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Letting June 15, 2018

Notice to Bidders, Specifications and Proposal

Springfield, Illinois 62764

Contract No. 60Y39
COOK County
Section (1517&1415)R-2
Route FAI 90
Project CMAQ-NHPP-NWQA(467)
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 10:00 a.m. June 15, 2018 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. 60Y39
   COOK County
   Section (1517&1415)R-2
   Project CMAQ-NHPP-NWQA(467)
   Route FAI 90
   District 1 Construction Funds

   Resurfacing, electrical and construction of retaining walls on I-90.

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 readvertise the proposed improvement, and to waive technicalities.

By Order of the
Illinois Department of Transportation

Randall S. Blankenhorn,
Secretary

INDEX
FOR
SUPPLEMENTAL SPECIFICATIONS
AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2018

This index contains a listing of SUPPLEMENTAL SPECIFICATIONS and frequently used RECURRING SPECIAL PROVISIONS.

ERRATA Standard Specifications for Road and Bridge Construction (Adopted 4-1-16) (Revised 1-1-18)

SUPPLEMENTAL SPECIFICATIONS

RECURRING SPECIAL PROVISIONS

The following RECURRING SPECIAL PROVISIONS indicated by an "X" are applicable to this contract and are included by reference:

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STATE OF ILLINOIS

SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction," adopted April 1, 2016, the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways" and the "Manual of Test Procedures for Materials" in effect on the date of invitation for bids; and the "Supplemental Specifications and Recurring Special Provisions," indicated on the Check Sheet included herein, the "Tollway Supplemental Specifications to the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction," adopted April 1, 2016, issued April 1, 2016 which apply to and govern the construction of FAI Route 90 (I-90), Project CMAQ-NHPP-NWQA(467), Section (1517 & 1415) R-2, Cook County, Contract No. 60Y39 and in case of conflict with any or parts of said Specifications, the said Special Provisions shall take precedence and shall govern.

FAI Route 90 (I-90)
Project CMAQ-NHPP-NWQA(467)
Section (1517 & 1415) R-2
Cook County
Contract No. 60Y39

LOCATION OF IMPROVEMENT

Westbound I-90 from Cumberland Avenue to Harlem Avenue. Improvements are within the City of Chicago in Cook County, Illinois and covers a total length along all roadways of approximately 12,300 feet (2.3 miles).

DESCRIPTION OF IMPROVEMENT

The roadway improvements consist of roadway reconstruction, widening, and resurfacing of I-90 from Cumberland Avenue to Harlem Avenue; including the installation of proposed storm sewer, lighting, signing, construction of 7 retaining walls, signing structures, pavement markings and collateral work necessary to complete the project as shown in the plans described herein.

COORDINATION WITH ADJACENT AND/OR OVERLAPPING CONTRACTS

This contract abuts and/or overlaps with other concurrent contracts listed below. The Contractor shall cooperate with the other contractors in the phasing and performance of his/her work so as not to delay, interrupt or hinder the progress or completion of work being performed by the other contractors.

Contract 60X56 – I-190/I-90 Cumberland Flyover
The I-190/I-90 Cumberland Flyover project will consist of a new flyover bridge from the Jane Addams Memorial Tollway to I-90, The roadway improvements include roadway reconstruction, widening, and resurfacing of I-190 and roadway widening and resurfacing of I-90. Other items of work include drainage, lighting, pavement markings, signing, sign structures, and pavement markings.

Critical items affecting the above contract include (but not limited to): MOT coordination and overhead sign panel placement.

The Contractor shall be aware that Contract 60X56 is anticipated to be nearing the end of construction in the Fall of 2018.

Contract 60Y38 – I-90 Eastbound Reconstruction
The I-90 Eastbound Reconstruction project will consist of the widening and resurfacing of I-90 from Cumberland Avenue to Harlem Avenue. Other items of work include retaining wall design drainage, lighting, pavement markings, sign maintenance and water main improvements.

Critical items affecting the above contract include (but not limited to): MOT and detour coordination, coordination with CTA

The Contractor shall be aware that Contract 60Y38 is anticipated to be nearing the end of construction in the Fall of 2017.

Add the following paragraph to the beginning of Article 105.08; “The Contractor shall identify all such work items (including the critical items listed above) at the beginning of the contract and coordinate the sequence and timing of their execution and completion with the other Contractor through the Engineer. All of these work items shall be identified as separate line items in the Contractor’s proposed Construction Progress Schedule. Additional compensation or the extension of contract time will not be allowed for the progress of work items affected by the lack of such coordination by the Contractor”.

Shared Access and Work Area

When necessary for proper prosecution of work, each Contractor shall permit the other access through the overlapping construction areas and the use of any access or haul roads constructed by others.

When necessary for the proper prosecution of work, each Contractor shall permit the other to work within predetermined areas of overlapping construction work areas for a predetermined duration. The Contractor working within the adjacent overlapping construction work areas will be responsible for cleaning the work area upon completion and leaving the work area in a suitable condition, including application of temporary erosion control measures as required, to the satisfaction of both Engineers. Examples of work requiring occupation of overlapping work areas include (but are not limited to): Earth Excavation/ Grading, Landscaping, Maintenance of Erosion Control Items.

Any damages resulting from the shared use of access facilities or overlapping work area shall be repaired by the Contractor which caused the damage at his own expense and at no additional cost to the Contract.

Basis of Payment: All expenses incurred by the Contractor by reason of compliance with these requirements shall be considered as included in and completely covered by the contract unit prices for the various items included in the contract.

COORDINATION OF THE CONTRACT DOCUMENTS

Coordination of contract documents shall be in accordance with Article 105.05. The Illinois Tollway Supplemental Specifications to the Illinois Department of Transportation Standard Specification for Road and Bridge Construction will be applicable as the supplemental specification designated in Article 105.05 for all items of work within the Tollway jurisdictional limits.

The Contractor shall not commence any work on the Illinois Tollway under this contract until all the insurance as specified in Article 107.26 and 107.27 of the Illinois Tollway Supplemental Specifications or any Special Provisions has been provided and approved. The Contractor must provide a copy of the Certificate of Insurance to the Illinois Tollway. The permit to commence work on the Illinois Tollway's property will not be issued until receipt of the Certificate of Insurance.

The Illinois Tollway and its officers, agents, directors, and employees shall be listed as additional insured parties in the general liability insurance. The insurance shall be maintained throughout construction of the project.

MAINTENANCE OF ROADWAYS (D-1)
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.

Illinois Tollway Work Coordination Maintenance of Traffic and Lane Closure Restrictions

DESCRIPTION

This work shall be in accordance with Section 701 of the Illinois Tollway Supplemental Specifications, plans, details, and as further defined and prescribed herein. This item shall be used for maintenance of traffic for the westbound mainline, ramp, and Toll Plaza 19 of the Jane Addams Memorial Tollway (I-90).

GENERAL REQUIREMENTS

Special attention is called to Sections 701 of the Illinois Tollway Supplemental Specifications and the following Illinois Tollway Standards relating to traffic control:

D4 E1 E2 E3 E6

The governing factor in the execution and staging of work for this project is to provide the motoring public with the safest possible travel conditions through the construction zone. The Contractor shall arrange his/her operations to keep the closing of lanes and/or roads to a minimum.

COORDINATION

Per Illinois Tollway Supplemental Specifications Article 701.04 (a) except as modified herein.

If an alternate traffic pattern is required within the contract, the Contractor shall submit a maintenance of traffic deviation plan, 21 days prior of the changes for approval by the Illinois Tollway. In addition, The Contractor is required to attend a maintenance of traffic meeting arranged by the Engineer with representatives of the Illinois Tollway to review the proposed changes in the maintenance of traffic 2 days prior to the implementation of the new maintenance of traffic stage changes.

In the event that this Contract fails to meet the interim completion dates, it will be the responsibility of the Contractor to provide, install and maintain any and all traffic control measures necessary to maintain traffic with adjacent sections. Such measures, with the exception of advance signing shall be located entirely within the limits of this Contract. These measures shall include, and may not be limited to, barricades, arrow boards and/or portable changeable message signs, moveable barrier wall, and pavement markings, and shall be installed in the form of a traffic shift meeting the requirements of all applicable Illinois Tollway standard drawings. No additional payment shall be made for this work.

Contractor shall coordinate all work with Plaza Manager, Michael Wayne (mwayne@getipass.com) and Art Manaois (amanaois@getipass.com) and shall contact the Plaza Manager a minimum of 1 week prior to any stage changes.

ALLOWABLE LANE CLOSURES

Temporary lane closures within the Illinois Tollway jurisdiction will be permitted only with the Illinois Tollway's approval. All temporary lane and shoulder closures must be approved by the Illinois Tollway and shall be submitted by the Contractor to the Engineer by 7:00 AM weekdays at least one business day before the closure. The lane closure coordination must be routed through the Engineer and no contact should be made directly with the Illinois Tollway. Closures along the Jane Addams Memorial Tollway (I-90) shall be in accordance with the Tollway's Standard E2,

The allowable temporary lane closure hours for the contract shall be as follows:

DAY	ALLOWABLE 1-LANE CLOSURE TIMES
	Westbound
Monday	10:00 p.m. - 5:00 a.m. Tues.
Tuesday	10:00 p.m. - 5:00 a.m. Wed.
Wednesday	10:00 p.m. - 5:00 a.m. Thru.
Thursday	10:00 p.m. - 5:00 a.m. Fri.
Friday	11:00 p.m. - 7:00 a.m. Sat.
Saturday	11:00 p.m. - 8:00 a.m. Sun.
Sunday	10:00 p.m.- 5:00 a.m. Mon.

The Contractor shall strictly adhere to the temporary lane closure hours set out above throughout the duration of the contract. Temporary lane closures will not be allowed, or must be removed, if so directed by the Engineer, due to inclement weather or heavy traffic, in accordance with the Standard Specifications.

No lane closure signs shall be erected any earlier than one-half (1/2) hour before the starting hours listed above. Also, these signs should be taken down within one-half (1/2) hour after the closure is removed.

When off-peak hour or weekend closures are required, a portable changeable message sign shall be installed one week prior to the closure. The wording and location shall be determined by the engineer.

In all cases, the Contractor is expected to be working in the areas closed due to the temporary lane closures. The Contractor shall remove the temporary lane closure when the scheduled work shift is over or when so required by the Contract Documents, whichever occurs first.

NON-COMPLIANCE

Should the Contractor fail to re-open lanes of traffic, in accordance with the above time limits, the Contractor shall be considered Non-Compliant with the Maintenance of Traffic Specifications, per Article 701.01(b)(1) & (2) of the Illinois Tollway Supplemental Specifications. For this Contract, it is understood “incident” is defined as every 10 minute interval, or portion thereof, where the Contractor fails to re-open the lanes of traffic by the time limit specified.

The Contractor shall notify the Engineer two (2) weeks in advance of beginning of his work, and shall obtain written approval of the Engineer of his intended work; however, the Engineer may require alteration of the intended work procedure as dictated by prevailing traffic conditions. Temporary, daytime, off-peak hour, one-lane closures must be requested in writing by the Contractor.

The Contractor shall notify the Engineer, all communications shall be through the Engineer, by 7 a.m. the working day preceding the requested two-lane closure. The Illinois Tollway shall be notified of closures as required by the Lane Closure Reference Guide. Two-lane closures on a three-lane directional roadway for any purpose will only be permitted during off-peak night-time hours and only with the specific approval of the Engineer. The Contractor shall be required to schedule the implementation of any traffic stage or subsequent stage change which requires two-lane closures on a three-lane directional roadway to ensure that such lane closures are limited to a single night-time period per direction of traffic. In order to minimize the length of lane closures during work operations, the following are required:

The signs posted for the temporary lane closures shall also be removed within one half hour after the lane closure is removed.

HOLIDAY PERIODS

Holiday periods shall be per Illinois Tollway Supplemental Specifications Section 701.12 with the following additions.

A. Thanksgiving Day Weekend
- A1 12:00 Noon, Wednesday November 23, 2017 through 9:00 A.M. Monday November 27, 2017
- A2 12:00 Noon, Wednesday November 21, 2018 through 9:00 A.M. Monday November 26, 2018

B. Christmas-New Year's Day
- B1 12:00 Noon, Friday December 22, 2017 through 9:00 A.M. Tuesday January 2, 2018
- B2 12:00 Noon, Monday December 24, 2018 through 9:00 A.M. Tuesday January 4, 2019

C. Easter Weekend
- C1 12:00 Noon, Thursday, April 1, 2018 through 9:00 A.M. Monday April 5, 2018
- C2 12:00 Noon, Thursday, April 18, 2019 through 9:00 A.M. Monday April 22, 2019

D. Memorial Weekend
- D1 12:00 Noon, Friday May 25, 2018 through 9:00 A.M. Tuesday May 29, 2018
- D2 12:00 Noon, Friday May 26, 2019 through 9:00 A.M. Tuesday May 28, 2019

E. Independence Day
- E1 12:00 Noon, Monday, July 2, 2018 through 9:00 A.M. Thursday July 5, 2018
- E2 12:00 Noon, Monday, July 1, 2019 through 9:00 A.M. Friday July 5, 2019

F. Labor Day Weekend
- F1 12:00 Noon, Friday August 31, 2018 through 9:00 A.M. Tuesday September 4, 2018
- F2 12:00 Noon, Friday August 30, 2019 through 9:00 A.M. Tuesday September 3, 2019

DMS COORDINATION

The existing DMS sign shall remain operational until two weeks prior to the start of Stage I. The Contractor shall notify Elyse Morgan, 630-241-6800 x3703, at the Tollway two weeks prior to the removal of the existing DMS sign.

