trains on Railway Property.
- D. The Contractor's right to enter Railway's Property is subject to the absolute right of Railway to cause the Contractor's work on Railway's Property to cease if, in the opinion of Railway, Contractor's activities create a hazard to Railway's Property, employees, and/or operations. Railway will have the right to stop construction work on the Project if any of the following events take place: (i) Contractor (or any of its subcontractors) performs the Project work in a manner contrary to the plans and specifications approved by Railway; (ii) Contractor (or any of its subcontractors), in Railway's opinion, prosecutes the Project work in a manner which is hazardous to Railway property, facilities or the safe and expeditious movement of railroad traffic; (iii) the insurance described in the attached Exhibit C-1 is canceled during the course of the Project; or (iv) Agency fails to pay Railway for the Temporary Construction License or Easement. The work stoppage will continue until all necessary actions are taken by Contractor or its subcontractor to rectify the situation to the satisfaction of Railway's Division Engineer or until additional insurance has been delivered to and accepted by Railway. In the event of a breach of (i) this Agreement, (ii) either Temporary Construction License, or (iii) the Easement, Railway may immediately terminate both Temporary Construction License and/or the Easement. Any such work stoppage under this provision will not give rise to any liability on the part of Railway. Railway's right to stop the work is in addition to any other rights Railway may have including, but not limited to, actions or suits for damages or lost profits. In the event that Railway desires to stop construction work on the Project, Railway agrees to immediately notify the following individual in writing:



Contract Number: BF-20170672

City of Naperville City Engineer
Naperville Municipal Center
400 South Eagle Street
Naperville, IL 60540

- E. The Contractor is responsible for determining and complying with all Federal, State and Local Governmental laws and regulations, including, but not limited to environmental laws and regulations (including but not limited to the Resource Conservation and Recovery Act, as amended; the Clean Water Act, the Oil Pollution Act, the Hazardous Materials Transportation Act, CERCLA), and health and safety laws and regulations. The Contractor hereby indemnifies, defends and holds harmless Railway for, from and against all fines or penalties imposed or assessed by Federal, State and Local Governmental Agencies against the Railway which arise out of Contractor's work under this Agreement.
- F. The Contractor must notify the City Engineer of the City of Naperville at (630-420-6704_) and Railway's Manager Public Projects at (913) 551-4275 at least thirty (30) calendar days before commencing any work on Railway Property. Contractor's notification to Railway must refer to Railway's file BF-20170672.
- G. For any bridge demolition and/or falsework above any tracks or any excavations located with any part of the excavations located within, whichever is greater, twenty-five (25) feet of the nearest track or intersecting a slope from the plane of the top of rail on a 2 horizontal to 1 vertical slope beginning at eleven (11) feet from centerline of the nearest track, both measured perpendicular to center line of track, the Contractor must furnish the Railway five sets of working drawings showing details of construction affecting Railway Property and tracks. The working drawing must include the proposed method of installation and removal of falsework, shoring or cribbing, not included in the contract plans and two sets of structural calculations of any falsework, shoring or cribbing. For all excavation and shoring submittal plans, the current "BNSF-UPRR Guidelines for Temporary Shoring" must be used for determining the design loading conditions to be used in shoring design, and all calculations and submittals must be in accordance with the current "BNSF-UPRR Guidelines for Temporary Shoring". All submittal drawings and calculations must be stamped by a registered professional

engineer licensed to practice in the state the project is located. All calculations must take into consideration railway surcharge loading and must be designed to meet American Railway Engineering and Maintenance-of-Way Association (previously known as American Railway Engineering Association) Coopers E-80 live loading standard. All drawings and calculations must be stamped by a registered professional engineer licensed to practice in the state the project is located. The Contractor must not begin work until notified by the Railway that plans have been approved. The Contractor will be required to use lifting devices such as, cranes and/or winches to place or to remove any falsework over Railway's tracks. In no case will the Contractor be relieved of



Contract Number: BF-20170672

responsibility for results obtained by the implementation of said approved plans.

- H. Subject to the movement of Railway's trains, Railway will cooperate with the Contractor such that the work may be handled and performed in an efficient manner. The Contractor will have no claim whatsoever for any type of damages or for extra or additional compensation in the event his work is delayed by the Railway.

2) **Contractor Safety Orientation**

- A. No employee of the Contractor, its subcontractors, agents or invitees may enter Railway Property without first having completed Railway's Engineering Contractor Safety Orientation, found on the web site www.BNSFContractor.com. The Contractor must ensure that each of its employees, subcontractors, agents or invitees completes Railway's Engineering Contractor Safety Orientation through internet sessions before any work is performed on the Project. Additionally, the Contractor must ensure that each and every one of its employees, subcontractors, agents or invitees possesses a card certifying completion of the Railway Contractor Safety Orientation before entering Railway Property. The Contractor is responsible for the cost of the Railway Contractor Safety Orientation. The Contractor must renew the Railway Contractor Safety Orientation annually. Further clarification can be found on the web site or from the Railway's Representative.

3) **Railway Requirements**

- A. The Contractor must take protective measures as are necessary to keep railway facilities, including track ballast, free of sand, debris, and other foreign objects and materials resulting from his operations. Any damage to railway facilities resulting from Contractor's operations will be repaired or replaced by Railway and the cost of such repairs or replacement must be paid for by the Agency.
- B. The Contractor must notify the Railway's Division Engineer Michael Gibson at (817) 352- 1945 and provide blasting plans to the Railway for review seven (7) calendar days prior to conducting any blasting operations adjacent to or on Railway's Property.



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- C. The Contractor must abide by the following temporary clearances during construction:
- 15'-0" Horizontally from centerline of nearest track
 - 21'-6" Vertically above top of rail
 - 27'-0" Vertically above top of rail for electric wires carrying less than 750 volts
 - 28'-0" Vertically above top of rail for electric wires carrying 750 volts to 15,000 volts
 - 30'-0" Vertically above top of rail for electric wires carrying 15,000 volts to 20,000 volts
 - 34'-0" Vertically above top of rail for electric wires carrying more than 20,000 volts
- D. Upon completion of construction, the following clearances shall be maintained:
- 25' Horizontally from centerline of nearest track
 - 23' 6" Vertically above top of rail
- E. Any infringement within State statutory clearances due to the Contractor's operations must be submitted to the Railway and to the City of Naperville and must not be undertaken until approved in writing by the Railway, and until the City of Naperville has obtained any necessary authorization from the State Regulatory Authority for the infringement. No extra compensation will be allowed in the event the Contractor's work is delayed pending Railway approval, and/or the State Regulatory Authority's approval.
- F. In the case of impaired vertical clearance above top of rail, Railway will have the option of installing tell-tales or other protective devices Railway deems necessary for protection of Railway operations. The cost of tell-tales or protective devices will be borne by the Agency.
- G. The details of construction affecting the Railway's Property and tracks not included in the contract plans must be submitted to the Railway by the City of Naperville as Lead Local Agency for the Agency for approval before work is undertaken and this work must not be undertaken until approved by the Railway.
- H. At other than public road crossings, the Contractor must not move any equipment or materials across Railway's tracks until permission has been obtained from the Railway. The Contractor must obtain a "Temporary Construction Crossing Agreement" from the Railway prior to moving his equipment or materials across the Railways tracks. The temporary crossing must be gated and locked at all times when not required for use by the Contractor. The temporary crossing for use of the Contractor will be constructed and, at the completion of the project, removed at the expense of the Contractor.
- I. Discharge, release or spill on the Railway Property of any hazardous substances, oil, petroleum, constituents, pollutants, contaminants, or any hazardous waste is prohibited



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and Contractor must immediately notify the Railway's Resource Operations Center at 1 (800) 832-5452, of any discharge, release or spills in excess of a reportable quantity. Contractor must not allow Railway Property to become a treatment, storage or transfer facility as those terms are defined in the Resource Conservation and Recovery Act or any state analogue.

- J. The Contractor upon completion of the work covered by this contract, must promptly remove from the Railway's Property all of Contractor's tools, equipment, implements and other materials, whether brought upon said property by said Contractor or any Subcontractor, employee or agent of Contractor or of any Subcontractor, and must cause Railway's Property to be left in a condition acceptable to the Railway's representative.

4) Contractor Roadway Worker on Track Safety Program and Safety Action Plan

- A. Each Contractor that will perform work within 25 feet of the centerline of a track must develop and implement a Roadway Worker Protection/On Track Safety Program and work with Railway Project Representative to develop an on track safety strategy as described in the guidelines listed in the on track safety portion of the Safety Orientation. This Program must provide Roadway Worker protection/on track training for all employees of the Contractor, its subcontractors, agents or invitees. This training is reinforced at the job site through job safety briefings. Additionally, each Contractor must develop and implement the Safety Action Plan, as provided for on the web site www.BNSFContractor.com, which will be made available to Railway prior to commencement of any work on Railway Property. During the performance of work, the Contractor must audit its work activities. The Contractor must designate an on-site Project Supervisor who will serve as the contact person for the Railway and who will maintain a copy of the Safety Action Plan, safety audits, and Material Safety Datasheets (MSDS), at the job site.
- B. Contractor shall have a background investigation performed on all of its employees, subcontractors and agents who will be performing any services for Railroad under this Agreement which are determined by Railroad in its sole discretion a) to be on Railroad's property, or b) that require access to Railroad Critical Infrastructure, Railroad Critical Information Systems, Railroad's Employees, Hazardous Materials on Railroad's property or is being transported by or otherwise in the custody of Railroad, or Freight in Transit involving Railroad.
 - 1) The required background screening shall at a minimum meet the rail industry background screening criteria defined by the e-RAILSAFE Program as outlined at www.eVerifile.com, in addition to any other applicable regulatory requirements.



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- ii) Contractor shall obtain written consent from all its employees, subcontractors or agents screened in compliance with the e-RAILSAFE Program to participate in the Program on their behalf and to release completed background information to Railroad's designee. Contractor shall be subject to periodic audit to ensure compliance.
- iii) Contractor subject to the e-RAILSAFE Program hereunder shall not permit any of its employees, subcontractors or agents to perform services hereunder who are not first approved under e-RAILSAFE Program standards. Railroad shall have the right to deny entry onto its premises or access as described in this section above to any of Contractor's employees, subcontractors or agents who do not display the authorized identification badge issued by a background screening service meeting the standards set forth in the e-RAILSAFE Program, or who in Railroad's opinion, which may not be unreasonable, may pose a threat to the safety or security of Railroad's operations, assets or personnel.
- iv) Contractors shall be responsible for ensuring that its employees, subcontractors and agents are United States citizens or legally working in the United States under a lawful and appropriate work VISA or other work authorization.

5) Railway Flagging Services

- A.** The Contractor must give Railway's **Roadmaster (telephone 630-692-6257)** a minimum of thirty (30) calendar days advance notice when flagging services will be required so that the Roadmaster can make appropriate arrangements (i.e., bulletin the flagger's position). If flagging services are scheduled in advance by the Contractor and it is subsequently determined by the parties hereto that such services are no longer necessary, the Contractor must give the Roadmaster five (5) working days advance notice so that appropriate arrangements can be made to abolish the position pursuant to union requirements.
- B.** Unless determined otherwise by Railway's Project Representative, Railway flagger will be required and furnished when Contractor's work activities are located over, under and/or within twenty-five (25) feet measured horizontally from centerline of the nearest track and when cranes or similar equipment positioned beyond 25-feet from the track centerline could foul the track in the event of tip over or other catastrophic occurrence, but not limited thereto for the following conditions:
 - i) When, upon inspection by Railway's Representative, other conditions warrant.



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- ii) When any excavation is performed below the bottom of tie elevation, if, in the opinion of Railway's representative, track or other Railway facilities may be subject to movement or settlement.
- iii) When work in any way interferes with the safe operation of trains at timetable speeds.
- iv) When any hazard is presented to Railway track, communications, signal, electrical, or other facilities either due to persons, material, equipment or blasting in the vicinity.
- v) Special permission must be obtained from the Railway before moving heavy or cumbersome objects or equipment which might result in making the track impassable.

C. Flagging services will be performed by qualified Railway flaggers.

- i) Flagging crew generally consists of one employee. However, additional personnel may be required to protect Railway Property and operations, if deemed necessary by the Railways Representative.
- ii) Each time a flagger is called, the minimum period for billing will be the eight (8) hour basic day.
- iii) The cost of flagger services provided by the Railway will be borne by the Agency. The estimated cost for one (1) flagger is approximately between \$1,200.00-\$2,000.00 for a ten (10) hour basic day with time and one-half or double time for overtime, rest days and holidays. The estimated cost for each flagger includes vacation allowance, paid holidays, Railway and unemployment insurance, public liability and property damage insurance, health and welfare benefits, vehicle, transportation, meals, lodging, radio, equipment, supervision and other costs incidental to performing flagging services. Negotiations for Railway labor or collective bargaining agreements and rate changes authorized by appropriate Federal authorities may increase actual or estimated flagging rates. **THE FLAGGING RATE IN EFFECT AT THE TIME OF PERFORMANCE BY THE CONTRACTOR HEREUNDER WILL BE USED TO CALCULATE THE ACTUAL COSTS OF FLAGGING PURSUANT TO THIS PARAGRAPH.**
- iv) The average train traffic on this route is 1 freight train per 24-hour period at a timetable speed 20 MPH.



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6) Contractor General Safety Requirements

- A.** Work in the proximity of railway track(s) is potentially hazardous where movement of trains and equipment can occur at any time and in any direction. All work performed by contractors within 25 feet of any track must be in compliance with FRA Roadway Worker Protection Regulations.
- B.** Before beginning any task on Railway Property, a thorough job safety briefing must be conducted with all personnel involved with the task and repeated when the personnel or task changes. If the task is within 25 feet of any track, the job briefing must include the Railway's flagger, as applicable, and include the procedures the Contractor will use to protect its employees, subcontractors, agents or invitees from moving any equipment adjacent to or across any Railway track(s).
- C.** Workers must not work within 25 feet of the centerline of any track without an on track safety strategy approved by the Railway's Project Representative. When authority is provided, every contractor employee must know: (1) who the Railway flagger is, and how to contact the flagger, (2) limits of the authority, (3) the method of communication to stop and resume work, and (4) location of the designated places of safety. Persons or equipment entering flag/work limits that were not previously job briefed, must notify the flagger immediately, and be given a job briefing when working within 25 feet of the center line of track.
- D.** When Contractor employees are required to work on the Railway Property after normal working hours or on weekends, the Railway's representative in charge of the project must be notified. A minimum of two employees must be present at all times.
- E.** Any employees, agents or invitees of Contractor or its subcontractors under suspicion of being under the influence of drugs or alcohol, or in the possession of same, will be removed from the Railway's Property and subsequently released to the custody of a representative of Contractor management. Future access to the Railway's Property by that employee will be denied.
- F.** Any damage to Railway Property, or any hazard noticed on passing trains must be reported immediately to the Railway's representative in charge of the project. Any vehicle or machine which may come in contact with track, signal equipment, or structure (bridge) and could result in a train derailment must be reported immediately to the Railway representative in charge of the project and to the Railway's Resource Operations Center at 1(800) 832-5452. Local emergency numbers are to be obtained from the Railway representative in charge of the project prior to the start of any work and must be posted at the job site.



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- G. For safety reasons, all persons are prohibited from having pocket knives, firearms or other deadly weapons in their possession while working on Railway's Property.
- H. All personnel protective equipment (PPE) used on Railway Property must meet applicable OSHA and ANSI specifications. Current Railway personnel protective equipment requirements are listed on the web site, www.BNSFContractor.com, however, a partial list of the requirements include: a) safety glasses with permanently affixed side shields (no yellow lenses); b) hard hats; c) safety shoe with: hardened toes, above-the-ankle lace-up and a defined heel; and d) high visibility retro-reflective work wear. The Railway's representative in charge of the project is to be contacted regarding local specifications for meeting requirements relating to hi-visibility work wear. Hearing protection, fall protection, gloves, and respirators must be worn as required by State and Federal regulations. (NOTE – Should there be a discrepancy between the information contained on the web site and the information in this paragraph, the web site will govern.)
- I. **THE CONTRACTOR MUST NOT PILE OR STORE ANY MATERIALS, MACHINERY OR EQUIPMENT CLOSER THAN 25'-0" TO THE CENTER LINE OF THE NEAREST RAILWAY TRACK. MATERIALS, MACHINERY OR EQUIPMENT MUST NOT BE STORED OR LEFT WITHIN 250 FEET OF ANY HIGHWAY/RAIL AT-GRADE CROSSINGS OR TEMPORARY CONSTRUCTION CROSSING, WHERE STORAGE OF THE SAME WILL OBSTRUCT THE VIEW OF A TRAIN APPROACHING THE CROSSING. PRIOR TO BEGINNING WORK, THE CONTRACTOR MUST ESTABLISH A STORAGE AREA WITH CONCURRENCE OF THE RAILWAY'S REPRESENTATIVE.**
- J. Machines or vehicles must not be left unattended with the engine running. Parked machines or equipment must be in gear with brakes set and if equipped with blade, pan or bucket, they must be lowered to the ground. All machinery and equipment left unattended on Railway's Property must be left inoperable and secured against movement. (See internet Engineering Contractor Safety Orientation program for more detailed specifications)
- K. Workers must not create and leave any conditions at the work site that would interfere with water drainage. Any work performed over water must meet all Federal, State and Local regulations.
- L. All power line wires must be considered dangerous and of high voltage unless informed to the contrary by proper authority. For all power lines the minimum clearance between the lines and any part of the equipment or load must be; 200 KV or below - 15 feet; 200 to 350 KV - 20 feet; 350 to 500 KV - 25 feet; 500 to 750 KV - 35 feet; and 750 to 1000 KV - 45 feet. If capacity of the line is not known, a minimum clearance of 45 feet must be



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maintained. A person must be designated to observe clearance of the equipment and give a timely warning for all operations where it is difficult for an operator to maintain the desired clearance by visual means.

7) **Excavation**

- A. Before excavating, the Contractor must determine whether any underground pipe lines, electric wires, or cables, including fiber optic cable systems are present and located within the Project work area. The Contractor must determine whether excavation on Railway's Property could cause damage to buried cables resulting in delay to Railway traffic and disruption of service to users. Delays and disruptions to service may cause business interruptions involving loss of revenue and profits. Before commencing excavation, the Contractor must contact **BNSF's Field Engineering Representative (Mark Anderson 816-536-3253)**. All underground and overhead wires will be considered HIGH VOLTAGE and dangerous until verified with the company having ownership of the line. **It is the Contractor's responsibility to notify any other companies that have underground utilities in the area and arrange for the location of all underground utilities before excavating.**
- B. The Contractor must cease all work and notify the Railway immediately before continuing excavation in the area if obstructions are encountered which do not appear on drawings. If the obstruction is a utility and the owner of the utility can be identified, then the Contractor must also notify the owner immediately. If there is any doubt about the location of underground cables or lines of any kind, no work must be performed until the exact location has been determined. There will be no exceptions to these instructions.
- C. All excavations must be conducted in compliance with applicable OSHA regulations and, regardless of depth, must be shored where there is any danger to tracks, structures or personnel.
- D. Any excavations, holes or trenches on the Railway's Property must be covered, guarded and/or protected when not being worked on. When leaving work site areas at night and over weekends, the areas must be secured and left in a condition that will ensure that Railway employees and other personnel who may be working or passing through the area are protected from all hazards. All excavations must be back filled as soon as possible.

8) **Hazardous Waste, Substances and Material Reporting:**

- A. If Contractor discovers any hazardous waste, hazardous substance, petroleum or other deleterious material, including but not limited to any non-containerized commodity or



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material, on or adjacent to Railway's Property, in or near any surface water, swamp, wetlands or waterways, while performing any work under this Agreement, Contractor must immediately: (a) notify the Railway's Resource Operations Center at 1(800) 832-5452, of such discovery; (b) take safeguards necessary to protect its employees, subcontractors, agents and/or third parties; and (c) exercise due care with respect to the release, including the taking of any appropriate measure to minimize the impact of such release.

9) Personal Injury Reporting

- A.** The Railway is required to report certain injuries as a part of compliance with Federal Railroad Administration (FRA) reporting requirements. Any personal injury sustained by an employee of the Contractor, subcontractor or Contractor's invitees while on the Railway's Property must be reported immediately (by phone mail if unable to contact in person) to the Railway's representative in charge of the project. The Non-Employee Personal Injury Data Collection Form contained herein is to be completed and sent by Fax to the Railway at 1(817) 352-7595 and to the Railway's Project Representative no later than the close of shift on the date of the injury.



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NON-EMPLOYEE PERSONAL INJURY DATA COLLECTION

(If injuries are in connection with rail equipment accident/incident, highway rail grade crossing accident or automobile accident, ensure that appropriate information is obtained, forms completed and that data entry personnel are aware that injuries relate to that specific event.)

Injured Person Type:

- | | |
|---|--|
| <input type="checkbox"/> Passenger on train (C) | <input type="checkbox"/> Non-employee (N)
<i>(i.e., emp of another railroad, or, non-BNSF emp involved in vehicle accident, including company vehicles)</i> |
| <input type="checkbox"/> Contractor/safety | <input type="checkbox"/> Contractor/non-safety sensitive (G) |
| <input type="checkbox"/> Volunteer/safety sensitive (H) | <input type="checkbox"/> Volunteer/other non-safety sensitive (I) |
| <input type="checkbox"/> Non-trespasser (D) - to include highway users involved in highway rail grade crossing accidents who did not go around or through gates | |
| <input type="checkbox"/> Trespasser (E) - to include highway users involved in highway rail grade crossing accidents who went around or through gates | |
| <input type="checkbox"/> Non-trespasser (J) - Off railroad property If | |

train involved, Train ID: _____

Transmit attached information to Accident/Incident Reporting Center by:
Fax 1-817-352-7595 or by Phone 1-800-697-6736 or email to: Accident-Reporting.Center@BNSF.com

Officer Providing Information:

(Name) (Employee No.) (Phone #)

**REPORT PREPARED TO COMPLY WITH FEDERAL ACCIDENT REPORTING
REQUIREMENTS AND PROTECTED FROM DISCLOSURE PURSUANT TO 49 U.S.C. 20903
AND 83 U.S.C. 490**



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NON-EMPLOYEE PERSONAL INJURY DATA COLLECTION

Please complete this form and provide to the BNSF supervisor, who will input this information into the EHS Star system. For questions, call (817) 352-1267 or email Safety.IncidentReporting@BNSF.com.

Accident City/State: _____ Date: _____ Time: _____

County: _____ Temperature: _____
Weather: _____ (if non-BNSF location)

Name (Last/First/MI): _____

Age: _____ Gender (if available): _____

Company: _____

eRailsafe Badge Number: _____ Expiration Date: _____

BNSF Contractor Badge Number: _____ Expiration Date: _____

Injury: _____ Body Part: _____

(e.g., laceration)
(e.g., hand)

Description of accident (including how accident occurred, potential cause, etc.):

Work activity in progress at time of accident: _____

Tools, machinery, or hazardous materials involved in accident: _____

Treatment:

- ☐ First Aid Only
- ☐ Required Medical Treatment
- ☐ Other Medical Treatment: _____

Dr. Name: _____

Date: _____

Dr. Street Address: _____ City: _____ State: _____ Zip: _____

Hospital Name: _____

Hospital Street Address: _____ City: _____ State: _____ Zip: _____

Diagnosis: _____



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THIS REPORT IS PART OF BNSF'S ACCIDENT REPORT PURSUANT TO THE ACCIDENT REPORTS STATUTE AND, AS SUCH SHALL NOT "BE ADMITTED AS EVIDENCE OR USED FOR ANY PURPOSE IN ANY SUIT OR ACTION FOR DAMAGES GROWING OUT OF ANY MATTER MENTIONED IN SAID REPORT...." 49 U.S.C. § 20903. See 49 C.F.R. § 225.7(b).

ADDITIONAL CONTRACTOR REQUIREMENTS (BNSF)

Description: The Contractor shall be aware of additional BNSF requirements for construction operations when working inside the BNSF right-of-way. The following guidelines are as follows.

CONTRACTOR OBLIGATIONS

1. The Contractor must make, any required application and obtain all required permits and approvals for the construction of the Project.
2. The Contractor must make, any and all arrangements, in compliance with BNSF's Utility Accommodation Manual (<http://www.bnsf.com/communities/faqs/pdf/utility.pdf>), for the installation or relocation of wire lines, pipe lines and other facilities owned by private persons, companies, corporations, political subdivisions or public utilities other than BNSF which may be necessary for the construction of the Project.
3. The Contractor must furnish all labor, materials, tools and equipment for the performance of City's (Agency's) Work. The principal elements of Agency's Work are as follows:
 - a. The construction, operation, maintenance and repair of a public roadway, and related surface improvements, including but not limited to a roadway, a retaining wall with tie-backs, storm sewer, water main, and sidewalk;
 - b. Provide suitable drainage, both temporary and permanent;
 - c. job site cleanup including removal of all construction materials, concrete debris, surplus soil, refuse, contaminated soils, asphalt debris, litter and other waste materials to the satisfaction of BNSF.
4. The Contractor and/or Contractor's sub-Contractors work must be performed in a manner that will not endanger or interfere with the safe and timely operations of BNSF and its facilities.
5. All warranties provided to Agency by the Contractor or any sub-Contractor performing work on the Project will inure to the benefit of BNSF, its successors, or assigns.
6. All work performed, either routine or otherwise, including work performed by the Contractor or any sub-Contractor on behalf of the Agency, requires the Contractor and any sub-Contractor to comply with the provisions of the attached Exhibit C and execute the agreement attached hereto as Exhibit C-1.
7. The Contractor must include, the following provisions in any contract regarding Agency's Work on said Project:
 - a. The Contractor is placed on notice that fiber optic, communication and other cable lines and systems (collectively, the "**Lines**") owned by various telecommunications companies may be buried on BNSF's property or right-of-way. The locations of these Lines have been included on the plans based on information from BNSF or based on information from telecommunication companies that BNSF has indicated may be on BNSF's property right-of-way. The Contractor will be responsible for contacting BNSF and the telecommunications companies and notifying them of any work that may damage these Lines or facilities and/or interfere with their service. The Contractor must also mark all Lines shown on the plans or marked in the field in order to verify their locations. The Contractor must use all reasonable methods when working in the BNSF right-of-way or on BNSF property to determine if any other Lines (fiber optic, cable, communication or otherwise) may exist.