STATUS OF UTILTIES (D-1)

Utility companies and/or municipal owners located within the construction limits of this project have provided the following information in regard to 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.

UTILTIES 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 in the action column; 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.

LOCATION / STAGE	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	ACTION

Pre-Stage

No conflicts to be resolved

Stage 1

I-90 3026+51 Crossing	Gas 12" St in 16" Casing	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7016 along outside shoulder 3. I-90 widening, I-90 CD Road, Ramp D	People's Gas	15 days for relocation of all People's Gas Facilities
I-90 3098+86 Crossing	16" ST	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7052 along outside shoulder 3. I-90 widening 4. Prop lighting conduit along Outside shoulder 5. Piles for proposed retaining wall		15 days for relocation of all People's Gas Facilities
I-90 3093+18 Crossing	16" ST	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7055 along outside shoulder 3. I-90 widening		20 days for relocation of all People's Gas Facilities
I-90 3028+00 to 3030+00 Crossing	Fiber Optic	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7017 along outside shoulder 3. I-90 widening, I-90 CD Road, Ramp D	Metropolitan Fiber Systems of Chicago Incorporated	15 days for relocation
I-90 3014+00 Crossing	Gas	Possible conflict with: 1. Proposed mainline storm sewer and drainage structures 2. I-90 widening, I-90 CD Road 3. Proposed lighting conduit along outside shoulder	Nicor	60 days for relocation of Nicor Facilities

Stage 2
No conflicts to be resolved

Pre-Stage: 0 Days Total Installation
Stage 1: 125 Days Total Installation
Stage 2: 0 Days Total Installation

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	Address	Phone	e-mail address
City of Chicago - water section	Rolando Villalon	100 East Ohio Street +1, room 306 Chicag0, IL 60611	312-742-3601	
ComEd	Caitlin Ball	Facility Relocation Department 4601 S. Lawndale Ave. Chicago, IL 60652	773-838-2905	
Peoples Gas	Mr. Chuck Creager	200 East Randolph, floor 24-s, Chicago IL 60601	312-240-7189	CRCreager@peoplesgasdelivery.com
X0 Communications	Mel Conn	810 Jorie Blvd Oak Brook IL 60523	630-371-3108	Mel.conn@xo.com
AT&T	Stanley Plodzien	1000 Commerce Drive, Floor 1 Oak Brook, IL 60523	630-573-5453	sp3264@att.com
ComCast	Bob Schulter / Robert Stroll	688 Industrial Drive Elmhurst, IL 60126	224-229-5861/ 2241-229-5849	
CTA	Abdin Carillo	567 West Lake Street 9th Floor Chicago, IL 60661-1465	See CTA FLAGGING AND DCOORDINATION specification for contact and coordination information	
Nicor	Bruce Koppang	1844 Ferry Rd. Naperville, IL 60563	630-388-3046	bkoppan@southernco.com
Level 3 Communications	Vince Skau	1305 E. Algonquin Rd. Arlington Heights, IL 60005	847-705-4436	vince.skau@level3.com
Illinois American Water	Henry Maradiaga	1000 International Parkway Woodridge, IL 60517	630-739-8859	Henry.maradiaga@amwater.com
Verizon / MCI	Jim Todd			investigations@verizon.com, jimtodd@ameritech.net

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 owners part can be secured.

LOCATION / STAGE	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	ACTION

Pre-Stage
No facilities requiring extra consideration

LOCATION / STAGE	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	ACTION

Stage 1

I-90 3011+65 Crossing	ComEd 138 KV line	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7010 along outside shoulder 3. I-90 widening, I-90 CD Road 4. Prop lighting conduit along outside shoulder	ComEd	Watch and Protect during construction
I-90 3111+12 Crossing Harlem Ramp D 106+98.89	Electrical Transmission line	Possible conflict with: 1. inside shoulder reconstruction 2. Prop Storm Sewer 9153 along Harlem Ramp 3. Harlem Ramp gore reconstruction 4. Prop lighting conduit along outside shoulder		Watch and protect as needed during construction. A 1' cover distance needs to be maintained at all times.
I-90 3118+41 Crossing 3120+63 Crossing 3121+32 Crossing 3075+67 Crossing 3013+00 Crossing	Electrical conduits attached to bridges	Electrical conduits attached to CTA Bus Bridge, Harlem Bridge, Harlem Bridge Canfield Bridge, River Road Bridge Respectively.		Watch and Protect during construction
I-90 3102+80 Crossing	24" MTD	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7081 along outside shoulder 3. I-90 widening 4. Prop lighting conduit along outside Shoulder Piles for proposed retaining wall	AT&T	Watch and Protect
I-90 3039+12 Crossing	Telephone	AT&T LNS on Cumberland Bridge in Bay 2 on west side		

I-90 3118+01 Crossing	BxTA-100	Potential conflict with WB inside shoulder reconstruction.		
I-90 3047+80 Crossing	4" Duct	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7031 along outside shoulder 3. I-90 widening, I-90 CD Road, Ramp C Prop lighting conduit along outside shoulder		AT&T reports that all conflict should be resolved prior to construction
I-90 3038+07 Crossing	16" ST	Possible conflict with proposed ITS fiber optic and power conduits		AT&T reports that all conflict should be resolved prior to construction
I-90 3013+80 Crossing	4-Duct (2' wide)	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7011 along outside shoulder 3. I-90 widening, I-90 CD Road 4. Prop lighting conduit along outside shoulder		AT&T reports that all conflict should be resolved prior to construction
I-90 3075+82 Crossing	Electrical	Potential conflict with WB inside shoulder reconstruction and proposed sewer.	City of Chicago	
I-90 3047+56 & 3047+72 Crossing	42" ST and 12" ST	Possible conflict with proposed ITS fiber optic conduit		Watch and protect, fiber can be routed around storm sewer.
I-90 WBCD Road 25+80 Crossing	Telephone	Possible conflict with: Proposed Retaining wall Piles (3.7' Horizontal Clearance. Approximate elevation of facility is at 607.81.	Level 3 Communications	Locate utility prior to construction of footings to ensure proper clearance is available. Some piles may need to be shifted
I-90 3013+05 Crossing	Telephone	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7029 along outside shoulder I-90 widening, I-90 CD Road		
I-90 3039+04 Crossing	2 Quads	Potential conflict with WB inside shoulder reconstruction, proposed sewer, I-90 Widening, I-90 CD Road.		
I-90 3014+15 Crossing	24" D.I.R.J.W.P. In 42" Steel Casing	Relocated Watermain in Contract 62A64		

I-90 3026+33 Crossing	16" D.I.R.J.W.P. in 30" Steel Casing	Relocated Watermain in Contract 62A64	Chicago Department of Water Management	Watch and Protect
I-90 3074+77 Crossing	12" D.I.R.J.W.P. in 24" Steel Casing	Relocated Watermain in Contract 60Y38		
I-90 3090+38.83 Crossing	36" D.I.R.J.W.P in 54" Steel Casing	Relocated Watermain in Contract 60Y38		
Project Limits	CTA Utilities	The Contractor is alerted that there are existing surface and underground facilities within the CTA operating area. These facilities may include, but are not limited to, Power Distribution Cables, Train Control Signal Cables and Communication Service Lines. The exact location of these facilities is not known. It will be the Contractor's responsibility to obtain this information from the CTA before proceeding with any work within the CTA operating area.	CTA	Watch and Protect
I-90 3051+50 Crossing	4" water Service Connection & 8" Sanitary Sewer	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7035 along outside shoulder 3. I-90 widening, I-90 CD Road 4. Prop lighting conduit along outside shoulder	Illinois American Water Company	Verification of utility depths is required to determine if conflict exists. Request 24 hour notification before construction in the area so field representative can be onsite
I-90 3013+12 Crossing	Fiber Optic	Possible conflict with: 1. Inside shoulder reconstruction 2. Prop Storm Sewer 7029 along outside shoulder 3. I-90 widening, I-90 CD Road 4. Prop lighting conduit along outside Shoulder	Comcast	Potential conflict resolved prior to construction

Stage 2
No facilities requiring extra consideration

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 taken into account 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 in the action column 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 dates 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. The Department's contractor is responsible to contact J.U.L.I.E. prior to any and all excavation work

EXISTING UTILITIES

The Contractor shall familiarize himself with the locations of all utilities and structures that may be found in the vicinity of the construction. The Contractor shall conduct his operations to avoid damage to all utilities and structures within the project limits. Should any damage occur due to the
Contractor's negligence, repairs shall be made by the Contractor at his expense in a manner acceptable to the Engineer.

The Contractor shall notify all utility owners of his construction schedule and shall coordinate constructions operations with utility owners so that relocation of utility lines and structures may proceed in an orderly manner. Notification shall be in writing, with copies transmitted to the Engineer.

ILLINOIS TOLLWAY PERMIT

The Contractor will be required to obtain a permit from the Illinois State Toll Highway Authority (Tollway) in accordance with Article 107.04 of the Standard Specifications prior to initiating any lane closures on the Tollway or doing any work on the Tollway right of way. As part of the permit, the Contractor will be required to insure the Tollway as part of the surety bond . The Contractor will furnish a copy of the authorized permit to the Engineer.

To perform work under, over, or on the Tollway, the Contractor shall submit in writing to the Tollway requesting a Construction Permit to:

The Illinois State Toll Highway Authority
Mr. Dana Havraneck
Permit/Utility Sections
2700 Ogden Avenue
Downers Grove, IL 60515

The Contractor will furnish a copy of the authorized permit to the Engineer.

No work is allowed on the Tollway through Thanksgiving Holidays. Wednesday through Monday at 9:00 am.

COMPLETION DATE PLUS WORKING DAYS (D-1)
Effective: September 30, 1985 Revised: January 1, 2007

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

"When a completion date plus working days is specified, the Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on **August 31, 2020** except as specified herein.

The Contractor will be allowed to complete all clean-up work and punch list items within **10** working days after the completion date for opening the roadway to traffic. Under extenuating circumstances, the Engineer may direct that certain items of work, not affecting the safe opening of the roadway to traffic, may be completed within the working days allowed for clean-up work and punch list items. Temporary lane closures for this work may be allowed at the discretion of the Engineer.

The Special Provision for "Failure to Complete the Work on Time" shall apply to both the completion date and the number of working days.

WORK ITEMS NOT PAID FOR SEPARATELY BUT INCLUDED IN THE COST OF ANOTHER PAY ITEM

Highlighted work item	Paid for as	Sheet location	Notes
Minor Ditch Grading and any Bulkheading	20200100 – EARTH EXCAVATION	G-03	Applies to work as directed by engineer in the field
Pipe Underdrain Connections to Drainage Structures	X6062410- CONCRETE BARRIER MEDIAN (SPECIAL)	G-03, DRN-17	Applies to all drainage structures that have pipe underdrain connections per drainage schedule
Topsoil excavation, stockpile, and placement	21101625 TOPSOIL FURNISH AND PLACE, 6"	Cross Section	All work that is included in topsoil excavated from site
All Transitions	Paid for at the contract unit price for work highlighted	Various	
Full or partial depth saw cuts	Included in the unit price for the item	N/A	
Field verify existing sewer locations and inverts	This work shall be considered in the cost of the receiving structures and proposed pipes	Various	Field conditions should be confirmed before structure fabrication
Proposed Guardrail Connection to Existing Guardrail	63000001 – Steel Plate Beam Guardrail, Type A, 6 Foot Posts	PR-01	

Any connection to existing or proposed structures or storm sewers shall be included in the cost of the sewers being connected.	550AXXXX – STORM SEWERS, CLASS A	All Drainage	
Any connections to existing or proposed structures or storm sewers shall be included in the cost of the pipe underdrains being connected.	60108204 – PIPE UNDERDRAINS, TYPE 2, 4”	All Drainage	
Frames and Lids adjustment with Milling	X6030310 – FRAMES AND LIDS TO BE ADJUSTED (SPECIAL)	District 1 detail BD-8	Work for this pay item is included in the District 1 detail BD-8 included in the contract documents
Plugging pipe end to abandon pipe is included in the cost of filling the storm sewer.	X0325405 – FILL EXISTING STORM SEWER	All Drainage Removals	
Backfill and restoration after removal of underground item	89502380 REMOVE EXISTING HANDHOLE 89502385 REMOVE EXISTING CONCRETE FOUNDATION	Various	Applies to removal of handholes, communications vaults, and concrete foundations.
Cable connection to electric service disconnect or telephone service drop	This work is included in the cost of the installed cable to the service.	Sheets with service locations	
Removal of existing lighting branch circuit wiring,	This work is considered in the cost of removing existing lighting equipment	Removal and Temporary lighting sheets	
Removal of existing lighting cable duct.	This work is considered in the cost of removing existing roadway	Removal and Temporary lighting sheets	
Removal of temporary lighting cables, luminaires, wood poles, cable duct, and mounting hardware	This work is considered in the cost of removal of temporary lighting unit	Temporary lighting sheets	

Unit duct Lighting circuit splice connections.	This work is considered in the cost of the unit duct 11/2 dia. Polyethylene, sch-40 600v, 3-1/c#2 & 1/c #4 ground (xlp-type use), pay item.	Temporary and Proposed lighting sheets	
Aerial cable lighting circuit splice connections	This work is considered in the cost of the aerial cable,31/C #2, aluminum pay item.	Temporary lighting plans	
Removal of existing underpass, hardware and junction boxes and cable	This work is considered in the cost of the removal of underpass unit, no salvage pay item.	Temporary lighting sheets.	
30A underpass lighting fuses and fuse holders.	This work is considered in the cost the underpass luminaire pay item.	Proposed lighting sheets	
Fill holes with high strength bolts and paint to match color of bridge beams after removing bridge mounted signs.	This work is included in the cost of 73602000- REMOVE OVERHEAD SIGN STRUCTURE - BRIDGE MOUNTED	Removal sheets	

FAILURE TO COMPLETE THE WORK ON TIME (D-1)
Effective: September 30, 1985 Revised: January 1, 2007

Should the Contractor fail to complete the work on or before the completion date as specified in the Special Provisions for "Interim Completion Date" or "Completion Date Plus Working Days", or within such extended time as may have been allowed by the Department, the Contractor shall be liable to the Department in the amount of **$8,000**, not as a 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 certain 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 use of the roadway if the project is delayed in completion. 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.

DETOUR RESTRICTIONS

The Contractor shall coordinate all detours per the Special Provision for COORDINATION WITH ADJACENT AND/OR OVERLAPPING CONTRACTS, and per the restrictions identified in this special provision.

WB I-90 exit ramp to canfield Rd will be closed for construction during construction of retaining wall and adjacent ramp, during construction stage 1. The traffic will be detoured to west on I-90 to NB Cumberland exit ramp to Higgins Rd during this period. This detour will be allowed for a maximum of 22 consecutive calendar weeks. Contractor shall verify that the detour for WB I-90 exit ramp to Canfield Rd will not have any conflict with other detour plans that already implemented for the other projects as listed in coordination with adjacent and/or overlapping contracts.

Detour #1 (WB I-90 Contract 60Y39): WB Canfield Exit Ramp Closure

- All traffic: WB I-90 exit at Cumberland Ave North Exit Ramp, east on Higgins Rd (**signalized**), end detour at Canfield Rd (**signalized**).
- Detour Restrictions
    - Detour #1 (and associated work) shall not begin until 2019, or until any/all conflicting work or detours from adjacent contracts is confirmed to be complete in 2018.
    - Detour #1 shall only be allowed for **22** consecutive calendar weeks

Winter Shutdown: Detours will not be allowed to remain in place during any winter shut down period.

Traffic Signal Coordination Along Detour Routes: Prior to detour installation, Contractor shall notify CDOT 14 days prior to start of each detour. At any time during the detour duration, and at the request of the Engineer or CDOT, the Contractor will coordinate and complete signal timing review and actual revision of signal timing to the subject traffic signal controller. Cost of the traffic signal timing review and revision of signal timing shall be included in the cost of MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION.

The cost of the Contractor obtaining No Parking permits and posting shall be included in the cost of TRAFFIC CONTROL AND PROTECTION (SPECAL).

CTA FLAGGING AND COORDINATION

All work to be done by the Contractor on, over, or in close proximity of the CTA (Chicago Transit Authority) right-of-way and infrastructure shall be performed according to Article 107.12 of the Standard Specifications and this specification. This specification includes language from CTA Master Specification Section 01 35 15, "Special Project Procedures for Adjacent Construction." No interruption to CTA service will be allowed unless approved in writing by the CTA.

The CTA's Representative for this project will be:

Mr. Abdin Carrillo
Project Manager, Construction Oversight
(312) 681-3913

1.01 SUMMARY

A. This section includes the requirements for safe construction operations on, above, below and adjacent to operating tracks of the CTA rail system. The Contractor shall be responsible for compliance with the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System* (in effect at such time). The contractor shall also be responsible for compliance with the CTA Adjacent Construction Manual (in effect at such time) – this manual may be found at http://www.transitchicago.com/adjacentconstruction. Note: in case of conflict between the manual and this CTA FLAGGING AND COORDINATION Specification, the most stringent as determined by the engineer in the field shall take precedence.

B. After the letting of the contract and prior to performing any work, the CTA Representative shall be notified by the Department to attend the preconstruction meeting. In this meeting, the Contractor shall confer with the CTA's Representative regarding the CTA's requirements for the protection of clearances, operations and safety.

C. Prior to the start of any work on or over the CTA's right-of-way, the Contractor shall meet with the CTA Representative to determine his requirements for flagmen and all other necessary items related to the work activities on, over and next to the CTA facilities and to receive CTA's approval for the Contractor's proposed operations. At least twenty-one (21) calendar days prior to the start of work the Contractor must request CTA to prepare a Right-of-Entry document. The Contractor must also conform to all requirements of the "CTA Requirements for Contractors Working along the Right-of-Way (R.O.W.)", included as EXHIBIT A.

D. The Contractor shall notify the CTA Representative 72-hours in advance of the time he intends to enter upon the CTA right-of-way for the performance of any work.

E. When the scope of work under this contract includes construction activities adjacent to and above CTA tunnels, then work activities shall protect the existing CTA infrastructure and allow unimpeded service to CTA customers unless specifically allowed by CTA as identified herein.

1.02 PROJECT CONDITIONS

A. The Chicago Transit Authority (CTA) is an operating transportation agency and must maintain rail operations at all scheduled times for the benefit of the public. The Contractor shall conduct his operations in such a manner as not to cause damage to the CTA equipment, put the public or the CTA personnel in danger, cause inconvenience to the customers, interrupt train service (except as permitted herein) or cause avoidable inconvenience to the public and the surrounding communities.

B. The CTA will be operating trains during the construction of this project. The rail operations are 24 hours per day, seven days per week.

C. Certain portions of the project may be performed on, above or adjacent to sections of track where rail service is suspended in order to facilitate the work. For any work occurring within, above or adjacent to a section of track to be taken out of service, the Contractor shall confirm with the CTA that track within the work limits has been taken out of service and the third rail de-energized, as required, prior to beginning the work.

D. If the CTA deems any of the Contractor's work or operations hazardous to the CTA's operations or to the public, the CTA shall contact the Engineer. The Engineer may elect to order the Contractor to immediately suspend work until reasonable remedial measures are taken satisfactory to the CTA.

E. The CTA may review any of the Contractor's procedures, methods, temporary structures, tools or equipment that will be utilized within the CTA Right-of-Way. These reviews do not relieve the Contractor of responsibility for the safety, maintenance, and repairs of any temporary structure or work, or for the safety, construction, and maintenance of the work, or from any liability whatsoever on account of any procedure or method employed, or due to any failure or movement of any temporary structure, tools or equipment furnished as necessary to execute work on CTA Right-of-Way.

F. At least five (5) weeks prior to the start of any work on, above or adjacent to the CTA right-of-way, the Contractor will be required to attend weekly coordination meetings with CTA Operations and other CTA departments to review and coordinate proposed work activities of the Contractor(s). The Contractor will be required to provide a five week look-ahead schedule, in a format acceptable to CTA, reflecting proposed work activities within the CTA Right-of-Way.

G. The Contractor, through the Engineer, shall submit a Rail Service Bulletin Request form to the CTA at least twenty-one (21) calendar days in advance of the Contractor's proposed scheduled time to enter upon the CTA Right-of-Way for the performance of any work under this Contract. Bulletin requests will be required when performing work which impacts rail operations such as prior to each phase of staged station construction, Track Access Occurrences, track survey, etc.

H. CTA generally permits only one Track Access Occurrence at a time on any given route. Other work on CTA's system, including required operations and/or maintenance by CTA, or work by other contractors elsewhere on the route, may limit the available dates of track access occurrences for this project. The Contractor is strongly encouraged to submit Rail Service Bulletin requests with more than the twenty-one (21) day minimum required advance notice. The CTA has indicated that they typically will not grant Track Access Occurrences on consecutive weekend periods in order to provide scheduled service to customers.

I. The Contractor shall at all times observe all rules, safety regulations and otherrequirements of the CTA, including, but not limited to, the following Standard Operating Procedures (SOP's).

No. 7037, "Flagging on the Right-of-Way".
No. 7038, "Train Operation Through Slow Zones".
No. 7041, "Slow Zones".
No. 8111, "Workers Ahead Warning System".
No. 8130, "Safety on Rapid Transit Tracks".
No. 8212, "Test Train Procedures"
Sketch 2000-SZ-1, Slow Zone Equipment

1.03 REIMBURSEMENT OF COSTS

A. The cost of all flagmen, infrastructure crews, engineering inspection, switchmen, and other workmen furnished by the CTA and authorized by the Engineer shall be paid for directly to the CTA by the Contractor.

B. The costs associated with Track Access Occurrences granted and established by the CTA shall be paid for directly to the CTA by the Contractor.

C. The amount paid to the Contractor shall be the amount charged to the Contractor for all authorized CTA charges including CTA additive rates audited and accepted by the Department, according to Article 107.12 and Article 109.05 of the Standard Specifications.

D. Following approval of the CTA invoices by the Department, the Contractor shall pay all monies to the CTA as invoiced and shall submit to the Department certified and notarized evidence of the amount of payments. No overhead or profit will be allowed on these payments.

E. If there are maximum amounts of flagger shifts identified within this specification and if Contractor operations require flagger shifts that are granted by the CTA beyond these limits, the Contractor shall pay for the services, but will receive no reimbursement.

F. The Department will not be liable for any delays by the CTA in providing flagmen, establishing track closures or other service provided by the CTA and identified within this special provision.

1.04 RAIL SAFETY TRAINING

A. All Contractor and Subcontractor employees assigned to work on, over or near the CTA Right-of-Way shall be required to attend an all-day Rail Right-of-Way Safety Training Session in accordance with the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System*. The cost of this training is currently $200.00 per employee, paid by the Contractor in advance. The certification is good for one calendar year from the date of issuance. The Contractor shall coordinate rail safety training with the Engineer. The cost of training shall be paid directly to the CTA by the Contractor.

B. Rail Right-of-Way Safety Training for Contractor and subcontractor personnel will be scheduled by CTA as training slots become available. The Contractor is advised that the Contractor's failure to request training sufficiently in advance of when the employee is required on the work site shall not be cause for relaxing the requirement for Rail Right-of-Way Safety Training.

C. The $200.00 fee is non-refundable. If any individual fails to report for training or is rejected for training and must be rescheduled, an additional $200.00 will be required. No additional compensation will be made for the rescheduling of any training.

D. Upon successful completion of CTA Rail Safety Training, each trainee will be issued a non-transferable Rail Safety Tour Identification Card with the trainee's photo and a decal with pressure sensitive adhesive to be affixed on the hard hat. The Rail Safety Tour Identification Card and the decal are valid for one (1) year from the date of issue. The validity of the Card and the decal are in no way related to the length of this Contract.

E. Contractor and Subcontractor personnel must renew their Rail Safety Tour Identification Cards annually by successfully completing Rail Safety Training again. Contractor or Subcontractor personnel who fail to maintain a valid Rail Safety Tour Identification Card are not permitted to work on, above or adjacent to the CTA Rail Right of Way and CTA reserves the right to remove such personnel from the work site.

F. The costs incurred by the Contractor for CTA Rail Safety Training will not be reimbursed.

1.05 MANDATORY ITEMS FOR EMPLOYEES ON CTA RIGHT-OF-WAY

A. Contractor's and Subcontractor's employees assigned to work on the CTA Right-of-Way:

1. Contractor's and Subcontractor's employees will be given individual property permits. These permits shall be carried by each employee at all times while on CTA property. All permits issued shall be returned to CTA at the completion of the project, if the employee no longer works on this project, or on the date of expiration.

2. Each employee shall carry a valid Rail Safety Tour Identification Card at all times while on CTA right-of-way in accordance with Article 2-2 of the CTA Safety Manual.

3. All employees shall wear an undamaged hard hat with current rail safety sticker affixed, CTA standard safety vest and eye protection at all times while on CTA right-of-way. Noise protection shall be used when necessary. The Contractor must also comply with all OSHA requirements as required for the work. The CTA shall provide the rail safety sticker to each Contractor employee upon successful completion of the Rail Right-of-Way Safety Training.