- b. Contractor will be responsible for the rearrangement of any facilities or Lines determined to interfere with the construction. Contractor must cooperate fully with any telecommunications company(ies) in performing such rearrangements.
- c. Failure to mark or identify these Lines will be sufficient cause for BNSF to stop construction at no cost to the Agency or BNSF until these items are completed.
- d. In addition to the liability terms contained elsewhere in this Agreement, Contractor shall indemnify, defend and hold harmless BNSF for, from and against all cost, liability, and expense whatsoever (including, without limitation, attorney's fees which accrue prior to and court costs and expenses, but not including any legal fees or costs related to legal counsel retained by BNSF to monitor any litigation after Contractor accepts the obligations arising under this Section arising out of or in any way contributed to by any act or omission of Contractor, its sub-Contractors, agents and/or employees that cause or in any way or degree contribute to (1) any damage to or destruction of any Lines by Contractor, and/or its sub-Contractors, agents and/or employees, on BNSF's property or within BNSF's right-of-way, and (2) any injury to or death of any person employed by or on behalf of any telecommunications company, and/or its Contractor, agents and/or employees, on BNSF's property or within BNSF's right-of-way, and/or (3) any claim or cause of action for alleged loss of profits or revenue by, or loss of service by a customer or user of such telecommunication company(ies).

THE LIABILITY ASSUMED BY CONTRACTOR WILL NOT BE AFFECTED BY THE FACT, IF IT IS A FACT, THAT THE DAMAGE, DESTRUCTION, INJURY, DEATH, CAUSE OF ACTION OR CLAIM WAS OCCASIONED BY OR CONTRIBUTED TO BY THE NEGLIGENCE OF BNSF, ITS AGENTS, SERVANTS, EMPLOYEES OR OTHERWISE, EXCEPT TO THE EXTENT THAT SUCH CLAIMS ARE PROXIMATELY CAUSED BY THE INTENTIONAL MISCONDUCT OR SOLE NEGLIGENCE OF BNSF.

- 8. The Contractor must advise the appropriate BNSF Manager of Public Projects, in writing, of the completion date of the Project within thirty (30) days after such completion date. Additionally, the Contractor must notify BNSF's Manager of Public Projects, in writing, of the date on which Agency and/or Contractor will meet with BNSF for the purpose of making final inspection of the Project.
- 9. The parties (Contractor, Agency and BNSF) hereto mutually understand and agree that trains cannot be subject to delay during the fourth quarter of each calendar year. The parties mutually agree that construction activities for the Project will not be permitted during the fourth quarter of each year without express permission from BNSF. Upon Agency or Contractor request to BNSF's Manager of Public Projects and project manager, BNSF, in its sole discretion, will determine whether and when to permit construction activities during the fourth quarter of each year. Emergency work will be permitted only upon prior notification to BNSF's Network Operations Center (telephone number 800-832-5452).

RAILROAD RIGHT-OF-WAY ENTRY PERMIT (BNSF)



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EXHIBIT C-1

Agreement Between BNSF RAILWAY COMPANY and the CONTRACTOR

Railway File: BF-20170672

Agency Project: _____

_____ (hereinafter called "**Contractor**"), has entered into an agreement (hereinafter called "**Agreement**") dated _____, 2024, with the Illinois Department of Transportation ("**IDOT**") for the performance of certain work in connection with the following project: work on BNSF Railway Company right-of-way related to reconstruction of the North Aurora Road Underpass. Performance of such work will necessarily require Contractor to enter **BNSF RAILWAY COMPANY** (hereinafter called "**Railway**") right of way and property (hereinafter called "**Railway Property**"). The Agreement provides that no work will be commenced within Railway Property until the Contractor employed in connection with said work (i) executes and delivers to Railway an Agreement in the form hereof, and (ii) provides insurance of the coverage and limits specified in such Agreement and Section 3 herein. If this Agreement is executed by a party who is not the Owner, General Partner, President or Vice President of Contractor, Contractor must furnish evidence to Railway certifying that the signatory is empowered to execute this Agreement on behalf of Contractor.

Accordingly, in consideration of Railway granting permission to Contractor to enter upon Railway Property and as an inducement for such entry, Contractor, effective on the date of the Agreement, has agreed and does hereby agree with Railway as follows:

1) RELEASE OF LIABILITY AND INDEMNITY

- A.** Contractor hereby waives, releases, indemnifies, defends and holds harmless Railway for all judgments, awards, claims, demands, and expenses (including attorneys' fees), for injury or death to all persons, including Railway's and Contractor's officers and employees, and for loss and damage to property belonging to any person, arising in any manner from Contractor's or any of



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Contractor's subcontractors' acts or omissions or any work performed on or about Railway's property or right-of-way. **THE LIABILITY ASSUMED BY CONTRACTOR WILL NOT BE AFFECTED BY THE FACT, IF IT IS A FACT, THAT THE DESTRUCTION, DAMAGE, DEATH, OR INJURY WAS OCCASIONED BY OR CONTRIBUTED TO BY THE NEGLIGENCE OF RAILWAY, ITS AGENTS, SERVANTS, EMPLOYEES OR OTHERWISE, EXCEPT TO THE EXTENT THAT SUCH CLAIMS ARE PROXIMATELY CAUSED BY THE INTENTIONAL MISCONDUCT OR SOLE NEGLIGENCE OF RAILWAY**

B. THE INDEMNIFICATION OBLIGATION ASSUMED BY CONTRACTOR INCLUDES ANY CLAIMS, SUITS OR JUDGMENTS BROUGHT AGAINST RAILWAY UNDER THE FEDERAL EMPLOYEE'S LIABILITY ACT, INCLUDING CLAIMS FOR STRICT LIABILITY UNDER THE SAFETY APPLIANCE ACT OR THE LOCOMOTIVE INSPECTION ACT, WHENEVER SO CLAIMED.

C. Contractor further agrees, at its expense, in the name and on behalf of Railway, that it will adjust and settle all claims made against Railway, and will, at Railway's discretion, appear and defend any suits or actions of law or in equity brought against Railway on any claim or cause of action arising or growing out of or in any manner connected with any liability assumed by Contractor under this Agreement for which Railway is liable or is alleged to be liable. Railway will give notice to Contractor, in writing, of the receipt or dependency of such claims and thereupon Contractor must proceed to adjust and handle to a conclusion such claims, and in the event of a suit being brought against Railway, Railway may forward summons and complaint or other process in connection therewith to Contractor, and Contractor, at Railway's discretion, must defend, adjust, or settle such suits and protect, indemnify, and save harmless Railway from and against all damages, judgments, decrees, attorney's fees, costs, and expenses growing out of or resulting from or incident to any such claims or suits except to the extent that such claims are proximately caused by the intentional misconduct or sole negligence of Railway.

D. In addition to any other provision of this Agreement, in the event that all or any portion of this Article shall be deemed to be inapplicable for any reason, including without limitation as a result of a decision of an applicable court, legislative enactment or regulatory order, the parties agree that this Article shall be interpreted as requiring Contractor to indemnify Railway to the fullest extent permitted by applicable law.

E. It is mutually understood and agreed that the assumption of liabilities and indemnification provided for in this Agreement survive any termination of this Agreement.

2) TERM

A. This Agreement is effective from the date of the Agreement until (i) the completion of the project set forth herein, and (ii) full and complete payment to Railway of any and all sums or other amounts owing and due hereunder.



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3) INSURANCE

Contractor shall, at its sole cost and expense, procure and maintain during the life of this Agreement the following insurance coverage:

- A. Commercial General Liability insurance. This insurance shall contain broad form general liability with a combined single limit of a minimum of \$2,000,000 each occurrence and an aggregate limit of at least \$4,000,000 but in no event less than the amount otherwise carried by the Contractor. Coverage must be purchased on a post 2004 ISO occurrence form or equivalent and include coverage for, but not limit to the following:

- ◆ Bodily Injury and Property Damage
- ◆ Personal Injury and Advertising Injury
- ◆ Fire legal liability
- ◆ Products and completed operations

This policy shall also contain the following endorsements, which shall be indicated on the certificate of insurance:

- ◆ The definition of insured contract shall be amended to remove any exclusion or other limitation for any work being done within 50 feet of railroad property.
- ◆ Waiver of subrogation in favor of and acceptable to Railway.
- ◆ Additional insured endorsement in favor of and acceptable to Railway.
- ◆ Separation of insureds.
- ◆ The policy shall be primary and non-contributing with respect to any insurance carried by Railway.
- ◆ Contractual liability endorsement shall separately provide that BNSF is an additional insured with respect to contractual liability.

It is agreed that the workers' compensation and employers' liability related exclusions in the Commercial General Liability insurance policy(s) required herein are intended to apply to employees of the policy holder and shall not apply to *Railway* employees.

No other endorsements limiting coverage as respects obligations under this Agreement may be included on the policy with regard to the work being performed under this agreement.

- B. Business Automobile Insurance. This insurance shall contain a combined single limit of at least \$1,000,000 per occurrence, and include coverage for, but not limited to the following:



Contract Number: BF-20170672

- ◆ Bodily injury and property damage
- ◆ Any and all vehicles owned, used or hired

The policy shall also contain the following endorsements or language, which shall be indicated on the certificate of insurance:

- ◆ Waiver of subrogation in favor of and acceptable to Railway.
- ◆ Additional insured endorsement in favor of and acceptable to Railway.
- ◆ Separation of insureds.
- ◆ The policy shall be primary and non-contributing with respect to any insurance carried by Railway.

C. Workers Compensation and Employers Liability insurance including coverage for, but not limited to:

- ◆ Contractor's statutory liability under the worker's compensation laws of the state(s) in which the work is to be performed. If optional under State law, the insurance must cover all employees anyway.
- ◆ Employers' Liability (Part B) with limits of at least \$500,000 each accident, \$500,000 by disease policy limit, \$500,000 by disease each employee.

This policy shall also contain the following endorsements or language, which shall be indicated on the certificate of insurance:

- ◆ Waiver of subrogation in favor of and acceptable to Railway.

D. Railroad Protective Liability insurance naming only the **Railway** as the Insured with coverage of at least \$2,000,000 per occurrence and \$6,000,000 in the aggregate. The policy Must be issued on a standard ISO form CG 00 35 12 04 and include the following:

- ◆ Endorsed to include the Pollution Exclusion Amendment
- ◆ Endorsed to include the Limited Seepage and Pollution Endorsement.
- ◆ Endorsed to remove any exclusion for punitive damages.
- ◆ No other endorsements restricting coverage may be added.
- ◆ The original policy must be provided to the **Railway** prior to performing any work or services under this Agreement
- ◆ Definition of "Physical Damage to Property" shall be endorsed to read: "means direct and accidental loss of or damage to all property owned by any named insured and all property in any named insured' care, custody, and control arising out of the acts or omissions of the contractor named on the Declarations.

In lieu of providing a Railroad Protective Liability Policy, Licensee may participate (if available) in Railway's Blanket Railroad Protective Liability Insurance Policy.



Contract Number: BF-20170672

Other Requirements:

Where allowable by law, all policies (applying to coverage listed above) shall contain no exclusion for punitive damages.

Contractor agrees to waive its right of recovery against **Railway** for all claims and suits against **Railway**. In addition, its insurers, through the terms of the policy or policy endorsement, waive their right of subrogation against **Railway** for all claims and suits. Contractor further waives its right of recovery, and its insurers also waive their right of subrogation against **Railway** for loss of its owned or leased property or property under Contractor's care, custody or control.

Allocated Loss Expense shall be in addition to all policy limits for coverages referenced above.

Contractor is not allowed to self-insure without the prior written consent of **Railway**. If granted by **Railway**, any self-insured retention or other financial responsibility for claims shall be covered directly by Contractor in lieu of insurance. Any and all **Railway** liabilities that would otherwise, in accordance with the provisions of this Agreement, be covered by Contractor's insurance will be covered as if Contractor elected not to include a deductible, self-insured retention or other financial responsibility for claims.

Prior to commencing services, Contractor shall furnish to **Railway** an acceptable certificate(s) of insurance from an authorized representative evidencing the required coverage(s), endorsements, and amendments. The certificate should be directed to the following address:

BNSF Railway Company
c/o CertFocus
P.O. Box 140528 Kansas
City, MO 64114 Toll Free:
877-576-2378
Fax number: 817-840-7487
Email: BNSF@certfocus.com
www.certfocus.com

Contractor shall notify **Railway** in writing at least 30 days prior to any cancellation, non-renewal, substitution or material alteration.

Any insurance policy shall be written by a reputable insurance company acceptable to **Railway** or with a current Best's Guide Rating of A- and Class VII or better, and authorized to do business in the state(s) in which the service is to be provided.