4. Contractor personnel shall wear suitable work shoes with defined heel and non-slip soles. Steel toes or metal cleats on the sole or heel of shoes are prohibited. Shoelaces are to be kept short so they do not pose a tripping hazard. Athletic shoes, sandals, open-toed shoes, moccasins and/or shoes with heels higher than 1" are not permitted.

5. Contractor personnel shall have a non-metallic, working flashlight after dark or when working in the subway.

B. Contractor and Subcontractor employees assigned to work adjacent to or above the CTA right-of-way shall wear a CTA standard safety vest at all times. Personnel without current Rail Safety Training and a valid property permit shall not enter onto any CTA Right-of-Way.

1.06 WORK AREA AVAILABILITY

A. DEFINITIONS

1. RIGHT-OF-WAY WORK: Any work performed at, above, or below track level within the CTA Right-of-Way.

2. IN-SERVICE TRACK: All CTA tracks are in service seven days a week, 24 hours a day, unless specifically removed from service for specific times by a Rail Service Bulletin issued by the Vice President, Rail Operations. Copies of the CTA's current train schedule for the lines affected by this project is available on the CTA's website and are subject to changes at any time, before or during, the Contract.

3. OUT-OF-SERVICE TRACK: The CTA tracks within limits defined by CTA that are temporarily removed from service for the purpose of completing specific work. Traction power will remain on at all times unless power removal is requested by the Contractor and approved by the CTA. In such cases, traction power must be removed and restored by CTA personnel. The Contractor may request the CTA to de-energize portions of the CTA right-of-way to perform work on, or near an Out-of-Service Track when no revenue service is scheduled, or as specified under a Rail Service Bulletin. Upon completion of the Out-of-Service Work, the Contractor shall maintain sufficient personnel on-site to correct any deficiencies in the Contractor's Work discovered by the CTA during power and service restoration and testing.

4. TRACK ACCESS OCCURRENCE: A condition(s) which provides a modification to the normal operation of CTA service to facilitate access for a Contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited herein.

5. RE-ROUTE: Modification to the normal routing of trains in order to remove rail traffic from a section of track to facilitate access for a Contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited herein.

6. LINE CUT: A temporary cessation of all service on a transit line; meaning total stoppage of transit service on all tracks and at all stations within the closure zone to facilitate access for a contractor(s) to perform work on or near the CTA Right-of-Way as defined and limited herein.

7. SINGLE-TRACK: A temporary operation established by operating trains bi-directionally on one track while the adjacent track is taken out-of-service as defined in paragraph 1.05.a.4, above. Only one single-track at a time can be set up on a line and only for very limited time periods. If CTA or a separate contractor(s) request single track operations along the same line concurrently with the Contractor for this contract, CTA shall have the exclusive authority to determine which request shall be granted.

8. RUSH HOURS: Monday through Friday, from 0500 to 0900 hours and from 1500 to 1900 hours.

9. FLAGGER SHIFT: A flagger shift is defined as the services of a CTA Flagman up to, but no more than eight (8) hours including travel and required breaks. For example:

    a. A Contractor five hour work shift which requires 3 flaggers will use 3 flagger shifts.
    b. A Contractor eight hour work shift requiring 3 flaggers shall use 6 flagger shifts (because travel & break time will increase the flaggers work hours beyond eight).
    c. A Contractor ten hour work shift requiring 3 flaggers will use 6 flagger shifts.

10. INFRASTRUCTURE SHIFT: An infrastructure shift is defined as up to, but no more than eight (8) hours worked per CTA Infrastructure employee. For example:

    a. A Contractor five hour work shift requiring 2 signal maintainers will use 2 infrastructure shifts.
    b. A Contractor eight hour work shift requiring 2 towermen shall use 2 infrastructure shifts.
    c. A ten hour work shift requiring 2 lineman will use 4 infrastructure shifts.

11. PERSON-IN-CHARGE (PIC): A person or persons, specified in a CTA Rail Service Bulletin, who is solely in charge of a work zone and is the single point contact between CTA and all persons (Contractor's, CTA and others) working in a work zone. The Rail Service Bulletin may identify the PIC by name or by radio call number. The Engineer or the Engineer's designee shall serve as PIC.

12. POWER & WAY SERVICE BULLETIN (PWS Bulletin): A document authorized by the CTA Infrastructure Division intended to supplement a CTA Rail Service Bulletin by defining power/signal removal and restoration procedures and other work zone protection measures required to safely perform construction and/or maintenance work on or adjacent to the CTA Right-of-Way (ROW).

B. No service disruptions will be allowed for the completion of this work, except as noted herein. If the CTA deems it necessary, the CTA will impact operations to avoid a hazardous condition to either the passengers or employees and charge the Contractor for all associated costs and damages incurred. No compensation will be made for CTA charges to the Contractor due to unauthorized Contractor access or other unapproved impacts to CTA operations.

1.07 CTA OPERATING REQUIREMENTS

A. Strictly comply with operating requirements of the Chicago Transit Authority while construction work is in progress, specifically as follows:

1. All work performed on the CTA Right-of-Way will be allowed during the Construction Period only in accordance with the Article 1.08 "ALLOWABLE HOURS OF CONSTRUCTION". During most periods of construction, a "slow zone" shall be established at the work site and flagging personnel shall be deployed to facilitate safe and continuous train operations and to protect Contractor, CTA employees, passengers, the general public and property in the vicinity.

2. No one is permitted to enter the CTA Right-of-Way during Rush Hours. Access to the underside of the existing or proposed bridge structure within the limits of the CTA Right-of-Way will not be permitted.

B. As much work as possible is to be done under normal CTA operating conditions (under traffic) without disruption of train movements. A maximum interruption of service to the CTA traffic of 15 minutes or as agreed upon with the CTA will be allowed. No interruption to CTA service will be allowed unless approved in writing by the CTA. The CTA has indicated during overnight periods, train headways are between fifteen (15) and thirty (30) minutes.

C. Pedestrian traffic access to CTA station facilities shall be maintained at all times. Barricades and signage for sidewalk closures as well as all details for pedestrian crossings of street intersections at the entrance of the station must be coordinated with the CTA at least twenty-eight (28) days prior to modifications to staging.

D. Bus traffic access to CTA station facilities must be maintained. Any proposed changes to bus routes or normal access by pedestrians will need to be coordinated and approved by CTA (and Pace where applicable).

E. Access control of the CTA Right-of-Way must be maintained at all times. This includes eliminating openings directly to the Right-of-Way where existing median barriers are to be removed. All planned removals of existing access control must be coordinated with the CTA, with plans for counter measures provided to the CTA at least three (3) weeks prior to removals. If the CTA grants the removal of a portion of the existing access control, the Contractor shall provide a fence system to enclose the Contractor's work area and provide a visual separation between the Contractor's work area and the CTA operating track(s). The fence shall be designed and installed to meet all CTA requirements, including, but not limited to, horizontal clearance requirements, minimum wind and vertical loading, foundation embedment, screening, fencing connections, installation requirements, maintenance of the fence throughout the installed period, removal of the fence at the completion of the period for the fence need and restoration of the CTA Right-of-Way. The Engineer and CTA shall approve all fence designs, components and installation procedures prior to the start of fence installation. The cost to design, install, maintain and remove the fence shall be considered included in the work required to be performed within the CTA Right-of-Way and will not be paid for separately.

1.08 ALLOWABLE HOURS OF CONSTRUCTION

A. Construction activities within CTA Right-of-Way are not permitted during Rush Hours. Access to the underside of the existing or proposed bridge structure within the limits of the CTA Right-of-Way will not be permitted during Rush Hours.

B. Construction activities within CTA Right-of-Way may be permitted during non- Rush Hour periods under flagging protection with the advance concurrence of the CTA as follows:

1. Monday thru Friday: From 0900 to 1500 and from 1900 hours to 0500 hours the next day (the power shall remain on for these hours unless allowed via specific Track Access Occurrence).

2. Weekends: 1900 hours Friday to 0500 hours Monday

C. Track Access Occurrences:

1. The total number of Track Access Occurrences shall be as specified below:

   a. Overnight Single Tracks: A maximum of six (6) Overnight Single-Track Track Access Occurrences will be permitted. Construction activities within the CTA Right-of-Way may be permitted between the hours of 22:00 and 04:00 the following morning, including any time required for test trains stipulated in the Rail Service Bulletin.

   b. Weekend Single Tracks: A maximum of zero (0) Weekend Single-Track Track Access Occurrences will be permitted. Construction activities within the CTA Right-of-Way may be permitted between the hours of 22:00 Friday night and 04:00 the following Monday morning, including any time required for test trains stipulated in the Rail Service Bulletin.

   c. If proposed work requires that CTA operations be suspended due to any circumstance, the Engineer must be informed immediately to coordinate the service suspension with the CTA. Any reimbursement to the CTA for the granting of a Track Access Occurrence must be approved by the Engineer.

2. The exact dates and hours for all Track Access Occurrences are subject to change by the CTA depending on the nature of the work, access requirements of CTA personnel, work performed under separate contract or operational requirements of the CTA. The approval of specific dates and times for Track Access Occurrences on this Contract may be affected by major events or by a Track Access Occurrence scheduled elsewhere on that route or the CTA System. The CTA has indicated that they typically will not grant Track Access Occurrences on consecutive weekend periods in order to provide scheduled service to customers.

3. Contractors completing other Department projects may also request Track Access Occurrences along the same section of track as described herein. These projects are identified in CONTRACTOR COOPERATION. Provided these Track Access Occurrences are approved, scheduled and initiated by the CTA, the Contractor shall be able to access CTA Right-of-Way with no impact to the total count of Track Access Occurrences attributed to this Contract.

D. The CTA reserves the right to modify the allowable dates or hours of track access occurrences based on service requirements for the subject route and manpower availability for the date and location requested.

E. The CTA reserves the right to deny or to cancel a previously approved request for a Track Access Occurrence based on service requirements for the time period requested. The CTA may notify the Contractor of such denial or cancellation no later than 1 day prior to a Track Access Occurrence. Service requirements may be affected by major events (e.g., festivals, White Sox and Cubs games, concerts), or by a Track Access Occurrence scheduled elsewhere on that route or the CTA System.

F. The Contractor will not be permitted to perform work requiring a Track Access Occurrence or Flagging during the following special events:

1. Taste of Chicago
2. Independence Day
3. Chicago Air and Water Show
4. Chicago Marathon
5. Chicago Jazz Festival
6. Chicago Blues Festival
7. Chicago St. Patrick's Day Parade
8. The Saturday before Thanksgiving Day through the Monday following Thanksgiving
9. New Year's Eve and New Year's Day
10. Easter Sunday
11. Gospel Fest
12. Chicago White Sox Home Games
13. Chicago Cubs Home Games
14. Chicago Bears Home Games
15. Lollapalooza
16. Pride Parade

In addition, CTA reserves the right to limit or deny access to the system during other major special events that may develop and that may impact service needs, during emergencies, and during severe weather conditions.

The CTA, at their discretion, may provide a Track Access Occurrence or Flagging during a time period identified above provided the request is made in conformance with this specification and is properly scheduled with the CTA as required.

1.09 CONSTRUCTION PROCESS PLAN

A. CTA will require the Contractor to submit a Construction Process Plan whenever any work, in the opinion of the CTA, affects the safety or causes disruption of service or inconvenience to transit users, CTA Operations or impacts CTA Right- of-Way including, but not limited to: protection of CTA tracks/ CTA Right-of-Way, demolition, temporary shoring installation, drilled shaft installation, pier construction, structural steel erection over CTA tracks/ CTA Right-of-Way, temporary pedestrian bridge to CTA's station entrance, and any other necessary temporary construction related to the above listed items. At a minimum, an individual Construction Process Plan shall be required for each instance the Contractor requests a Track Access Occurrence from CTA and for any work that requires flagging protection from CTA.

B. A draft Construction Process Plan must be submitted to CTA by such method as the CTA may direct, at least twenty-one (21) calendar days in advance of work and at least fourteen (14) calendar days prior to a pre-activity meeting. The plan shall include/address the following:

1. Applicable Contract Documents
2. Options
3. Possible conflicts
4. Compatibility problems
5. Time schedules
6. Weather limitations
7. Temporary facilities & signage
8. Space and access limitations
9. Governing regulations
10. Safe Work Plans (including Hazard Analysis)
11. CTA Operations Impact
12. Proposed Traffic Control & Staging Areas
13. Lift Plan
14. For construction processes where failure of temporary structures will result in service interruptions and/or damage to CTA infrastructure CTA will require calculations and drawings signed and sealed by an Illinois SE. These processes include but are not limited to temporary Earth Retention Structures, formwork, lift plans and demolition. CTA also reserves the right to require a 3rd party SE review of the calculations, drawings and installation.

C. The draft plan must also include reference to all Contractor Requests for Information (RFI's) and submittals that pertain to work identified in the plan.

D. In addition, for any work to be performed during a Track Access Occurrence, the Contractor shall provide the following to the CTA:

1. A track access plan submitted to and approved by the CTA specifically identifying the area(s) of power removal and work zone protection methods being requested by the Contractor.

2. Work zone protection methods to be performed by the Contractor

3. Name, title, contact information, and work hours for Contractor's on-site supervision

4. Work zone protection requested by the Contractor for implementation by the CTA (subject to CTA approval).

5. Pre-approved Safety and Quality Control Checklists, applicable to the work elements being performed during the specific track(s) outage request for completion by the Contractor and submission to the Person-In-Charge during Track Access Occurrence.

6. A general schedule reflecting proposed work to be performed within the requested Track Access Occurrence.

E. After pre-activity meeting minutes have been agreed to, all comments from the meeting must be incorporated into a final Construction Process Plan. This plan must be submitted and approved by the Engineer and CTA prior to the start of related work.

F. Prior to the CTA implementing an authorized Track Access Occurrence, the Contractor must provide, at least 48 hours in advance, an hourly schedule broken into tasks with a defined critical path that clearly establishes milestones that may be monitored. The hourly schedule shall also include, but not be limited to:

1. Name, title, contact information, and work hours for Contractor's on-site supervision.
2. Power removal (min 1 hour)
3. Proposed work activities.
4. Activities for inspection and completion of safety & quality checklists by Contractor.
5. Submission of safety & quality checklists to the CTA's Person-In-Charge (PIC) during Track Access Occurrence. The checklists shall be submitted to the PIC prior to commencing power restoration activities.
6. Power, Signal Restoration (min 1 hour).
7. Test train (min ½ hour).

G. The CTA intends to issue Power & Way Service Bulletins to supplement CTA Rail Service Bulletins. The Power & Way Service Bulletins are intended to provide procedural guidelines for safely removing and restoring the CTA's power & way systems (primarily traction power & signal) within the limits defined by the contract and Contractors specific track outage plan(s).

H. CTA labor shall be required to de-energize and re-energize traction power and perform such other work as may be deemed by the CTA to be required pursuant to the Contractor's work activities and authorized Track Access Occurrences, etc. CTA Signal Maintainer shall also be required to observe and witness the Contractor disconnection and reconnection of temporary signal work at each location where modifications are performed to support construction activities. One Signal Maintainer will be required to witness testing at each location or housing where it is taking place. CTA Signal Maintainer shall also be required to witness the Contractor restoration safety testing, prior to the line being returned to the CTA.

I. Two Linemen will be required at each location where traction power is energized or de-energized. The Contractor's schedule must include travel time for the CTA Electrician's (min ½ hour) if they are to energize or de-energize traction power at more than one location.

J. Failure of the Contractor to provide the CTA the minimum specified time required for the removal and restoration of all Power & Way systems within an authorized Track Access Occurrence will result in specified liquidated damages for failure to return track(s) to service in accordance with the contract requirements. There will be no reimbursement for liquidated damages charged to the Contractor by CTA. The following schedule for liquidated damages has been established by the CTA:

From 1 minute through 29 minutes delay - $5,000.00
From 30 minutes through 59 minutes delay – an additional $5,000.00
For each additional hour or fraction thereof - $30,000.00 per hour

K. When scope of work under this Contract includes construction activities adjacent to the existing CTA tunnels, the construction process plan shall identify the following items to be approved by the CTA prior to all construction near the CTA tunnels:

1. The scope and sequence of work near the CTA tunnel

2. The type of equipment to be used adjacent to the tunnel

3. Equipment to be operated, stored or serviced within the limits of the projected edges of the CTA tunnels up to ground

4. Specialized pads, racks, mats or other supports for any equipment to be operated or stored or materials to be stored over CTA tunnels

5. Excavation limits in the area of the CTA tunnels, braced excavation or temporary earth retention system designs to be used (if applicable), excavation procedures (including hand, vacuum, hydro and other non-mechanical techniques), and other elements related to the excavations near the CTA tunnels

6. Materials and activities to protect the CTA tunnels during excavations and proposed construction near the CTA tunnels

7. Emergency plan and communication protocol in the event there is confirmed damage to the CTA tunnels due to Contractor activities

8. Restoration plan and construction techniques to restore the soil fill around and over the CTA tunnels

L. Placing equipment and materials in the area above the CTA tunnels is at the discretion of the CTA, and must be authorized prior to the start of any activities above and around the tunnel. In order for the CTA to evaluate the impact due to Contractor activities, a Structural Assessment Report shall be prepared concerning the CTA tunnel structures.

1. The Contractor shall retain the services of an engineering firm, prequalified in the IDOT consultant selection category of Highway Bridge (Advance Typical / Complex), for preparation of the Structural Assessment Report(s). Contractor’s pre-approval shall not be applicable for this project. Preparation of the Structural Assessment Report(s) shall be at the Contractor’s expense.

2. The Contractor is advised that the existing structures most likely contain elements that are in deteriorated conditions with reduced load carrying capacities. It is the Contractor’s responsibility to account for the condition of existing structures when developing construction procedures for using them to support construction loads.

3. The Contractor shall verify that the structural demands of the applied loads due to the Contractor's means and methods will not exceed the available capacity of the structure at the time loads are applied nor will any overstress to the tunnel structure occur. The Contractor may need to provide modifications to the existing tunnels (or other methods of retrofitting) to support construction loads. Locations and design of such modifications system will be the responsibility of the Contractor, will not be paid for separately, and will be subject to the review and approval of the CTA.
4. The modifications may include constructing elements adjacent to the CTA tunnels to reduce the load transfer to the tunnel structures. Any proposed improvements within the area of the tunnel to support Contractor operations will not be paid for separately, but will be included in the cost of other items.

1.10 HAZARDOUS WORKING CONDITIONS

A. The Contractor shall caution all employees of the presence of electric third rail (600 volts DC), live cables and moving trains on CTA tracks. The Contractor shall take all necessary precautions to prevent damage to life or property through contact with the electrical or operations systems. The Contractor shall caution all employees that any contact with live electric third rail or "live" portions of train undercarriage may result in a severe burn or death.

B. The Contractor shall establish third-rail safety precautions in accordance with CTA regulations, such as using insulating hoods or covers for live third rail or cables adjacent to the work. On every day and at every work site where a live third rail hazard exists, the Contractor shall instruct all employees of the emergency procedures. Knowledge of the disconnect switch locations or manner of disconnection shall be available at all times to the personnel on the job Unless otherwise noted, only CTA Electricians are allowed to disconnect power.

C. The third rail may be de-energized during authorized Track Access Occurrences. The planning and implementation of the de-energizing shall be listed in the Contractor's process plan and include documenting checklist requirements.

1.11 TRACK SAFETY

A. The Contractor shall, at all times, take special care to conduct operations over, on, under, adjacent to, or adjoining, the CTA Right-of-Way in such a manner as not to cause damage, settlement or displacement of any structures, tracks or any portion thereof. Contractor will monitor CTA tracks for vertical and horizontal movements. Contractor to refer to the requirements as identified under the Special Provision, "TRACK MONITORING".

B. Any damages to the CTA tracks, supporting structures or other existing facilities and properties caused by the Contractor's operations shall be replaced or repaired by the Contractor to the satisfaction of the CTA without reimbursement. Contractor shall obtain photo documentation of damaged property to the CTA prior to performing any repair or replacement work.

C. The CTA shall have the right to perform any work it deems to be of an emergency nature and/or necessary to permit normal train operations during construction operations by the Contractor. The work to be completed by the CTA may impact the ongoing Contractor operations. If the emergency work is required due to Contractor actions, the cost of such service or emergency work provided by the CTA shall be borne by the Contractor with no reimbursement by the Department.

D. All work shall comply with the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System* and CTA Standard Operating Procedures.

E. Train Clearances

1. Minimum 7’-2” Horizontal Clearance:
   The Contractor shall take such precautions as are necessary to ensure the safety and continuity of the CTA operations and passengers. The Contractor shall provide a minimum horizontal clearance of 7'-2" from the centerline of the nearest tangent track to any falsework, bracing and forms or other temporary obstruction during the work under this Contract. The clearance requirements for curved track sections must be calculated by the Contractor to ensure encroachment into the clearance envelope will not occur. Prepare, submit and obtain approval of detailed drawings prepared and sealed by a licensed structural engineer in the state of Illinois for all falsework, sheeting and construction procedures adjacent to and under the tracks before doing any work on same. After obtaining approval of such plans, said falsework, sheeting and construction procedures shall be constructed strictly in accordance with the approved drawings and specifications. All submittals must be submitted to the Engineer to be provided to the CTA In case of any settlement or displacement of structures or tracks, the Contractor shall immediately proceed with all shoring or other work necessary to maintain the CTA property in a safe condition for the operation of train service. If the Contractor fails to undertake this work within 24 hours after notice by the Engineer in writing, the CTA may proceed to repair or shore any such structure or tracks; and the cost thereof shall be billed to the Contractor with no compensation. If the settlement or displacement is severe enough to limit train service, the repairs shall be made immediately. All costs of any disruption to the CTA service due to the Contractor's operations or negligence shall be at the Contractor's expense with no compensation.

2. Limited minimum 6’-1” Horizontal Clearance:
   In limited cases and with advance authorization by the CTA, a minimum horizontal clearance of 6’-1” between the centerline of the nearest tangent track and an obstruction may be allowed. This clearance does not allow CTA or Contractor personnel to safely stand between the obstruction and an operating train. In addition, an obstruction at this clearance is a hazard to motormen with a cab window open. Any required flagging by the CTA will need to be requested as described herein.

3. 14’-6” Vertical Clearance:
   Vertical clearance A minimum vertical clearance of 14'-6" (4.42 m) above the high running rail the CTA tracks must be provided at all times.

F. Protective Shield

1. The Contractor shall furnish, install, and later remove protective shields to protect the CTA traffic from damage due to (a) falling material and (b) work on bridge piers.

2. Protective shields will be necessary for any demolition/repair/new construction activities.

3. The protective shield may be a platform, a net, or any other Department approved structure that can support the construction debris and satisfy train clearance requirements.

4. Required protective shield for falling material, as indicated on the plans and the supporting members shall be designed to sustain a load of 200 pounds per square foot in addition to its own weight.

5. Required protective shield for work on bridge piers shall be designed for a 30 psf minimum wind load pressure or greater as determined by Contractor’s engineer for site specific conditions. Any other loads that can be imposed by Contractor’s construction activities shall also be included. Preferred material for shield is wood.

6. Drawings and design calculations for the protective shields shall be stamped by an Illinois Licensed Structural Engineer and shall be submitted to the Department for approval. The protective shield shall be constructed only after the Department has approved the drawings and the design.

G. Work adjacent and above the CTA tunnels must consider the protection of the tunnel structures in addition to items described above related to open track conditions. The protection of the tunnel structure is critical to maintain continuous transit operations. Section 1.09K describes the required items as part of the Construction Process near the tunnel structures. The CTA, at their discretion, may place inspectors, or other personnel, within adjacent tunnel sections during Contractor operations. The CTA personnel will alert the Engineer if the Contractor actions appear to be damaging the CTA tunnel structure(s).

1.12 TRACK FLAGGING OPERATIONS

A. Temporary Track Flagging slow zones per CTA SOP 7041 and CTA, *Safety Manual for Contract Construction On, Above or Adjacent to the CTA Rail System* are restricted in the following manner:

1. Temporary track flagging slow zones can only be mobilized, utilized and demobilized in non-rush hour time periods and no more than one (1) Track Flagging Operation zone will be permitted at any given time. The Contractor will be the responsible party responsible to furnish (Contractor may purchase signage from CTA if Contractor does not have) and install the required slow zone signage and equipment. A Track Flagging Operation zone is defined as a contiguous work zone, of no more than 600 feet in length, regardless of the number of tracks fouled. The costs for all manpower, signage and equipment for flagging operations will be billed by the CTA to the Contractor with reimbursement as defined herein.

2. Current Standard Operating Procedures require Slow Zone with flagging protection whenever any workers are scheduled to work on, across or near a section of track. Flagging protection shall be ordered and assigned according to the CTA Flagmen Requirements Manual. These standards must be adhered to and the number of flagmen assigned to a work location shall be as required by the CTA Flagmen Requirements Manual that is available for public viewing at CTA Headquarters upon request. If the work will take place in an area of restricted visibility, then flagmen must be assigned (for any number of workers/duration of work) and a slow zone must be established.

3. Temporary Track Flagging slow zone signs will be placed, removed or turned by the Contractor so the sign cannot be read from the motor cab or hooded to cover the sign so it may not be read from the motor cab when the work crew clears the Right-of-Way.

4. The Contractor shall provide the Engineer with a written request for flagmen and other personnel at least seventy two (72) hours (two normal working days and before noon) prior to the date, and time the work will be performed and the CTA personnel are requested. The Engineer or the Engineer’s designee will coordinate all flagmen requests with the CTA.

5. A maximum of () N/A flagger shifts will be reimbursed as part of the Contract (N/A- All Flagger shifts will be reimbursed by IDOT, unless noted otherwise). The costs for additional flagger shifts required for the Contractor’s operations that are requested and granted by the CTA will be reviewed after the flagger shift request has been made to the Engineer.