If coverage is purchased on a "claims made" basis, Contractor hereby agrees to maintain coverage in force for a minimum of three years after expiration, cancellation or termination of this Agreement. Annually Contractor agrees to provide evidence of such coverage as required hereunder.



Contract Number: BF-20170672

Contractor represents that this Agreement has been thoroughly reviewed by Contractor's insurance agent(s)/broker(s), who have been instructed by Contractor to procure the insurance coverage required by this Agreement.

Not more frequently than once every five years, *Railway* may reasonably modify the required insurance coverage to reflect then-current risk management practices in the railroad industry and underwriting practices in the insurance industry.

If any portion of the operation is to be subcontracted by Contractor, Contractor shall require that the subcontractor shall provide and maintain insurance coverage(s) as set forth herein, naming *Railway* as an additional insured, and shall require that the subcontractor shall release, defend and indemnify *Railway* to the same extent and under the same terms and conditions as Contractor is required to release, defend and indemnify *Railway* herein.

Failure to provide evidence as required by this section shall entitle, but not require, *Railway* to terminate this Agreement immediately. Acceptance of a certificate that does not comply with this section shall not operate as a waiver of Contractor's obligations hereunder.

The fact that insurance (including, without limitation, self-insurance) is obtained by Contractor shall not be deemed to release or diminish the liability of Contractor including, without limitation, liability under the indemnity provisions of this Agreement. Damages recoverable by *Railway* shall not be limited by the amount of the required insurance coverage.

In the event of a claim or lawsuit involving *Railway* arising out of this agreement, Contractor will make available any required policy covering such claim or lawsuit.

These insurance provisions are intended to be a separate and distinct obligation on the part of the Contractor. Therefore, these provisions shall be enforceable and Contractor shall be bound thereby regardless of whether or not indemnity provisions are determined to be enforceable in the jurisdiction in which the work covered hereunder is performed.

For purposes of this section, *Railway* shall mean "Burlington Northern Santa Fe LLC", "BNSF Railway Company" and the subsidiaries, successors, assigns and affiliates of each.

4) INTENTIONALLY OMITTED

5) EXHIBIT "C" CONTRACTOR REQUIREMENTS

- A. The Contractor must observe and comply with all provisions, obligations, requirements and limitations contained in the Agreement, and the Contractor Requirements set forth on Exhibit "C" attached to the Agreement and this Agreement, including, but not be limited to, payment of all costs incurred for any damages to Railway roadbed, tracks, and/or appurtenances thereto, resulting from use, occupancy, or presence of its employees, representatives, or agents or subcontractors on or about the Project site. Contractor shall



Contract Number: BF-20170672

execute a Temporary Construction Crossing Agreement or Private Crossing Agreement (<http://www.bnsf.com/communities/faqs/permits-real-estate/>), for any temporary crossing requested to aid in the construction of this Project, if approved by BNSF.

6) TRAIN DELAY

- A. Contractor is responsible for and hereby indemnifies and holds harmless Railway (including its affiliated railway companies, and its tenants) for, from and against all damages arising from any unscheduled delay to a freight or passenger train which affects Railway's ability to fully utilize its equipment and to meet customer service and contract obligations. Contractor will be billed, as further provided below, for the economic losses arising from loss of use of equipment, contractual loss of incentive pay and bonuses and contractual penalties resulting from train delays, whether caused by Contractor, or subcontractors.
- B. For loss of use of equipment, Contractor will be billed the current freight train hour rate per train as determined from Railway's records. Any disruption to train traffic may cause delays to multiple trains at the same time for the same period.
- C. Additionally, the parties acknowledge that passenger, U.S. mail trains and certain other grain, intermodal, coal and freight trains operate under incentive/penalty contracts between Railway and its customer(s). Under these arrangements, if Railway does not meet its contract service commitments, Railway may suffer loss of performance or incentive pay and/or be subject to penalty payments. Contractor is responsible for any train performance and incentive penalties or other contractual economic losses actually incurred by Railway which are attributable to a train delay caused by Contractor or its subcontractors.
- D. The contractual relationship between Railway and its customers is proprietary and confidential. In the event of a train delay covered by this Agreement, Railway will share information relevant to any train delay to the extent consistent with Railway confidentiality obligations. The rate then in effect at the time of performance by the Contractor hereunder will be used to calculate the actual costs of train delay pursuant to this agreement.
- E. Contractor and its subcontractors must give Railway's representative Mark Anderson eight (8) weeks advance notice of the times and dates for proposed work windows. Railway and Contractor will establish mutually agreeable work windows for the project. Railway has the right at any time to revise or change the work windows due to train operations or service obligations. Railway will not be responsible for any additional costs or expenses resulting from a change in work windows. Additional costs or expenses resulting from a change in work windows shall be accounted for in Contractor's expenses for the project.
- F. Contractor and subcontractors must plan, schedule, coordinate and conduct all Contractor's work so as to not cause any delays to any trains.

SIGNATURE PAGES FOLLOW



Contract Number: BF-20170672

IN WITNESS WHEREOF, each of the parties hereto has caused this Agreement to be executed by its duly authorized officer the day and year first above written.

BNSF RAILWAY COMPANY

CONTRACTOR

Signature: _____

Signature: _____

Printed Name: _____

Printed Name: _____

Title: Manager Public Projects

Title: _____

Date: _____

Date: _____

Accepted and effective this _____ day of 2024.

Contact Person: _____

Address: _____

City: _____

State: _____

Zip: _____

Fax: _____

Phone: _____

E-mail: _____

LPC-663 CCDD FORMS



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: North Aurora Road Underpass Project Office Phone Number, if available: _____

Physical Site Location (address, including number and street):

North Aurora Road from Pennsbury Lane to Frontenac Road

City: Aurora and Naperville State: IL Zip Code: 60504

County: DuPage Township: Aurora

Lat/Long of approximate center of site in decimal degrees (DD.ddddd) to five decimal places (e.g., 40.67890, -90.12345):

Latitude: 41.78146 Longitude: -88.23229

(Decimal Degrees)

(-Decimal Degrees)

Identify how the lat/long data were determined:

☐ GPS ☐ Map Interpolation ☐ Photo Interpolation ☐ Survey ☒ Other

ISGS Public Land Survey System. Lat/lon above refer to the approximate center of the Project Area

IEPA Site Number(s), if assigned: BOL: _____ BOW: _____ BOA: _____

Approximate Start Date (mm/dd/yyyy): _____ Approximate End Date (mm/dd/yyyy): _____

Estimated Volume of debris (cu. Yd.): _____

II. Owner/Operator Information for Source Site

Site Owner

Name: _____ City of Naperville

Street Address: _____ 400 S. Eagle Street

PO Box: _____

City: _____ Naperville State: IL

Zip Code: 60540 Phone: 630-548-2958

Contact: Andy Hynes, PE - Deputy City Engineer

Email, if available: _____ hynesa@naperville.il.us

Site Operator

Name: _____

Street Address: _____

PO Box: _____

City: _____ State: _____

Zip Code: _____ Phone: _____

Contact: _____

Email, if available: _____

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.

Project Name: North Aurora Road Underpass Project

Latitude: 41.78146

Longitude: - 88.23229

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)]:

A database review was completed in the 2020 H&H PESA for the Project Area, which consists of residential and commercial properties. Nine (9) potentially impacted properties (PIPs) were identified in connection with the Project Area through the database review and site visit. Refer to the attachments for additional information.

- 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]:

Twelve soil borings were advanced in the Project Area on May 7, 2020. Samples were analyzed for one or more of: VOCs, BTEX, PNAs, RCRA Metals, and pH. With the exception of arsenic detections above the MAC values in the historical analytical results at location SB-103, Results achieve the CCDD requirements. Refer to the attachments for additional info.

IV. Certification Statement, Signature and Seal of Licensed Professional Engineer or Licensed Professional Geologist

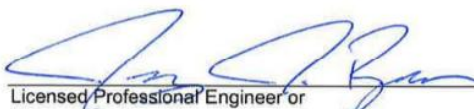
I, Jeremy J. Reynolds, P.G. (name of licensed professional engineer or geologist) certify under penalty of law that the information submitted, including but not limited to, all attachments and other information, is to the best of my knowledge and belief, true, accurate and complete. In accordance with 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: Huff & Huff, Inc.
Street Address: 915 Harger Rd Suite 330
City: Oak Brook State: IL Zip Code: 60523
Phone: (630) 684-9100

Jeremy J. Reynolds, P.G.

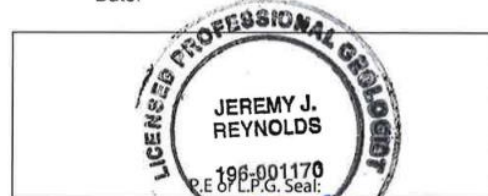
Printed Name:



Licensed Professional Engineer or
Licensed Professional Geologist Signature:

Jun 15, 2020

Date:



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

CEMENT, FINELY DIVIDED MINERALS, ADMIXTURES; CONCRETE, AND MORTAR (BDE)

Effective: January 1, 2025

Revise the first paragraph of Article 285.05 of the Standard Specifications to read:

“285.05 Fabric Formed Concrete Revetment Mat. The grout shall consist of a mixture of cement, fine aggregate, and water so proportioned and mixed as to provide a pumpable slurry. Fly ash or ground granulated blast furnace (GGBF) slag, and concrete admixtures may be used at the option of the Contractor. The grout shall have an air content of not less than 6.0 percent nor more than 9.0 percent of the volume of the grout. The mix shall obtain a compressive strength of 2500 psi (17,000 kPa) at 28 days according to Article 1020.09.”

Revise Article 302.02 of the Standard Specifications to read:

“302.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Hydrated Lime	1012.01
(d) By-Product, Hydrated Lime	1012.02
(e) By-Product, Non-Hydrated Lime	1012.03
(f) Lime Slurry	1012.04
(g) Fly Ash	1010
(h) Soil for Soil Modification (Note 1)	1009.01
(i) Bituminous Materials (Note 2)	1032

Note 1. This soil requirement only applies when modifying with lime (slurry or dry).

Note 2. The bituminous materials used for curing shall be emulsified asphalt RS-2, CRS-2, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250.”

Revise Article 312.07(c) of the Standard Specifications to read:

“(c) Cement1001”

Add Article 312.07(i) of the Standard Specifications to read:

“(i) Ground Granulated Blast Furnace (GGBF) Slag1010”

Revise the first paragraph of Article 312.09 of the Standard Specifications to read:

“312.09 Proportioning and Mix Design. At least 60 days prior to start of placing CAM II, the Contractor shall submit samples of materials to be used in the work for proportioning and testing.

The mixture shall contain a minimum of 200 lb (120 kg) of cement per cubic yard (cubic meter). Cement may be replaced with fly ash or ground granulated blast furnace (GGBF) slag according to Article 1020.05(c)(1) or 1020.05(c)(2), respectively, however the minimum cement content in the mixture shall be 170 lbs/cu yd (101 kg/cu m). Blends of coarse and fine aggregates will be permitted, provided the volume of fine aggregate does not exceed the volume of coarse aggregate. The Engineer will determine the proportions of materials for the mixture according to the "Portland Cement Concrete Level III Technician Course" manual. However, the Contractor may substitute their own mix design. Article 1020.05(a) shall apply, and a Level III PCC Technician shall develop the mix design."

Revise Article 352.02 of the Standard Specifications to read:

"352.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Cement (Note 1)	1001
(b) Soil for Soil-Cement Base Course	1009.03
(c) Water	1002
(d) Bituminous Materials (Note 2)	1032

Note 1. Bulk cement may be used for the traveling mixing plant method if the equipment for handling, weighing, and spreading the cement is approved by the Engineer.

Note 2. The bituminous materials used for curing shall be emulsified asphalt RS-2, CRS-2, HFE 90, or HFE 150; rapid curing liquid asphalt RC-70; or medium curing liquid asphalt MC-70 or MC-250."

Revise Article 404.02 of the Standard Specifications to read:

"404.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Fine Aggregate	1003.08
(d) Bituminous Material (Tack Coat)	1032.06
(e) Emulsified Asphalts (Note 1) (Note 2)	1032.06
(f) Fiber Modified Joint Sealer	1050.05
(g) Additives (Note 3)	

Note 1. When used for slurry seal, the emulsified asphalt shall be CQS-1h according to Article 1032.06(b).

Note 2. When used for micro-surfacing, the emulsified asphalt shall be CQS-1hP according to Article 1032.06(e).

Note 3. Additives may be added to the emulsion mix or any of the component materials to provide the control of the quick-traffic properties. They shall be included as part of the mix design and be compatible with the other components of the mix.

Revise the last sentence of the fourth paragraph of Article 404.08 of the Standard Specifications to read:

“When approved by the Engineer, the sealant may be dusted with fine sand, cement, or mineral filler to prevent tracking.”

Revise Note 2 of Article 516.02 of the Standard Specifications to read:

“Note 2. The sand-cement grout mix shall be according to Section 1020 and shall be a 1:1 blend of sand and cement comprised of a Type I, IL, or II cement at 185 lb/cu yd (110 kg/cu m). The maximum water cement ratio shall be sufficient to provide a flowable mixture with a typical slump of 10 in. (250 mm).”

Revise Note 2 of Article 543.02 of the Standard Specifications to read:

“Note 2. The grout mixture shall be 6.50 hundredweight/cu yd (385 kg/cu m) of cement plus fine aggregate and water. Fly ash or ground granulated blast furnace (GGBF) slag may replace a maximum of 5.25 hundredweight/cu yd (310 kg/cu m) of the cement. The water/cement ratio, according to Article 1020.06, shall not exceed 0.60. An air-entraining admixture shall be used to produce an air content, according to Article 1020.08, of not less than 6.0 percent nor more than 9.0 percent of the volume of the grout. The Contractor shall have the option to use a water-reducing or high range water-reducing admixture.”

Revise Article 583.01 of the Standard Specifications to read:

“583.01 Description. This work shall consist of placing cement mortar along precast, prestressed concrete bridge deck beams as required for fairing out any unevenness between adjacent deck beams prior to placing of waterproofing membrane and surfacing.”

Revise Article 583.02(a) of the Standard Specifications to read:

“(a) Cement1001”

Revise the first paragraph of Article 583.03 of the Standard Specifications to read:

“583.03 General. This work shall only be performed when the air temperature is 45 °F (7 °C) and rising. The mixture for cement mortar shall consist of three parts sand to one part cement by volume. The amount of water shall be no more than that necessary to produce a workable, plastic mortar.”

Revise Note 2/ in Article 1003.01(b) of the Standard Specifications to read:

“2/ Applies only to sand. Sand exceeding the colorimetric test standard of 11 (Illinois Modified AASHTO T 21) will be checked for mortar making properties according to Illinois Modified ASTM C 87 and shall develop a compressive strength at the age of 14 days when using Type I, IL, or II cement of not less than 95 percent of the comparable standard.

Revise the second sentence of Article 1003.02(e)(1) of the Standard Specifications to read:

“The test will be performed with Type I, IL, or II portland cement having a total equivalent alkali content ($\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$) of 0.90 percent or greater.”

Revise the first sentence of the second paragraph of Article 1003.02(e)(3) of the Standard Specifications to read:

“The ASTM C 1293 test shall be performed with Type I, IL, or II portland cement having a total equivalent alkali content ($\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$) of 0.80 percent or greater.”

Revise the second sentence of Article 1004.02(g)(1) of the Standard Specifications to read:

“The test will be performed with Type I, IL, or II portland cement having a total equivalent alkali content ($\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$) of 0.90 percent or greater.”

Revise Article 1017.01 of the Standard Specifications to read:

“1017.01 Requirements. The mortar shall be high-strength according to ASTM C 387 and shall have a minimum 80.0 percent relative dynamic modulus of elasticity when tested by the Department according to Illinois Modified AASHTO T 161 or AASHTO T 161 when tested by an independent lab. The high-strength mortar shall have a water-soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the high-strength mortar shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every five years, and the test results shall be provided to the Department. Mixing of the high-strength mortar shall be according to the manufacturer’s specifications. The Department will maintain a qualified product list.”

Revise the fourth sentence of Article 1018.01 of the Standard Specifications to read:

“The ASTM C 1218 test shall be performed by an independent lab a minimum of once every five years, and the test results shall be provided to the Department.”

Revise Article 1019.02 of the Standard Specifications to read:

“1019.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Cement	1001
(b) Water	1002

- (c) Fine Aggregate for Controlled Low-Strength Material (CLSM) 1003.06
- (d) Fly Ash 1010
- (e) Ground Granulated Blast Furnace (GGBF) Slag..... 1010
- (f) Admixtures (Note 1)

Note 1. The air-entraining admixture may be in powder or liquid form. Prior to approval, a CLSM air-entraining admixture will be evaluated by the Department. The admixture shall be able to meet the air content requirements of Mix 2. The Department will maintain a qualified product list.”

Revise Article 1019.05 of the Standard Specifications to read:

“**1019.05 Department Mix Design.** The Department mix design shall be Mix 1, 2, or 3 and shall be proportioned to yield approximately one cubic yard (cubic meter).

Mix 1	
Cement	50 lb (30 kg)
Fly Ash – Class C or F, and/or GGBF Slag	125 lb (74 kg)
Fine Aggregate – Saturated Surface Dry	2900 lb (1720 kg)
Water	50-65 gal (248-322 L)
Air Content	No air is entrained

Mix 2	
Cement	125 lb (74 kg)
Fine Aggregate – Saturated Surface Dry	2500 lb (1483 kg)
Water	35-50 gal (173-248 L)
Air Content	15-25 %

Mix 3	
Cement	40 lb (24 kg)
Fly Ash – Class C or F, and/or GGBF Slag	125 lb (74 kg)
Fine Aggregate – Saturated Surface Dry	2500 lb (1483 kg)
Water	35-50 gal (179-248 L)
Air Content	15-25 %”

Revise Article 1020.04, Table 1, Note (8) of the Standard Specifications to read:

“(8) In addition to the Type III portland cement, 100 lb/cu yd of ground granulated blast-furnace slag and 50 lb/cu yd of microsilica (silica fume) shall be used. For an air temperature greater than 85 °F, the Type III portland cement may be replaced with Type I, IL, or II portland cement.”

Revise Article 1020.04, Table 1 (Metric), Note (8) of the Standard Specifications to read:

“(8) In addition to the Type III portland cement, 60 kg/cu m of ground granulated blast-furnace slag and 30 kg/cu m of microsilica (silica fume) shall be used. For an air temperature greater than 30 °C, the Type III portland cement may be replaced with Type I, IL, or II portland cement.”

Revise the second paragraph of Article 1020.05(a) of the Standard Specifications to read:

“For a mix design using a portland-pozzolan cement, portland blast-furnace slag cement, portland-limestone cement, or replacing portland cement with finely divided minerals per Articles 1020.05(c) and 1020.05(d), the Contractor may submit a mix design with a minimum portland cement content less than 400 lbs/cu yd (237 kg/cu m), but not less than 375 lbs/cu yd (222 kg/cu m), if the mix design is shown to have a minimum relative dynamic modulus of elasticity of 80 percent determined according to AASHTO T 161. Testing shall be performed by an independent laboratory accredited by AASHTO re:source for Portland Cement Concrete.”

Revise the first sentence of the first paragraph of Article 1020.05(b) of the Standard Specifications to read:

“Corrosion inhibitors and concrete admixtures shall be according to the qualified product lists.”

Delete the fourth and fifth sentences of the second paragraph of Article 1020.05(b) of the Standard Specifications.

Revise the third sentence of the second paragraph of Article 1020.05(b)(5) of the Standard Specifications to read:

“The qualified product lists of concrete admixtures shall not apply.”

Revise second paragraph of Article 1020.05(b)(10) of the Standard Specifications to read:

“When calcium nitrite is used, it shall be added at the rate of 4 gal/cu yd (20 L/cu m) and shall be added to the mix immediately after all compatible admixtures have been introduced to the batch. Other corrosion inhibitors shall be added per the manufacturer’s specifications.”

Delete the third paragraph of Article 1020.05(b)(10) of the Standard Specifications.

Revise Article 1020.15(b)(1)c. of the Standard Specifications to read:

“c. The minimum portland cement content in the mixture shall be 375 lbs/cu yd (222 kg/cu m). When the total of organic processing additions, inorganic processing additions, and limestone addition exceed 5.0 percent in the cement, the minimum portland cement content in the mixture shall be 400 lbs/cu yd (237 kg/cu m). For a drilled shaft, foundation, footing, or substructure, the

minimum portland cement may be reduced to as low as 330 lbs/cu yd (196 kg/cu m) if the concrete has adequate freeze/thaw durability. The Contractor shall provide freeze/thaw test results according to AASHTO T 161, and the relative dynamic modulus of elasticity of the mix design shall be a minimum of 80 percent. Testing shall be performed by an independent laboratory accredited by AASHTO as a resource for Portland Cement Concrete. Freeze/thaw testing will not be required for concrete that will not be exposed to freezing and thawing conditions as determined by the Engineer.”

Revise Article 1021.01 of the Standard Specifications to read:

“1021.01 General. Admixtures shall be furnished in liquid or powder form ready for use. The admixtures shall be delivered in the manufacturer's original containers, bulk tank trucks or such containers or tanks as are acceptable to the Engineer. Delivery shall be accompanied by a ticket which clearly identifies the manufacturer, the date of manufacture, and trade name of the material. Containers shall be readily identifiable as to manufacturer, the date of manufacture, and trade name of the material they contain.

Concrete admixtures shall be on one of the Department's qualified product lists. Unless otherwise noted, admixtures shall have successfully completed and remain current with the AASHTO Product Eval and Audit Concrete Admixture (CADD) testing program. For admixture submittals to the Department; the product brand name, manufacturer name, admixture type or types, an electronic link to the product's technical data sheet, and the NTPEP testing number which contains an electronic link to all test data shall be provided. In addition, a letter shall be submitted certifying that no changes have been made in the formulation of the material since the most current round of tests conducted by AASHTO Product Eval and Audit. After 28 days of testing by AASHTO Product Eval and Audit, air-entraining admixtures may be provisionally approved and used on Departmental projects. For all other admixtures, unless otherwise noted, the time period after which provisionally approved status may be earned is 6 months.

The manufacturer shall include the following in the submittal to the AASHTO Product Eval and Audit CADD testing program: the manufacturing range for specific gravity, the midpoint and manufacturing range for residue by oven drying, and manufacturing range of pH. The submittal shall also include an infrared spectrophotometer trace no more than five years old.

For air-entraining admixtures according to Article 1021.02, the specific gravity allowable manufacturing range established by the manufacturer shall be according to AASHTO M 194. For residue by oven drying and pH, the allowable manufacturing range and test methods shall be according to AASHTO M 194.

For admixtures according to Articles 1021.03, 1021.04, 1021.05, 1021.06, 1021.07, and 1021.08, the pH allowable manufacturing range established by the manufacturer shall be according to ASTM E 70. For specific gravity and residue by oven drying, the allowable manufacturing range and test methods shall be according to AASHTO M 194.

All admixtures, except chloride-based accelerators, shall contain a maximum of 0.3 percent chloride by weight (mass) as determined by an appropriate test method. To verify the test result, the Department will use Illinois Modified AASHTO T 260, Procedure A, Method 1.

Prior to final approval of an admixture, the Engineer reserves the right to request a sample for testing. The test and reference concrete mixtures tested by the Engineer will contain a cement content of 5.65 cwt/cu yd (335 kg/cu m). For freeze-thaw testing, the Department will perform the test according to Illinois Modified AASHTO T 161. The flexural strength test will be performed according to AASHTO T 177. If the Engineer decides to test the admixture, the manufacturer shall submit AASHTO T 197 water content and set time test results on the standard cement used by the Department. The manufacturer may select their lab or an independent lab to perform this testing. The laboratory is not required to be accredited by AASHTO.

Random field samples may be taken by the Department to verify an admixture meets specification. A split sample will be provided to the manufacturer if requested. Admixtures that do not meet specification requirements or an allowable manufacturing range established by the manufacturer shall be replaced with new material.”

Revise Article 1021.03 of the Standard Specifications to read:

“**1021.03 Retarding and Water-Reducing Admixtures.** The admixture shall be according to the following.

- (a) Retarding admixtures shall be according to AASHTO M 194, Type B (retarding) or Type D (water-reducing and retarding).
- (b) Water-reducing admixtures shall be according to AASHTO M 194, Type A.
- (c) High range water-reducing admixtures shall be according to AASHTO M 194, Type F (high range water-reducing) or Type G (high range water-reducing and retarding).”

Revise Article 1021.05 of the Standard Specifications to read:

“**1021.05 Self-Consolidating Admixtures.** Self-consolidating admixture systems shall consist of either a high range water-reducing admixture only or a high range water-reducing admixture combined with a separate viscosity modifying admixture. The one or two component admixture system shall be capable of producing a concrete that can flow around reinforcement and consolidate under its own weight without additional effort and without segregation.

High range water-reducing admixtures shall be according to AASHTO M 194, Type F.

Viscosity modifying admixtures shall be according to AASHTO M 194, Type S (specific performance).”

Revise Article 1021.06 of the Standard Specifications to read:

“1021.06 Rheology-Controlling Admixture. Rheology-controlling admixtures shall be capable of producing a concrete mixture with a lower yield stress that will consolidate easier for slipform applications used by the Contractor. Rheology-controlling admixtures shall be according to AASHTO M 194, Type S (specific performance).”

Revise Article 1021.07 of the Standard Specifications to read:

“1021.07 Corrosion Inhibitor. The corrosion inhibitor shall be according to one of the following.

(a) Calcium Nitrite. Corrosion inhibitors shall contain a minimum 30 percent calcium nitrite by weight (mass) of solution and shall comply with either the requirements of AASHTO M 194, Type C (accelerating) or the requirements of ASTM C 1582. The corrosion inhibiting performance requirements of ASTM C 1582 shall not apply.

(b) Other Materials. The corrosion inhibitor shall be according to ASTM C 1582.

For submittals requiring testing according to ASTM M 194, Type C (accelerating), the admixture shall meet the requirements of the AASHTO Product Eval and Audit CADD testing program according to Article 1021.01.