B. The providing of such personnel and any other safety precautions taken by the CTA shall not relieve the Contractor of any liability for death, injury or damage arising in connection with the construction operations. See CTA SOP No. 7037, "Flagging on the right-of-way", for a description of flagging personnel duties.

C. To minimize flagmen usage, the Contractor shall use approved barricades, barricaded scaffolds and/or safety railings. Barricades and safety railing arrangements shall be in accordance with Section 4-5.3 of the CTA, *Safety Manual for Contract Construction On, Above, or Adjacent to the CTA Rail System*.

D. The CTA does not guarantee that flagging or other personnel will always be available when requested. The Contractor shall be advised that requests for flagging manpower must conform to the CTA Flagman Requirements Manual, and certain work locations require multiple flagging personnel when only one track is fouled by the work.

E. The Contractor shall pay for all flagging and other personnel costs incurred and charged by the CTA. The cost for the each flagger shift shall be approximately $900.00 per flagger shift (exact cost will be based on actual wage rates, fringes and overhead). The Contractor shall also be responsible to reimburse the CTA for all costs associated with the use of other personnel for infrastructure shifts throughout the duration of the contract. The cost for any other CTA personnel (signalmen, linemen, towermen, inspectors, etc.) shall be approximately $1,100.00 per infrastructure shift (exact cost will be based on actual wage rates, fringes and overhead). CTA personnel assigned to monitor CTA tunnels during Contractor operations identified within Section 1.11I are considered as infrastructure shifts.

F. By labor contract, CTA flagging personnel are entitled to a 30-minute break after a continuous 5-1/2 hour work period, including report and travel time. The 5-1/2 hour period begins when the person reports to work at his or her home terminal. Additionally, flagging personnel are entitled to occasional personal breaks (to use the washroom facilities) during the normal course of work. When flagging personnel leave the work site, work must cease unless provision is made for a relief flagger. The Contractor shall coordinate the Project work schedule with the flagging personnel break periods.

G. All employees of the Contractor and subcontractors shall report any actions of perceived CTA employee misconduct, or if any CTA employee does not provide a full level of cooperation in support of the contract; immediately and directly to the Engineer. The Engineer will provide written correspondence to the CTA Project Manager, as well as CTA Operations. Only with timely, written documentation will CTA be enabled to resolve work site personnel issues and take appropriate disciplinary action, when necessary.

H. If the Contractor, Engineer, CTA Construction or Safety Inspector believes that the Flagman is unable to perform his/her duties responsibly, work shall be stopped immediately, ensure that the Right-of-Way is safe for train operations, and the Work Crew shall exit, without delay, the Rail System Right-of-Way. The Contractor must contribute incident information to the Engineer to that a written report can be submitted to the CTA prior to the end of the workday.

1. In addition, all employees of the Contractor and subcontractors must report any actions of perceived CTA employee misconduct, or if any CTA employee does not provide a full level of cooperation in support of the contract immediately to the Engineer. The Engineer will then contact the CTA's Control Center and/or CTA Rail Operations Route Manager. Within 24 hours of alleged incident, the Engineer must provide a written report to the CTA including detailed explanation of incident, employee badge numbers, location of incident, etc. The Contractor must contribute incident information to the Engineer.

2. Failure to make the proper notification in writing may adversely affect any claim that the Department may file with respect to CTA employee performance or lack thereof.

I. CTA Flaggers only provide flagging protection for the CTA Right-of-Way, and only CTA Flaggers are permitted to provide flagging protection for the CTA Right-of-Way. Flaggers for streets, highways or other railroads are solely the responsibility of the Contractor, and will not be permitted to provide flagging protection for the CTA Right-of-Way. Any additional flagging required by other agencies or railroads is the responsibility of the Contractor.

1.13 TRACK ACCESS OCCURRENCES

A. The entire system must be fully operational when the tracks are put back into service after a Track Access Occurrence. The track where work was conducted must be returned to the CTA in revenue condition; all stations must be open, fully functional and properly cleaned. The Contractor shall be immediately available with sufficient staff for up to one hour after revenue operation begins to ensure that all systems are functioning properly.

B. The Contractor shall allow enough time prior to putting the tracks back into service to make sure the line can be fully operational. A test train shall be required after any construction activity, determined by the Engineer or CTA, to require a test train. The scheduling of test trains must include travel time to and from the location being tested. Additional time should also be allowed for any possible remedial work required before the system can be made fully operational.

C. All components of the system, including, but not limited to, tracks, signals, stations, entrances, etc. must be fully and properly operational prior to putting the tracks and facilities back into service. Any facilities under demolition or construction and any temporary facilities must be safe and secure so they do not impact revenue service operations.

D. The Contractor shall be subject to fines if any station, facility, yard, structure, track, or component is not fully operational and useable at the prescribed predetermined time; including all planned staging of construction sites. The CTA will identify appropriate fines at the time of the incident. No compensation will be made for fines levied by the CTA due to Contractor actions or delays in providing CTA facilities at prescribed times.

E. The Contractor shall clean all debris and equipment from the work or staging areas after work has been completed after each work day. In the event the Contractor fails to so clean to the CTA's satisfaction, the CTA may perform any necessary cleaning and fine the Contractor the cost of such cleaning. No compensation will be made for fines levied by the CTA due to delays and cleaning costs.

TRACK MONITORING

Description.
This work shall consist of providing pre-construction and post-construction track surveys and daily monitoring of the CTA tracks for vertical and horizontal movements during operations associated with the removal of existing barrier wall and jacking of steel casing pipes. Work also includes monitoring of excavation and temporary shoring systems and adjacent tracks(s) and structures throughout the duration of shoring installation, excavation, construction, removal, and backfill. These operations include, but not limited to:

1. Overhead Sign Structure/DMS Installation at station 3087+00, 3107+50, 3128+87
2. Installation of STORM SEWERS JACKED IN PLACE, 60" (Storm Sewer # 7002) .
3. Installation of STORM SEWERS JACKED IN PLACE, 48" (Storm Sewer #100)

Item #2 and Item #3 includes all work specified in the Special Provision for STORM SEWERS JACKED IN PLACE, up to and including backfilling. Track monitoring shall commence once the jacked casing is approximated to be within 20' of the existing CTA barrier wall.

Surveyor Requirements.
The Contractor's field instrumentation specialist shall be responsible for purchasing, installing and obtaining data for the ground instrumentation and the structural instrumentation. The field instrumentation specialist shall be a registered Professional Engineer in the State of Illinois and have demonstrated previous successful experience on a minimum of two (2) projects in installation and monitoring of the types of instrumentation specified herein. The field instrumentation specialist shall have supervised instrumentation programs similar in magnitude and similar in subsurface conditions on at least one (1) project. The instrumentation specialist shall be on-site and supervise at least the first five (5) installations of each type of instrument; supervise and establish the formal initial reading for each instrument installed; and, supervise the interpretation of all instrumentation data. The Contractor shall be responsible for providing access to instrument locations throughout construction.

Limitation of Track Movement.
CTA requires that track settlement or track heave associated with all aspects of shoring and excavation shall not exceed the Limiting Value vertical change. Track movement shall not exceed Limiting Value horizontal change due to temporary shoring and excavation. Track resurfacing (i.e. track tamping) or other remedial measures will be required if these limits are exceeded. In addition to Limit Values, minimum Warning Values are also implemented and required by CTA to ensure a sufficient time window can be provided to implement contingency plans as specified for stopping further movement.

- Responses required when the change in vertical and horizontal location of the running rail exceeds the: **Limiting Value of 1/4 inches.**
    - Suspend all construction activities in the affected area and notify CTA immediately.
    - Within 24 hours of reducing instrumentation data indicating that a Limiting Value has been reached, implement contingency plans per the Contractor's CPP for stopping further movement.
    - Perform a detailed evaluation of construction procedures and submit to CTA the evaluation and recommended procedures to reduce movement. Furnish and install additional instruments if they are needed to further define the magnitude of the indicated problem. Obtain approval of the Authority prior to restarting work.

- Responses required when the change in vertical and horizontal location of the running rail exceeds the: **Warning Value of 3/16 inches.**
    - Notify CTA immediately. CTA Engineering may require the Contractor to suspend activities in the affected area with the exception of those actions necessary to avoid reaching the Limiting Value.
    - Increase frequency of monitoring readings. See Minimum Monitoring Requirements.
    - Supplemental readings will be required. See Supplemental Watering.

Minimum Monitoring Requirements

The excavation and temporary shoring system shall be visually inspected at least daily by a qualified field instrumentation specialist or the appointed qualified personnel to check for obvious movements or changes that were unplanned or that may be detrimental to transit operations or safety. Visual monitoring should be performed more often during the performance of critical activities, such as excavation or foundation installation immediately adjacent to shoring or after moderate to severe rain events.

CTA requires that tracks adjacent to excavations and above Jack-and-Bore/ Horizontal Directional Drilling Construction within the Zone of Influence be monitored for movement and settlement.

At a minimum, track monitoring shall consist of the following:

Survey points shall be established along all tracks for which the excavation is within the Zone of Influence. It is recommended to establish the survey points on the crossties adjacent to the running rails.[33] The maximum spacing and minimum extent of these points shall be as shown on Figure 1. A minimum of three (3) control points shall be established in areas that will not be subject to possible disturbance due to construction activities or railroad operations. CTA recommends that baseline readings be done over three (3) days and the average of readings be used as the baseline.

- The horizontal coordinates and elevation of both rails shall be measured at each survey point location in accordance with the following schedule and frequency:

    a. Prior to starting any work associated with installation of the shoring system, a baseline reading of horizontal coordinates, elevations, and dynamic rail movement (see Supplemental Monitoring) shall be taken at each survey point identified. In cases where track maintenance activities are performed to correct movements, a new baseline shall be established and its relationship to the previous baseline documented. CTA recommends that baseline readings be done over three (3) days and the average of all readings be used as baseline.
    b. From the time at which shoring installation commences until excavation reaches the design elevation and the shoring system is in its final design condition, readings at each survey point of the horizontal coordinates and elevations shall be taken on a daily basis before and after each work shift for all Zones shown in Figure 2. Supplemental readings will be required if excessive or unanticipated settlements are recorded more than the Warning Value.
    c. For (7) consecutive days after excavation reaches to the design elevation and the shoring system is in its final design condition., a minimum frequency of one reading of horizontal and vertical coordinates per day shall be performed for each monitoring point.
    d. After 7 days of (1) reading of horizontal and vertical coordinates per day, bi-daily readings shall be performed for each monitoring point or instrumentation during the construction but prior to shoring removal.
    e. Monitoring frequency will return to once daily basis if conditions warrant. Conditions include: modifications are made to shoring structures that change the load path or stiffness, weather condition changes such as heavy rain, freezing temperature and thawing temperature, readings that hit the warning limits and others as directed at the sole discretion of CTA.
    f. If permitted, from the time at which shoring removal commences until excavation is backfilled to the grade elevation, readings shall be taken on a daily basis for all Zones shown in Figure 2.
    g. After shoring removal has been completed and excavation has been backfilled, readings shall continue on a once weekly basis for a minimum of four weeks.
    h. Other monitoring instruments, such as inclinometers, and reading frequency of these instruments, may be requested by CTA or recommended by instrumentation specialist based on cases by case basis. See Access and Flagging.
    i. Refer to Section 4.5 of the CTA Adjacent Construction Manual for additional monitoring requirements for Jack-and-Bore Construction and Horizontal Directional Drilling Construction.

Raw survey data shall be made available to CTA within one working day of the readings are made. The field instrumentation specialist will reduce and interpret the data and make the reduced data and in terpretations available to the Contractor and CTA as soon as practicable, but no more than 1 week after the readings are taken, and shall be provided on a form similar to that shown in Appendix E in the CTA Adjacent Construction Manual.

Neither CTA nor their representatives are in any way responsible for the safety and serviceability of the work. The Contractor shall not disclose instrumentation data to third parties, and shall not publish data without prior approval of the CTA.

Monitoring of the shoring structure is required since movement in the structure may precede and predict potential movement in the track.

Monitoring of the open-cut excavation is required since movement in the excavation may precede and predict potential movement in the track.

Supplemental Monitoring.

Supplemental monitoring will be required when Warning Value is reached, and may be required by CTA in the case of movement less than the Warning Value as CTA deems necessary. Supplemental monitoring consists of the following:

- Measurement of rail movements under load using a dynamic void meter. Measurements shall be taken at the same locations as the survey points that reached Warning Value for both running rails.
- More frequent survey measurements of static top of running rail elevations and coordinates, and dynamic running rail movements and cross-slope. Monitoring frequency must be increased to twice per day (before and after a day shift) until corrections have been executed and CTA infrastructure is deemed stable.
- Provide CTA static and dynamic survey data, in a form similar to Appendix E in the CTA Adjacent Construction Manual, immediately following the survey.
- More frequent monitoring measurements of shoring structure.