For submittals requiring testing according to ASTM C 1582, a report prepared by an independent laboratory accredited by AASHTO re:source for portland cement concrete shall be provided. The report shall show the results of physical tests conducted no more than five years prior to the time of submittal, according to applicable specifications. However, ASTM G 109 test information specified in ASTM C 1582 is not required to be from an independent accredited lab. All other information in ASTM C 1582 shall be from an independent accredited lab. Test data and other information required to be submitted to AASHTO Product Eval and Audit according to Article 1021.01, shall instead be submitted directly to the Department.”

Add Article 1021.08 of the Standard Specifications as follows:

“1021.08 Other Specific Performance Admixtures. Other specific performance admixtures shall, at a minimum, be according to AASHTO M 194, Type S (specific performance). The Department also reserves the right to require other testing, as determined by the Engineer, to show evidence of specific performance characteristics.

Initial testing according to AASHTO M 194 may be conducted under the AASHTO Product Eval and Audit CADD testing program according to Article 1021.01, or by an independent laboratory accredited by AASHTO re:source for Portland Cement Concrete. In either case, test data and other information required to be submitted to AASHTO Product Eval and Audit according to Article 1021.01, shall also be submitted directly to the Department. The independent accredited lab report shall show the results of physical tests conducted no more than five years prior to the time of submittal, according to applicable specifications.”

Revise Article 1024.01 of the Standard Specifications to read:

“1024.01 Requirements for Grout. The grout shall be proportioned by dry volume, thoroughly mixed, and shall have a minimum temperature of 50 °F (10 °C). Water shall not exceed the minimum needed for placement and finishing.

Materials for the grout shall be according to the following.

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Fine Aggregate	1003.02
(d) Fly Ash	1010
(e) Ground Granulated Blast Furnace (GGBF) Slag.....	1010
(f) Concrete Admixtures	1021”

Revise Note 1 of Article 1024.02 of the Standard Specifications to read:

“Note 1. Nonshrink grout shall be according to Illinois Modified ASTM C 1107.

The nonshrink grout shall have a water-soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the grout shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every five years, and the test results shall be provided to the Department. Mixing of the nonshrink grout shall be according to the manufacturer’s specifications. The Department will maintain a qualified product list.”

Revise Article 1029.02 of the Standard Specifications to read:

“1029.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Cement.....	1001
(b) Fly Ash	1010
(c) Ground Granulated Blast Furnace (GGBF) Slag	1010
(d) Water.....	1002
(e) Fine Aggregate.....	1003
(f) Concrete Admixtures	1021
(g) Foaming Agent (Note 1)	

Note 1. The manufacturer shall submit infrared spectrophotometer trace and test results indicating the foaming agent meets the requirements of ASTM C 869 in order to be on the Department’s qualified product list. Submitted data/results shall not be more than five years old.”

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.”

Revise the first two sections of Check Sheet #11 of the Supplemental Specifications and Recurring Special Provisions to read:

“Description. This work shall consist of filling voids beneath rigid and composite pavements with cement grout.

Materials. Materials shall be according to the following Articles of Division 1000 - Materials of the Standard Specifications:

Item	Article/Section
(a) Cement	1001
(b) Water	1002
(c) Fly Ash	1010
(d) Ground Granulated Blast Furnace (GGBF) Slag.....	1010
(e) Admixtures	1021
(f) Packaged Rapid Hardening Mortar or Concrete	1018”

Revise the third paragraph of Materials Note 2 of Check Sheet #28 of the Supplemental Specifications and Recurring Special Provisions to read:

“The Department will maintain a qualified product list of synthetic fibers, which will include the minimum required dosage rate. For the minimum required fiber dosage rate based on the Illinois Modified ASTM C 1609 test, a report prepared by an independent laboratory accredited by AASHTO re:source for Portland Cement Concrete shall be provided. The report shall show results of tests conducted no more than five years prior to the time of submittal.”

80460

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: January 1, 2025

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 according to the table below.

Horsepower Range	Model Year and Older
50-99	2003
100-299	2002
300-599	2000
600-749	2001
750 and up	2005

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* (<https://www.epa.gov/verified-diesel-tech/verified-technologies-list-clean-diesel>), 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 (BDE)

Effective: September 1, 2000

Revised: January 2, 2025

1. OVERVIEW AND GENERAL 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 in accordance with the requirements of 49 CFR Part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory. Award of the contract is conditioned on meeting the requirements of 49 CFR Part 26, and failure by the Contractor to carry out the requirements of Part 26 is a material breach of the contract and may result in the termination of the contract or such other remedies as the Department deems appropriate.
2. CONTRACTOR ASSURANCE. All assurances set forth in FHWA 1273 are hereby incorporated by reference and will be physically attached to the final contract and all subcontracts.
3. CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. The Department has determined the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies and that, in the absence of unlawful discrimination and in an arena of fair and open competition, DBE companies can be expected to perform **25%** 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 in accordance with the requirements of 49 CFR 26.53 and SBE Memorandum No. 24-02.
4. IDENTIFICATION OF CERTIFIED DBE. Information about certified DBE Contractors can be found in the Illinois UCP Directory. Bidders can obtain additional information and assistance with identifying DBE-certified companies at the Department's website or by contacting the Department's Bureau of Small Business Enterprises at (217) 785-4611.
5. BIDDING PROCEDURES. Compliance with this Special Provision and SBE Policy Memorandum 24-02 is a material bidding requirement. The following shall be included with the bid.
 - (a) DBE Utilization Plan (form SBE 2026) documenting enough DBE participation has been obtained to meet the goal, or a good faith effort has been made to meet the goal even though the efforts did not succeed in obtaining enough DBE participation to meet the goal.

- (b) Applicable DBE Participation Statement (form SBE 2023, 2024, and/or 2025) for each DBE firm the bidder has committed to perform the work to achieve the contract goal.

The required forms and documentation shall 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 bid if it does not meet the bidding procedures set forth herein and the bid will be declared non-responsive. A bidder declared non-responsive for failure to meet the bidding procedures will not give rise to an administrative reconsideration. In the event the bid is declared non-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.

6. UTILIZATION PLAN EVALUATION. 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 the bidder has committed to DBE participation sufficient to meet the goal, or that the bidder has made good faith efforts to do so, in the event the bidder cannot meet the goal, in order for the Department to 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 Department determines, based upon the documentation submitted, that the bidder has made a good faith effort to meet the contract goal pursuant to 49 CFR Part 26, Appendix A and the requirements of SBE 2026.

If the Department determines that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan of that determination in accordance with SBE Policy Memorandum 24-02.

7. CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work the bidder commits to have performed by the specified DBEs 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 firms. 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 guidelines for counting goal credit are provided in 49 CFR Part 26.55. In evaluating Utilization Plans for award the Department will count goal credit as set forth in Part 26 and in accordance with SBE Policy Memorandum 24-02.
8. CONTRACT COMPLIANCE. The Contractor must utilize the specific DBEs listed to perform the work and supply the materials for which each DBE is listed in the Contractor's approved Utilization Plan, unless the Contractor obtains the Department's written consent to

terminate the DBE or any portion of its work. The DBE Utilization Plan approved by SBE is a condition-of-award, and any deviation to that Utilization Plan, the work set forth therein to be performed by DBE firms, or the DBE firms specified to perform that work, must be approved, in writing, by the Department in accordance with federal regulatory requirements. Deviation from the DBE Utilization Plan condition-of-award without such written approval is a violation of the contract and may result in termination of the contract or such other remedy the Department deems appropriate. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan.

- (a) NOTICE OF DBE PERFORMANCE. The Contractor shall provide the Engineer with at least three days advance notice of when all DBE firms are expected to perform the work committed under the Contractor's Utilization Plan.
- (b) SUBCONTRACT. If awarded the contract, the Contractor is required to enter into written subcontracts with all DBE firms indicated in the approved Utilization Plan and must provide copies of fully executed 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.
- (c) PAYMENT TO DBE FIRMS. 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 goal has been paid to the DBE. The Contractor shall document and report all payments for work performed by DBE certified firms in accordance with Article 109.11 of the Standard Specifications. All records of payment for work performed by DBE certified firms shall be made available to the Department upon request.
- (d) FINAL PAYMENT. After the performance of the final item of work or trucking, or delivery of material by a DBE and final payment 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 (form SBE 2115) to the Engineer. 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.
- (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.

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 – 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

PAVEMENT MARKING INSPECTION (BDE)

Effective: April 1, 2025

Revise the second sentence of the first paragraph of Article 780.13 of the Standard Specifications to read:

“In addition, thermoplastic, preformed plastic, epoxy, preformed thermoplastic, polyurea, and modified urethane pavement markings will be inspected following a winter performance period that extends from November 15 to April 1 of the next year.”

80464

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."

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 South Ashland Ave. Homewood, IL 60430	0 trains/day	17 trains/day @ 45 mph
Class 1 RR (Y or N): DOT/AAR No.: 260557P RR Division: CHICAGO TERMINAL	RR Mile Post: 21.50 RR Sub-Division: LEIGHTON	
For Freight/Passenger Information Contact: Thomas Brasseur For Insurance Information Contact: Rob Glass		Phone: 248-452-4854 Phone: 708-332-6673
BNSF Railway Company 2650 Lou Menk Dr. Fort Worth, TX 76131	0 trains/day	1 train/day @ 35 mph
Class 1 RR (Y or N): DOT/AAR No.: N/A RR Division: CHICAGO	RR Mile Post: 32.96 RR Sub-Division: CHICAGO	
For Freight/Passenger Information Contact: Jake Rzewnicki For Insurance Information Contact: Rosa Martinez		Phone: 913-551-4275 Phone: 214-303-8519

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 (RSMDR).”

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 Perennial Ryegrass <i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue)	100 (110) 60 (70) 40 (50)
1A Salt Tolerant Lawn Mixture 1/	Kentucky Bluegrass Perennial Ryegrass <i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue) <i>Festuca brevipila</i> (Hard Fescue) <i>Puccinellia distans</i> (Fults Saltgrass or Salty Alkaligrass)	60 (70) 20 (20) 20 (20) 20 (20) 60 (70)
1B Low Maintenance Lawn Mixture 1/	Turf-Type Fine Fescue 3/ Perennial Ryegrass Red Top <i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue)	150 (170) 20 (20) 10 (10) 20 (20)
2 Roadside Mixture 1/	<i>Lolium arundinaceum</i> (Tall Fescue) Perennial Ryegrass <i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue) Red Top	100 (110) 50 (55) 40 (50) 10 (10)
2A Salt Tolerant Roadside Mixture 1/	<i>Lolium arundinaceum</i> (Tall Fescue) Perennial Ryegrass <i>Festuca rubra</i> ssp. <i>rubra</i> (Creeping Red Fescue) <i>Festuca brevipila</i> (Hard Fescue) <i>Puccinellia distans</i> (Fults Saltgrass or Salty Alkaligrass)	60 (70) 20 (20) 30 (20) 30 (20) 60 (70)
3 Northern Illinois Slope Mixture 1/	<i>Elymus canadensis</i> (Canada Wild Rye) 5/ Perennial Ryegrass Alsike Clover 4/ <i>Desmanthus illinoensis</i> (Illinois Bundleflower) 4/ 5/ <i>Schizachyrium scoparium</i> (Little Bluestem) 5/ <i>Bouteloua curtipendula</i> (Side-Oats Grama) 5/ <i>Puccinellia distans</i> (Fults Saltgrass or Salty Alkaligrass) Oats, Spring Slender Wheat Grass 5/ Buffalo Grass 5/ 7/	5 (5) 20 (20) 5 (5) 2 (2) 12 (12) 10 (10) 30 (35) 50 (55) 15 (15) 5 (5)
3A Southern Illinois Slope Mixture 1/	Perennial Ryegrass <i>Elymus canadensis</i> (Canada Wild Rye) 5/ <i>Panicum virgatum</i> (Switchgrass) 5/ <i>Schizachyrium scoparium</i> (Little Blue Stem) 5/ <i>Bouteloua curtipendula</i> (Side-Oats Grama) 5/ <i>Dalea candida</i> (White Prairie Clover) 4/ 5/ <i>Rudbeckia hirta</i> (Black-Eyed Susan) 5/ Oats, Spring	20 (20) 20 (20) 10 (10) 12 (12) 10 (10) 5 (5) 5 (5) 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

SIGN PANELS AND APPURTENANCES (BDE)

Effective: January 1, 2025

Revised: April 1, 2025

Add Article 720.02(c) of the Standard Specifications to read:

“(c) Aluminum Epoxy Mastic1008.03”

Revise the second and third paragraphs of Article 720.02 of the Standard Specifications to read:

“The sign mounting support channel shall be manufactured from steel or aluminum and shall be according to Standard 720001.

Steel support channels shall be according to ASTM A 1011 (A 1011M), ASTM A 635 (A 635M), ASTM A 568 (A 568M), or ASTM A 684 (A 684M), and shall be galvanized. Galvanizing shall be according to ASTM A 653 (A 653M) when galvanized before fabrication, and AASHTO M 111 (M 111M) when galvanized after fabrication. Field or post fabricated drilled holes shall be spot painted with one coat of aluminum epoxy mastic paint prior to installation.”

Revise the fifth paragraph of Article 720.02 of the Standard Specifications to read:

“The stainless steel banding for mounting signs or sign support channels to light or signal standards shall be according to ASTM A 240 (A 240M) Type 302 stainless steel.”

80462

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 BIDDERS LIST INFORMATION (BDE)

Effective: January 2, 2025

Revised: March 2, 2025

In accordance with 49 CFR 26.11(c) all DBE and non-DBEs who bid as prime contractors and subcontractors shall provide bidders list information, including all DBE and non-DBE firms from whom the bidder has received a quote or bid to work as a subcontractor, whether or not the bidder has relied upon that bid in placing its bid as the prime contractor.

The bidders list information shall be submitted with the bid using the link provided within the “Integrated Contractor Exchange (iCX)” application of the Department’s “EBids System”.

80463

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

SURVEYING SERVICES (BDE)

Effective: April 1, 2025

Delete the fourth paragraph of Article 667.04 of the Standard Specifications.

Delete Section 668 of the Standard Specifications.

80465

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 5. 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: January 2, 2025

The following applies to all Disadvantaged Business Enterprise (DBE) trucks on the project, whether they are utilized for DBE goal credit or not.

The Contractor shall notify the Engineer at least three days prior to DBE trucking activity.

The Contractor shall submit a weekly report of DBE trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) 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

WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

Effective: March 2, 2020

Revised: January 1, 2025

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 shall be MASH compliant.

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 shall be MASH compliant.

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 compliant. Category 3 devices manufactured on or before December 31, 2019, and compliant

with NCHRP 350, 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 sign supports, speed feedback displays, 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 compliant is available, an NCHRP 350 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

WORKING DAYS (BDE)

Effective: January 1, 2002

The Contractor shall complete the work within **340** working days.

80071

STRUCTURAL REPAIR OF CONCRETE

Effective: March 15, 2006

Revised: August 9, 2019

Description. This work shall consist of structurally repairing concrete.

Materials. Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement Concrete (Note 1)	1020
(b) R1, R2, or R3 Concrete (Note 2)	
(c) Normal Weight Concrete (Notes 3 and 4)	
(d) Shotcrete (High Performance) (Notes 5 and 6)	
(e) Reinforcement Bars	1006.10
(f) Anchor Bolts	1006.09
(g) Water	1002
(h) Curing Compound	1022.01
(i) Cotton Mats	1022.02
(j) Protective Coat	1023.01
(k) Epoxy (Note 7)	1025
(l) Mechanical Bar Splicers	508.06(c)

Note 1. The concrete shall be Class SI, except the cement factor shall be a minimum 6.65 cwt/cu yd (395 kg/cu m), the coarse aggregate shall be a CA 16, and the strength shall be a minimum 4000 psi (27,500 kPa) compressive or 675 psi (4650 kPa) flexural at 14 days. A high range water-reducing admixture shall be used to obtain a 5-7 in. (125-175 mm) slump, but a cement factor reduction according to Article 1020.05(b)(8) is prohibited. A self-consolidating concrete mixture is also acceptable per Article 1020.04, except the mix design requirements of this note regarding the cement factor, coarse aggregate, strength, and cement factor reduction shall apply.

Note 2. The R1, R2, or R3 concrete shall be from the Department's qualified product list of Packaged, Dry, Rapid Hardening, Cementitious Materials for Concrete Repairs. The R1, R2, or R3 concrete shall comply with the air content and strength requirements for Class SI concrete as indicated in Note 1. Mixing shall be per the manufacturer's recommendations, except the water/cement ratio shall not exceed the value specified for Class SI concrete as indicated in Note 1. A high range water-reducing admixture shall be used to obtain a 5-7 in. (125-175 mm) slump, and a retarder may be required to allow time to perform the required field tests. The admixtures shall be per the manufacturer's recommendation, and the Department's qualified product list of Concrete Admixtures shall not apply.

Note 3. The "high slump" packaged concrete mixture shall be from the Department's qualified product list of Packaged, Dry, Formed, Concrete Repair Mixtures. The materials and preparation of aggregate shall be according to ASTM C 387. The

cement factor shall be 6.65 cwt/cu yd (395 kg/cu m) minimum to 7.05 cwt/cu yd (418 kg/cu m) maximum. Cement replacement with fly ash or ground granulated blast-furnace slag shall be according to Section 1020. The “high slump” packaged concrete mixture shall have a water soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the “high slump” packaged concrete mixture shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every two years, and the test results shall be provided to the Department. The coarse aggregate shall be a maximum size of 1/2 in. (12.5 mm). The packaged concrete mixture shall comply with the air content and strength requirements for Class SI concrete as indicated in Note 1. Mixing shall be per the manufacturer’s recommendations, except the water/cement ratio shall not exceed the value specified for Class SI concrete as indicated in Note 1. A high range water-reducing admixture shall be used to obtain a 5-7 in. (125-175 mm) slump. The admixture shall be per the manufacturer’s recommendation, and the Department’s qualified product list of Concrete Admixtures shall not apply. A maximum slump of 10 in. (250 mm) may be permitted if no segregation is observed by the Engineer in a laboratory or field evaluation.

Note 4 The “self-consolidating concrete” packaged concrete mixture shall be from the Department’s qualified product list of Packaged, Dry, Formed, Concrete Repair Mixtures. The materials and preparation of aggregate shall be according to ASTM C 387. The cement factor shall be 6.65 cwt/cu yd (395 kg/cu m) minimum to 7.05 cwt/cu yd (418 kg/cu m) maximum. Cement replacement with fly ash or ground granulated blast-furnace slag shall be according to Section 1020. The “self-consolidating concrete” packaged concrete mixture shall have a water soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the “self-consolidating concrete” packaged concrete mixture shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every two years, and the test results shall be provided to the Department. The concrete mixture should be uniformly graded, and the coarse aggregate shall be a maximum size of 1/2 in. (12.5 mm). The fine aggregate proportion shall be a maximum 50 percent by weight (mass) of the total aggregate used. The packaged concrete mixture shall comply with the air content and strength requirements for Class SI concrete as indicated in Note 1. Mixing shall be per the manufacturer’s recommendations, except the water/cement ratio shall not exceed the value specified for Class SI concrete as indicated in Note 1. The admixtures used to produce self-consolidating concrete shall be per the manufacturer’s recommendation, and the Department’s qualified product list of Concrete Admixtures shall not apply. The packaged concrete mixture shall meet the self-consolidating requirements of Article 1020.04.

Note 5. Packaged shotcrete that includes aggregate shall be from the Department’s qualified product list of Packaged High Performance Shotcrete, and independent

laboratory test results showing the product meets Department specifications will be required. The product shall be a packaged, pre-blended, and dry combination of materials, for the wet-mix shotcrete method according to ASTM C 1480. A non-chloride accelerator may be used according to the shotcrete manufacturer's recommendations. The shotcrete shall be Type FA or CA, Grade FR, and Class I. The fibers shall be Type III synthetic according to ASTM C 1116.

The packaged shotcrete shall have a water soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the hardened shotcrete shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every two years, and the test results shall be provided to the Department.

Each individual aggregate used in the packaged shotcrete shall have either a maximum ASTM C 1260 expansion of 0.16 percent or a maximum ASTM C 1293 expansion of 0.040 percent. However, the ASTM C 1260 value may be increased to 0.27 percent for each individual aggregate if the cement total equivalent alkali content ($\text{Na}_2\text{O} + 0.658\text{K}_2\text{O}$) does not exceed 0.60 percent. As an alternative to these requirements, ASTM C 1567 testing which shows the packaged shotcrete has a maximum expansion of 0.16 percent may be submitted. The ASTM C 1260, C 1293, or C 1567 test shall be performed a minimum of once every two years.

The 7 and 28 day compressive strength requirements in ASTM C 1480 shall not apply. Instead the shotcrete shall obtain a minimum compressive strength of 4000 psi (27,500 kPa) at 14 days.

The packaged shotcrete shall be limited to the following proportions:

The portland cement and finely divided minerals shall be 6.05 cwt/cu yd (360 kg/cu m) to 8.50 cwt/cu yd (505 kg/cu m) for Type FA and 6.05 cwt/cu yd (360 kg/cu. m) to 7.50 cwt/cu yd (445 kg/cu m) for Type CA. The portland cement shall not be below 4.70 cwt/cu yd (279 kg/cu m) for Type FA or CA.

The finely divided mineral(s) shall constitute a maximum of 35 percent of the total cement plus finely divided mineral(s).

Class F fly ash is optional and the maximum shall be 20 percent by weight (mass) of cement.

Class C fly ash is optional and the maximum shall be 25 percent by weight (mass) of cement.

Ground granulated blast-furnace slag is optional and the maximum shall be 30 percent by weight (mass) of cement.

Microsilica is required and shall be a minimum of 5 percent by weight (mass) of cement, and a maximum of 10 percent. As an alternative to microsilica, high-reactivity metakaolin may be used at a minimum of 5 percent by weight (mass) of cement, and a maximum of 10 percent.

Fly ash shall not be used in combination with ground granulated blast-furnace slag. Class F fly ash shall not be used in combination with Class C fly ash. Microsilica shall not be used in combination with high-reactivity metakaolin. A finely divided mineral shall not be used in combination with a blended hydraulic cement, except for microsilica or high-reactivity metakaolin.

The water/cement ratio as defined in Article 1020.06 shall be a maximum of 0.42.

The air content as shot shall be 4.0 – 8.0 percent.

Note 6 Packaged shotcrete that does not include pre-blended aggregate shall be from the Department's qualified product list of Packaged High Performance Shotcrete, and independent laboratory test results showing the product meets Department specifications will be required. The shotcrete shall be according to Note 5, except the added aggregate shall be according to Articles 1003.02 and 1004.02 in addition to each individual aggregate meeting the maximum expansion requirements of Note 5. The aggregate gradation shall be according to the manufacturer. The shotcrete shall be batched and mixed with added aggregate according to the manufacturer.

Note 7. In addition ASTM C 881, Type IV, Grade 2 or 3, Class A, B, or C may be used.

Equipment. Equipment shall be according to Article 503.03 and the following.

Chipping Hammer – The chipping hammer for removing concrete shall be a light-duty pneumatic or electric tool with a 15 lb. (7 kg) maximum class or less.

Blast Cleaning Equipment – Blast cleaning equipment for concrete surface preparation shall be the abrasive type, and the equipment shall have oil traps.

Hydrodemolition Equipment – Hydrodemolition equipment for removing concrete shall be calibrated, and shall use water according to Section 1002.

High Performance Shotcrete Equipment – The batching, mixing, pumping, hose, nozzle, and auxiliary equipment shall be for the wet-mix shotcrete method, and shall meet the requirements of ACI 506R.

Construction Requirements

General. The repair methods shall be either formed concrete repair or shotcrete. The repair method shall be selected by the Contractor with the following rules.

- (a) Rule 1. For formed concrete repair, a subsequent patch to repair the placement point after initial concrete placement will not be allowed. As an example, this may occur in a vertical location located at the top of the repair.
- (b) Rule 2. Formed concrete repair shall not be used for overhead applications.
- (c) Rule 3. If formed concrete repair is used for locations that have reinforcement with less than 0.75 in. (19 mm) of concrete cover, the concrete mixture shall contain fly ash or ground granulated blast-furnace slag at the maximum cement replacement allowed.
- (d) Rule 4. Shotcrete shall not be used for any repair greater than 6 in. (150 mm) in depth, except in horizontal applications, where the shotcrete may be placed from above in one lift.
- (e) Rule 5. Shotcrete shall not be used for column repairs greater than 4 in. (100 mm) in depth, unless the shotcrete mixture contains 3/8 in. (9.5 mm) aggregate.

Temporary Shoring or Cribbing. When a temporary shoring or cribbing support system is required, the Contractor shall provide details and computations, prepared and sealed by an Illinois licensed Structural Engineer, to the Department for review and approval. When ever possible the support system shall be installed prior to starting the associated concrete removal. If no system is specified, but during the course of removal the need for temporary shoring or cribbing becomes apparent or is directed by the Engineer due to a structural concern, the Contractor shall not proceed with any further removal work until an appropriate and approved support system is installed.

Concrete Removal. The Contractor shall provide ladders or other appropriate equipment for the Engineer to mark the removal areas. Repair configurations will be kept simple, and squared corners will be preferred. The repair perimeter shall be sawed a depth of 1/2 in. (13 mm) or less, as required to avoid cutting the reinforcement. Any cut reinforcement shall be repaired or replaced at the expense of the Contractor. If the concrete is broken or removed beyond the limits of the initial saw cut, the new repair perimeter shall be recut. The areas to be repaired shall have all loose, unsound concrete removed completely by the use of chipping hammers, hydrodemolition equipment, or other methods approved by the Engineer. The concrete removal shall extend along the reinforcement bar until the reinforcement is free of bond inhibiting corrosion. Reinforcement bar with 50 percent or more exposed shall be undercut to a depth of 3/4 in. (19 mm) or the diameter of the reinforcement bar, whichever is greater.