Figure 1

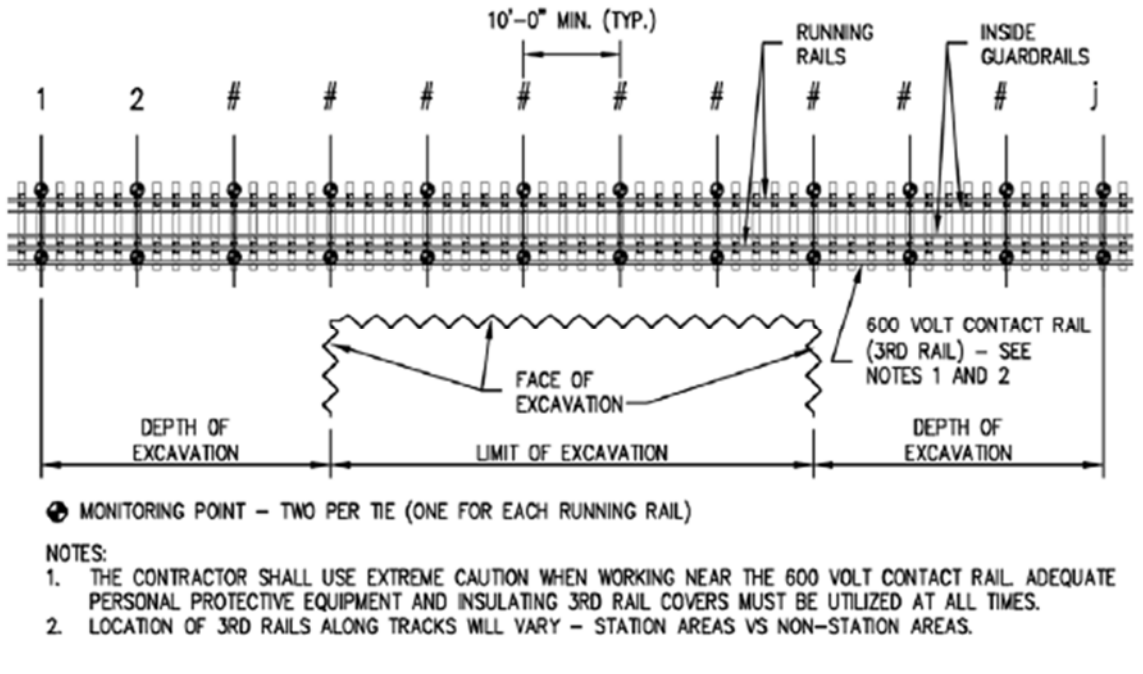
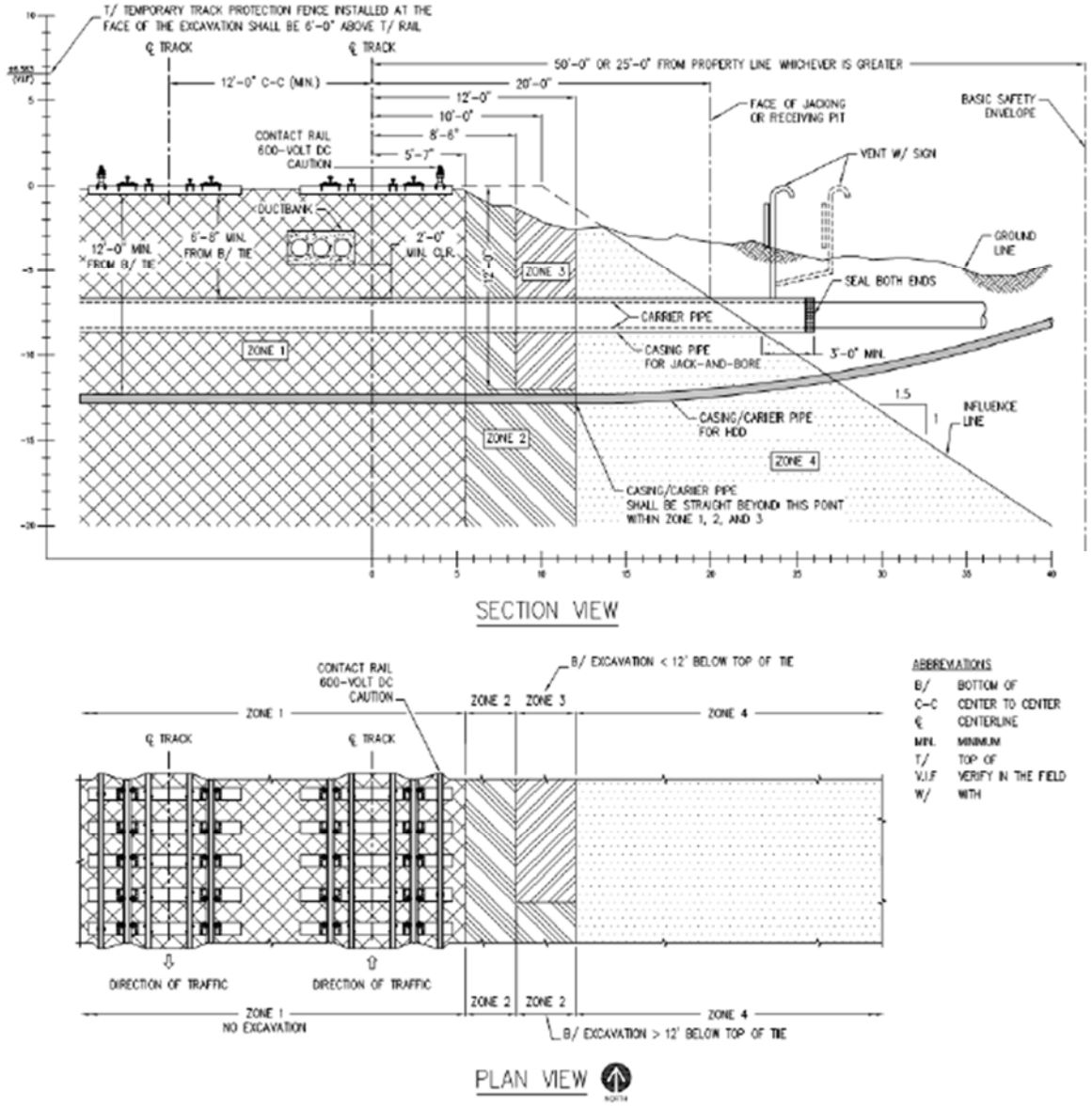


FIGURE 2 – also shown in CTA ACM Manual as figure 3-1



Special Monitoring

CTA reserves the right to require that special monitoring be done for large, atypical, or long-lived shoring projects. Special monitoring may include the use of inclinometers, piezometers, tiltmeters, or other types of monitoring instrumentation. CTA will address this issue on a project-specific basis.If open-cut adjacent to CTA tracks or track structures are permitted by CTA with Variance Request Form, inclinometers will be required to monitor the slope stability.

Access and Flagging.

Access and flagging for establishing and reading survey points and monitoring instrumentation shall be coordinated with CTA Construction, Safety and Rail Operations.

Method of Measurement
This item of work will be measured on a calendar day basis. One calendar day is equal to eight (8) working hours or as defined by the work effort allowed for CTA Right of Way access and will cover all track monitoring operations within the project limits that need to be surveyed for the duration of the day. The number of times per day that the survey monitoring is required will be as defined by the CTA and depending on the type of construction operation which could change should any movement occur. Monitoring requiring less than (1) calendar day will be measured in fractions of a day (1/4, 1/2, 3/4, etc).

Basis of Payment.
This work will be paid for at the contract unit price per calendar day or fraction thereof for TRACK MONITORING.

CTA COORDINATION AT HARLEM AVENUE STATION

Description.

This item shall consist of coordination with the CTA for removal of the existing overhead sign truss connecting to the Cumberland CTA station to match the existing area which includes but is not limited to paint color.

Removal of Sign Structure

The Contractor shall submit removal details on proposed removal method (e.g. will overhead sign be unbolted from connection) for CTA to review and approve prior to commencement of removal activities.

Existing Paint Color

Fed. Color #	Name	Approved Manf. #	Description	UOP	Comments
Chip*	Blue, Brite (station)	Carbit 20B12	Ext. H/G enamel oil	5 Gl	Accent Color
17722	White, Station	Carbit 20W17	Ext. H/G enamel oil	5 Gl	Columns, Panels, windows, etc

* Contact Bill Foster (bfoster@transitchicago.com) at the CTA for color chip.

Measurement and Basis of Payment.

This item of work will not be measured separately but shall be included in the contract unit price for **REMOVE OVERHEAD SIGN STRUCTURE FOUNDATION – SPAN,** which includes removal of sign and restoration to match existing area, coordination with CTA on removal method, and all material and work specified herein.

CTA BALLAST REQUIREMENTS

Description.

This Special Provision modifies applicable articles pertaining to backfill specified within the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction for areas located within CTA easement to meet the specifications outlined herein.

Materials.

Ballast Material – Limestone IDOT CA-3
Sub-ballast – IDOT CA-7
IDOT approved Geotextile Fabric

Construction Procedure

Ballast material needs to go down a minimum of 12” below the track tie. A minimum of 6” of sub-ballast must be located below the Ballast. A geotextile fabric shall be located below the sub-ballast. There is no specific material requirement below the geotextile other than any proposed earthwork should not include any sharp aggregate that could puncture the geotextile fabric.

Measurement and Basis of Payment.

This item of work will not be measured separately but shall be included in lieu of standard backfill items specified in the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction for all pay items requiring backfill within the CTA easement area.

RAILROAD PROTECTIVE LIABILITY INSURANCE (BDE)
Revised: January 1, 2006

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
Chicago Transit Authority (CTA) 120 N. Racine Avenue Chicago, IL 60607-2010	Blue Line 382 trains/day @ 55 mph	-0-

DOT/AAR No.: N/A
RR Division: CTA
RR Mile Post: N/A
RR Sub-Division: Blue Line

For Freight/Passenger Information Contact: Abdin Carrillo Phone: (312) 681-3913
For Insurance Information Contact: Tanika Press Phone: (312) 681-3134

Approval of Insurance. The original and one certified copy of each required policy shall be submitted to the following address for approval:

Illinois Department of Transportation
Bureau of Design and Environment
2300 South Dirksen Parkway, Room 326
Springfield, Illinois 62764

The Contractor will be advised when the Department has received approval of the insurance from the railroad(s). Before any work begins on railroad right-of-way, the Contractor shall submit to the Engineer evidence that the required insurance has been approved by the railroad(s). The Contractor shall also provide the Engineer with the expiration date of each required policy.

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.

KEEPING THE EXPRESSWAY OPEN TO TRAFFIC
Effective: March 22, 1996 Revised: January 21, 2015

Whenever work is in progress on or adjacent to an expressway, the Contractor shall provide the necessary traffic control devices to warn the public and to delineate the work zone as required in these Special Provisions, the Standard Specifications, the State Standards and the District Freeway details. All Contractors' personnel and the field staff shall be limited to these barricaded work zones and shall not cross the expressway.

The Contractor shall request and gain approval from the Illinois Department of Transportation's Expressway Traffic Operations Engineer at www.idotlcs.com twenty-four (24) hours in advance of all daily lane, ramp and shoulder closures and 7 days in advance of all permanent and weekend closures on all Freeways and/or Expressways in District One. This advance notification is calculated based on workweek of Monday through Friday and shall not include weekends or Holidays.

LOCATION: I-90/94 Kennedy: E. River Road to Ohio

WEEK NIGHT	TYPE OF CLOSURE	ALLOWABLE LANE CLOSURE HOURS		
Sunday - Thursday	1-Lane*	9:00 PM	to	5:00 AM
	2-Lane	11:59 PM	to	5:00 AM
Friday	1-Lane*	10:00 PM (Fri)	to	8:00 AM (Sat)
	2-Lane	11:59 PM (Fri)	to	6:00 AM (Sat)
Saturday	1-Lane*	9:00 PM (Sat)	to	10:00 AM (Sun)
	2-Lane	11:59 PM (Sat)	to	8:00 AM (Sun)

LOCATION: I-190: Bessie Coleman to E. River Road

WEEK NIGHT	TYPE OF CLOSURE	ALLOWABLE LANE CLOSURE HOURS					
		INBOUND (Toward Chicago)			OUTBOUND (Toward O'Hare)		
Sunday - Thurs	One Lane	11:00 PM	to	5:00 AM	10:00 PM	to	4:00 AM
Friday	One Lane	11:59 PM (Fri)	to	7:00 AM (Sat)	11:00 PM (Fri)	to	6:00 AM (Sat)
Saturday	One Lane	9:00 PM (Sat)	to	7:00 AM (Sun)	8:00 PM (Sat)	to	5:00 AM (Sun)

In addition to the hours noted above, temporary shoulder and non-system interchange partial ramp closures are allowed weekdays between 9:00 A.M. and 3:00 P.M. and between 7:00 P.M. and 5:00 A.M.

Narrow Lanes and permanent shoulder closures will not be allowed between Dec. 1st and April 1st.