If sound concrete is encountered before existing reinforcement bars are exposed, further removal of concrete shall not be performed unless the minimum repair depth is not met.

The repair depth shall be a minimum of 1 in. (25 mm). The substrate profile shall be $\pm 1/16$ in. (± 1.5 mm). The perimeter of the repair area shall have a vertical face.

If a repair is located at the ground line, any excavation required below the ground line to complete the repair shall be included in this work.

The Contractor shall have a maximum of 14 calendar days to complete each repair location with concrete or shotcrete, once concrete removal has started for the repair.

The Engineer shall be notified of concrete removal that exceeds 6 in. (150 mm) in depth, one fourth the cross section of a structural member, more than half the vertical column reinforcement is exposed in a cross section, more than 6 consecutive reinforcement bars are exposed in any direction, within 1.5 in. (38 mm) of a bearing area, or other structural concern. Excessive deterioration or removal may require further evaluation of the structure or installation of temporary shoring and cribbing support system.

Surface Preparation. Prior to placing the concrete or shotcrete, the Contractor shall prepare the repair area and exposed reinforcement by blast cleaning. The blast cleaning shall provide a surface that is free of oil, dirt, and loose material.

If a succeeding layer of shotcrete is to be applied, the initial shotcrete surface and remaining exposed reinforcement shall be free of curing compound, oil, dirt, loose material, rebound (i.e. shotcrete material leaner than the original mixture which ricochets off the receiving surface), and overspray. Preparation may be by lightly brushing or blast cleaning if the previous shotcrete surface is less than 36 hours old. If more than 36 hours old, the surface shall be prepared by blast cleaning.

The repair area and perimeter vertical face shall have a rough surface. Care shall be taken to ensure the sawcut face is roughened by blast cleaning. Just prior to concrete or shotcrete placement, saturate the repair area with water to a saturated surface-dry condition. Any standing water shall be removed.

Concrete or shotcrete placement shall be done within 3 calendar days of the surface preparation or the repair area shall be prepared again.

Reinforcement. Exposed reinforcement bars shall be cleaned of concrete and corrosion by blast cleaning. After cleaning, all exposed reinforcement shall be carefully evaluated to determine if replacement or additional reinforcement bars are required.

Reinforcing bars that have been cut or have lost 25 percent or more of their original cross sectional area shall be supplemented by new in kind reinforcement bars. New bars shall be lapped a minimum of 32 bar diameters to existing bars. A mechanical bar splicer shall be used when it is not feasible to provide the minimum bar lap. No welding of bars shall be performed.

Intersecting reinforcement bars shall be tightly secured to each other using 0.006 in. (1.6 mm) or heavier gauge tie wire, and shall be adequately supported to minimize movement during concrete placement or application of shotcrete.

For reinforcement bar locations with less than 0.75 in. (19 mm) of cover, protective coat shall be applied to the completed repair. The application of the protective coat shall be according to Article 503.19, 2nd paragraph, except blast cleaning shall be performed to remove curing compound.

The Contractor shall anchor the new concrete to the existing concrete with 3/4 in. (19 mm) diameter hook bolts for all repair areas where the depth of concrete removal is greater than 8 in. (205 mm) and there is no existing reinforcement extending into the repair area. The hook bolts shall be spaced at 15 in. (380 mm) maximum centers both vertically and horizontally, and shall be a minimum of 12 in. (305 mm) away from the perimeter of the repair. The hook bolts shall be installed according to Section 584.

Repair Methods. All repair areas shall be inspected and approved by the Engineer prior to placement of the concrete or application of the shotcrete.

- (a) Formed Concrete Repair. Falsework shall be according to Article 503.05. Forms shall be according to Article 503.06. Formwork shall provide a smooth and uniform concrete finish, and shall approximately match the existing concrete structure. Formwork shall be mortar tight and closely fitted where they adjoin the existing concrete surface to prevent leakage. Air vents may be provided to reduce voids and improve surface appearance. The Contractor may use exterior mechanical vibration, as approved by the Engineer, to release air pockets that may be entrapped.

The concrete for formed concrete repair shall be a Class SI Concrete, or a packaged R1, R2, or R3 Concrete,, or a packaged Normal Weight Concrete at the Contractor's option. The concrete shall be placed and consolidated according to Article 503.07. The concrete shall not be placed when frost is present on the surface of the repair area, or the surface temperature of the repair area is less than 40 °F (4 °C). All repaired members shall be restored as close as practicable to their original dimensions.

Curing shall be done according to Article 1020.13.

If temperatures below 45°F (7°C) are forecast during the curing period, protection methods shall be used. Protection Method I according to Article 1020.13(d)(1), or

Protection Method II according to Article 1020.13(d)(2) shall be used during the curing period.

The surfaces of the completed repair shall be finished according to Article 503.15.

- (b) Shotcrete. Shotcrete shall be tested by the Engineer for air content according to Illinois Modified AASHTO T 152. The sample shall be obtained from the discharge end of the nozzle by shooting a pile large enough to scoop a representative amount for filling the air meter measuring bowl. Shotcrete shall not be shot directly into the measuring bowl for testing.

For compressive strength of shotcrete, a 18 x 18 x 3.5 in. (457 x 457 x 89 mm) test panel shall be shot by the Contractor for testing by the Engineer. A steel form test panel shall have a minimum thickness of 3/16 in. (5 mm) for the bottom and sides. A wood form test panel shall have a minimum 3/4 in. (19 mm) thick bottom, and a minimum 1.5 in. (38 mm) thickness for the sides. The test panel shall be cured according to Article 1020.13 (a) (3) or (5) while stored at the jobsite and during delivery to the laboratory. After delivery to the laboratory for testing, curing and testing shall be according to ASTM C 1140.

The method of alignment control (i.e. ground wires, guide strips, depth gages, depth probes, and formwork) to ensure the specified shotcrete thickness and reinforcing bar cover is obtained shall be according to ACI 506R. Ground wires shall be removed after completion of cutting operations. Guide strips and formwork shall be of dimensions and a configuration that do not prevent proper application of shotcrete. Metal depth gauges shall be cut 1/4 in. (6 mm) below the finished surface. All repaired members shall be restored as close as practicable to their original dimensions.

For air temperature limits when applying shotcrete in cold weather, the first paragraph of Article 1020.14(b) shall apply. For hot weather, shotcrete shall not be applied when the air temperature is greater than 90°F (32°C). The applied shotcrete shall have a minimum temperature of 50°F (10°C) and a maximum temperature of 90°F (32°C). The shotcrete shall not be applied during periods of rain unless protective covers or enclosures are installed. The shotcrete shall not be applied when frost is present on the surface of the repair area, or the surface temperature of the repair area is less than 40°F (4°C). If necessary, lighting shall be provided to provide a clear view of the shooting area.

The shotcrete shall be applied according to ACI 506R, and shall be done in a manner that does not result in cold joints, laminations, sandy areas, voids, sags, or separations. In addition, the shotcrete shall be applied in a manner that results in maximum densification of the shotcrete. Shotcrete which is identified as being unacceptable while still plastic shall be removed and re-applied.

The nozzle shall normally be at a distance of 2 to 5 ft. (0.6 to 1.5 m) from the receiving surface, and shall be oriented at right angles to the receiving surface. Exceptions to this

requirement will be permitted to fill corners, encase large diameter reinforcing bars, or as approved by the Engineer. For any exception, the nozzle shall never be oriented more than 45 degrees from the surface. Care shall be taken to keep the front face of the reinforcement bar clean during shooting operations. Shotcrete shall be built up from behind the reinforcement bar. Accumulations of rebound and overspray shall be continuously removed prior to application of new shotcrete. Rebound material shall not be incorporated in the work.

Whenever possible, shotcrete shall be applied to the full thickness in a single layer. The maximum thickness shall be according to Rules 4 and 5 under Construction Requirements, General. When two or more layers are required, the minimum number shall be used and shall be done in a manner without sagging or separation. A flash coat (i.e. a thin layer of up to 1/4 in. (6 mm) applied shotcrete) may be used as the final lift for overhead applications.

Prior to application of a succeeding layer of shotcrete, the initial layer of shotcrete shall be prepared according to the surface preparation and reinforcement bar cleaning requirements. Upon completion of the surface preparation and reinforcement bar treatment, water shall be applied according to the surface preparation requirements unless the surface is moist. The second layer of shotcrete shall then be applied within 30 minutes.

Shotcrete shall be cut back to line and grade using trowels, cutting rods, screeds or other suitable devices. The shotcrete shall be allowed to stiffen sufficiently before cutting. Cutting shall not cause cracks or delaminations in the shotcrete. For depressions, cut material may be used for small areas. Rebound material shall not be incorporated in the work. For the final finish, a wood float shall be used to approximately match the existing concrete texture. A manufacturer approved finishing aid may be used. Water shall not be used as a finishing aid. All repaired members shall be restored as close as practicable to their original dimensions.

Contractor operations for curing shall be continuous with shotcrete placement and finishing operations. Curing shall be accomplished using wetted cotton mats, membrane curing, or a combination of both. Cotton mats shall be applied according to Article 1020.13(a)(5) except the exposed layer of shotcrete shall be covered within 10 minutes after finishing, and wet curing shall begin immediately. Curing compound shall be applied according to Article 1020.13(a)(4), except the curing compound shall be applied as soon as the shotcrete has hardened sufficiently to prevent marring the surface, and each of the two separate applications shall be applied in opposite directions to ensure coverage. The curing compound shall be according to Article 1022.01. Note 5 of the Index Table in Article 1020.13 shall apply to the membrane curing method.

When a shotcrete layer is to be covered by a succeeding shotcrete layer within 36 hours, the repair area shall be protected with intermittent hand fogging, or wet curing with either burlap or cotton mats shall begin within 10 minutes. Intermittent hand fogging may be used only for the first hour. Thereafter, wet curing with burlap or cotton mats shall be

used until the succeeding shotcrete layer is applied. Intermittent hand fogging may be extended to the first hour and a half if the succeeding shotcrete layer is applied by the end of this time.

The curing period shall be for 7 days, except when there is a succeeding layer of shotcrete. In this instance, the initial shotcrete layer shall be cured until the surface preparation and reinforcement bar treatment is started.

If temperatures below 45°F (7°C) are forecast during the curing period, protection methods shall be used. Protection Method I according to Article 1020.13(d)(1), or Protection Method II according to Article 1020.13(d)(2) shall be used during the curing period

Inspection of Completed Work. The Contractor shall provide ladders or other appropriate equipment for the Engineer to inspect the repaired areas. After curing but no sooner than 28 days after placement of concrete or shooting of shotcrete, the repair shall be examined for conformance with original dimensions, cracks, voids, and delaminations. Sounding for delaminations will be done with a hammer or by other methods determined by the Engineer.

The acceptable tolerance for conformance of a repaired area shall be within 1/4 in. (6 mm) of the original dimensions. A repaired area not in dimensional conformance or with delaminations shall be removed and replaced.

A repaired area with cracks or voids shall be considered as nonconforming. Exceeding one or more of the following crack and void criteria shall be cause for removal and replacement of a repaired area.

1. The presence of a single surface crack greater than 0.01 in. (0.25 mm) in width and greater than 12 in. (300 mm) in length.
2. The presence of two or more surface cracks greater than 0.01 in. (0.25 mm) in width that total greater than 24 in. (600 mm) in length.
3. The presence of map cracking in one or more regions totaling 15 percent or more of the gross surface area of the repair.
4. The presence of two or more surface voids with least dimension 3/4 in. (19 mm) each.

A repaired area with cracks or voids that do not exceed any of the above criteria may remain in place, as determined by the Engineer.

If a nonconforming repair is allowed to remain in place, cracks greater than 0.007 in. (0.2 mm) in width shall be repaired with epoxy according to Section 590. For cracks less than or equal to 0.007 in. (0.2 mm) in width, the epoxy may be applied to the surface of the crack. Voids shall be repaired according to Article 503.15.

Publications and Personnel Requirements. The Contractor shall provide a current copy of ACI 506R to the Engineer a minimum of one week prior to start of construction.

The shotcrete personnel who perform the work shall have current American Concrete Institute (ACI) nozzle men certification for vertical wet and overhead wet applications, except one individual may be in training. This individual shall be adequately supervised by a certified ACI nozzle men as determined by the Engineer. A copy of the nozzle men certificate(s) shall be given to the Engineer.

Method of Measurement. This work will be measured for payment in place and the area computed in square feet (square meters). For a repair at a corner, both sides will be measured.

Basis of Payment. This work will be paid for at the contract unit price per square foot (square meter) for STRUCTURAL REPAIR OF CONCRETE (DEPTH GREATER THAN 5 IN. (125 MM), STRUCTURAL REPAIR OF CONCRETE (DEPTH EQUAL TO OR LESS THAN 5 IN. (125 MM).

When not specified to be paid for elsewhere, the work to design, install, and remove the temporary shoring and cribbing will be paid for according to Article 109.04.

With the exception of reinforcement damaged by the Contractor during removal, the furnishing and installation of supplemental reinforcement bars, mechanical bar splicers, hook bolts, and protective coat will be paid according to Article 109.04.

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.

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)

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.

* * * * *

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.