Full Expressway Closures will only be permitted for a maximum of 15 minutes at a time during the low traffic volume hours of 1:00 A.M. to 5:00 A.M. Monday thru Friday and from 1:00 A.M. to 7:00 A.M. on Sunday. During Full Expressway Closures, the Contractor will be required to close off all lanes except one, using Freeway Standard Closures. Police forces should be notified and requested to close off the remaining lane at which time the work item may be removed or set in place. The District One Expressway Traffic Control Supervisor (847-705-4151) **shall be** notified at least 3 working days in advance of the proposed road closure and will coordinate the closure operations with police forces. Liquidated Damages as specified in the Failure to Open Traffic Lanes to Traffic for One lane or ramp blocked shall be assessed to the Contract for every 15 minutes beyond the initial 15 minutes all lanes are blocked.

All stage changes requiring the stopping and/or the pacing of traffic shall take place during the allowable hours for Full Expressway Closures and shall be approved by the Department. The Contractor shall notify the District One Expressway Traffic Control Supervisor at least 3 working days (weekends and holidays DO NOT count into this 72 hours notification) in advance of any proposed stage change.

A Maintenance of Traffic Plan shall be submitted to the District One Expressway Traffic Control Supervisor 14 days in advance of any stages changes or full expressway closures. The Maintenance of Traffic Plan shall include, but not be limited to: lane and ramp closures, existing geometrics, and equipment and material location.

All daily lane closures shall be removed during adverse weather conditions such as rain, snow, and/or fog and as determined by the Engineer. Also, the contractor shall promptly remove their lane closures when Maintenance forces are out for snow and ice removal.

Additional lane closure hour restrictions may have to be imposed to facilitate the flow of traffic to and from major sporting events and/or other events.

All lane closure signs shall not be erected any earlier than one-half (1/2) hour before the starting hours listed above. Also, these signs should be taken down within one-half (1/2) hour after the closure is removed.

The Contractor will be required to cooperate with all other contractors when erecting lane closures on the expressway. All lane closures (includes the taper lengths) without a three (3) mile gap between each other, in one direction of the expressway, shall be on the same side of the pavement. Lane closures on the same side of the pavement with a one (1) mile or less gap between the end of one work zone and the start of taper of next work zone should be connected. The maximum length of any lane closure on the project and combined with any adjacent projects shall be three (3) miles. Gaps between successive permanent lane closures shall be no less than two (2) miles in length.

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

Check barricades shall be placed every 1000' within a lane closure to prevent vehicles from driving through closed lanes.

Temporary ramp closures for service interchanges will only be permitted at night during the restricted hours listed for temporary one-lane closures within the project limits. However, no two (2) adjacent entrance and exit ramps in one direction of the expressway shall be closed at the same time.

Should the Contractor fail to completely open, and keep open, the ramps to traffic in accordance with the above limitations, the Contractor shall be liable to the Department for liquidated damages as noted under the Special Provision, "Failure to Open Traffic Lanes to Traffic".

FAILURE TO OPEN TRAFFIC LANES TO TRAFFIC (D-1)
Effective: March 22, 1996 Revised: February 9, 2005

Should the Contractor fail to completely open and keep open all the traffic lanes to traffic in accordance with the limitations specified under the Special Provisions for "Keeping the Expressway Open to Traffic", the Contractor shall be liable to the Department for the amount of:

One lane or ramp blocked = **$ 3,000**
Two lanes blocked = **$ 6,000**

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

KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (LANE CLOSURES ONLY)
Effective: January 22, 2003 Revised: February 20, 2015

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

Arterial lane closures shall be in accordance with the Standard Specifications, Highway Standards, District Details, traffic control plans and the direction of the Engineer. The Contractor shall request and gain approval from the Illinois Department of Transportation's Arterial Traffic Control Supervisor at 847-705-4470 seventy–two (72) hours in advance of all long-term (24 hrs. or longer) lane closures. This advance notification is calculated based on a Monday through Friday workweek and shall not include weekends or state holidays.

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

Peak traffic volume hours are defined as weekdays (Monday through Friday) from **7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM.**

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

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

One lane or ramp blocked = $1,000

Two lanes blocked = $2,500

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

TRAFFIC CONTROL PLAN (D-1)
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.

PLANS:

SUGGESTED STAGES OF CONSTRUCTION AND TRAFFIC CONTROL SHEETS

STANDARDS:

701106	OFF-RD OPERATIONS, MULTILANE, MORE THAN 15' AWAY
701301	LANE CLOSURE, 2L, 2W, SHORT TIME OPERATIONS
701311	LANE CLOSURE, 2L, 2W, MOVING OPERATIONS – DAY ONLY
701400	APPROACH TO LANE CLOSURE, FREEWAY/EXPRESSWAY
701401	LANE CLOSURE, FREEWAY/EXPRESSWAY
701411	LANE CLOSURE, MULTILANE, AT ENTRANCE OR EXIT RAMP, FOR SPEEDS >= 45 MPH
701428	TRAFFIC CONTROL SETUP AND REMOVAL FREEWAY/EXPRESSWAY
701446	TWO LANE CLOSURE FREEWAY/EXPRESSWAY
701501	URBAN LANE CLOSURE, 2L, 2W, UNDIVIDED
701601	URBAN LANE CLOSURE, MULTILANE, 1W OR 2W WITH NON TRAVERSABLE MEDIAN
701606	URBAN SINGLE LANE CLOSURE, MULTILANE, 2W WITH MOUNTABLE MEDIAN
701611	URBAN HALF ROAD CLOSURE, MULTILANE, 2W WITH MOUNTABLE MEDIAN
701701	URBAN LANE CLOSURE, MULITLANE INTERSECTION
701801	SIDEWALK, CORNER OR CROSSWALK CLOSURE
701901	TRAFFIC CONTROL DEVICES
704001	TEMPORARY CONCRETE BARRIER

DISTRICT 1 DETAILS:

TC-08	EXTRANCE AND EXIT RAMP CLOSURE DETAILS
TC-09	TRAFFIC CONTROL DETAILS FOR FREEWAY SINGLE & MULTI-LANE WEAVE
TC-10	TRAFFIC CONTROL AND PROTECTION FOR SIDE ROADS, INTERSECTIONS, AND DRIVEWAYS
TC-11	RAISED REFLECTIVE PAVEMENT MARKERS
TC-12	MULTI-LANE FREEWAY PAVEMENT MARKING (2 SHEETS)
TC-13	DISTRICT ONE TYPICAL PAVEMENT MARKING
TC-16	PAVEMENT MARKINGS LETTERS AND SYMBOLS FOR TRAFFIC STAGING
TC-17	TRAFFIC CONTROL FOR SHOULDER CLOSURES AND PARTICAL RAMP CLOSURES
TC-18	SIGNING FOR FLAGGING OPERATIONS AT WORK ZONE OPENINGS
TC-21	DETOUR SIGNING FOR CLOSING STATE HIGHWAYS
TC-22	ARTERIAL ROAD INFORMATION SIGN
TC-27	MILE POST MARKERS – GORE SIGNS MAJOR GUIDE SIGN LAYOUT – ARROWS

DISTRICT 1 SPECIAL PROVISIONS:

MAINTENANCE OF ROADWAYS
KEEPING THE EXPRESSWAYS OPEN TO TRAFFIC (D-1)
FAILURE TO OPEN TRAFFIC LANES TO TRAFFIC (D-1)
PUBLIC CONVENIENCE AND SAFETY (D-1)
TRAFFIC CONTROL PLAN (D-1)
TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS) (D-1)
TRAFFIC CONTROL FOR WORK ZONE AREAS (D-1)
TRAFFIC CONTROL SURVEILLANCE (EXPRESSWAYS)
TEMPORARY INFORMATION SIGNING (D-1)
WET REFLECTIVE TEMPORARY TAPE TYPE IV (D-1)
TEMPORARY PAVEMENT (D-1)
TRAFFIC CONTROL AND PROTECTION (ARTERIALS) (D-1)
SPEED DISPLAY TRAILER (D-1)
SIGN SHOP DRAWING SUBMITTAL (D-1)
NIGHTIME WORK ZONE LIGHTING (D-1)
KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (LANE CLOSURES ONLY)

CONTRACT SPECIAL PROVISIONS:

CLEANING OF TRAFFIC CONTROL DEVICES
COORDINATION WITH ADJACENT AND/OR OVERLAPPING CONTRACTS
SHOULDER RUMBLE STRIP REMOVAL
DETOUR RESTRICTIONS

SUPPLEMENTAL SPECIFICATIONS

(NONE)

RECURRING SPECIAL PROVISIONS

WORK ZONE PUBLIC INFORMATION SIGNS
PAVEMENT MARKING REMOVAL

BDE SPECIAL PROVISIONS

TEMPORARY CONCRETE BARRIER

TOLLWAY STANDARDS

E1 CONSTRUCTION SIGNS
E2 LANE CLOSURE DETAILS
E3 SHOULDER CLOSURE DETAILS

PUBLIC CONVENIENCE AND SAFETY (D-1)
Effective: May 1, 2012 Revised: July 15, 2012

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

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

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

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

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

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

TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS) (D-1)
Effective: March 8, 1996 Revised: January 1, 2018

Description. This work shall include furnishing, installing, maintaining, replacing, relocating, and removing all traffic control devices used for the purpose of regulating, warning, or directing traffic. Traffic control and protection shall be provided as called for in the plans, applicable Highway Standards, District One Expressway details, Standards and Supplemental Specifications, these Special Provisions, or as directed by the Engineer.

General. The governing factor in the execution and staging of work for this project is to provide the motoring public with the safest possible travel conditions on the expressway through the construction zone. The Contractor shall arrange his operations to keep the closing of lanes and/or ramps to a minimum.

The Contractor shall be responsible for the proper location, installation, and arrangement of all traffic control devices. Special attention shall be given to existing warning signs and overhead guide signs during all construction operations. Warning signs and existing guide signs with down arrows shall be kept consistent with the barricade placement at all times. The Contractor shall immediately remove, completely cover, or turn from the motorist's view all signs which are inconsistent with lane assignment patterns.

The Contractor shall coordinate all traffic control work on this project with adjoining or overlapping projects, including barricade placement necessary to provide a uniform traffic detour pattern. When directed by the Engineer, the Contractor shall remove all traffic control devices that were furnished, installed, or maintained by him under this contract, and such devices shall remain the property of the Contractor. All traffic control devices shall remain in place until specific authorization for relocation or removal is received from the Engineer.

Additional requirements for traffic control devices shall be as follows.

(a) Traffic Control Setup and Removal. The setting and removal of barricades for the taper portion of a lane closure shall be done under the protection of a vehicle with a truck/trailer mounted attenuator and arrow board per State Standard 701428 and Section 701 of the Standard Specifications. Failure to meet this requirement will be subject to a Traffic Control Deficiency. The deficiency will be calculated as outlined in Article 105.03 of the Standard Specifications. Truck/trailer mounted attenuators shall comply with Article 1106.02(g) or shall meet the requirements of NCHRP 350 Test Level 3 with vehicles used in accordance with manufacturer’s recommendations and requirements.

(b) Sign Requirements

(1) Sign Maintenance. Prior to the beginning of construction operations, the Contractor will be provided a sign log of all existing signs within the limits of the construction zone. The Contractor is responsible for verifying the accuracy of the sign log. Throughout the duration of this project, all existing traffic signs shall be maintained by the Contractor. All provisions of Article 107.25 of the Standard Specifications shall apply except the third paragraph shall be revised to read: "The Contractor shall maintain, furnish, and replace at his own expense, any traffic sign or post which has been damaged or lost by the Contractor or a third party.

(2) Work Zone Speed Limit Signs. Work zone speed limit signs shall be installed as required in Article 701.14(b) and as shown in the plans and Highway Standards. Based upon the exiting posted speed limit, work zone speed limits shall be established and signed as follows.

a. Existing Speed Limit of 55mph or higher. The initial work zone speed limit assembly, located approximately 4200’ before the closure, and shall be 55mph as shown in 701400. Additional work zone 45mph assemblies shall be used as required according to Article 701.14(b) and as shown in the Highway Standards and plans. WORK ZONE SPEED LIMIT 55 PHOTO ENFORCED assemblies may be omitted when this assembly would normally be placed within 1500 feet of the END WORK ZONE SPEED LIMIT sign. If existing speed limit is over 65mph then additional signage should be installed per 701400.

b. Existing Speed Limit of 45mph. The advance 55mph work zone speed limit assembly shown in 701400 shall be replaced with a 45mph assembly. Additional work zone 45mph assemblies shall be used as required according to Article 701.14(b) and as shown in the Highway Standards and plans. WORK ZONE SPEED LIMIT 55 PHOTO ENFORCED assemblies shall be eliminated in all cases. END WORK ZONE SPEED LIMIT signs are required.

(3) Exit Signs. The exit gore signs as shown in Standard 701411 shall be a minimum size of 48 inch by 48 inch with 12 inch capital letters and a 20 inch arrow. EXIT OPEN AHEAD signs shown in Standard 701411 shall be a minimum size of 48 inch by 48 inch with 8 inch capital letters.

(4) Uneven Lanes Signs. The Contractor shall furnish and erect “UNEVEN LANES” signs (W8-11) on both sides of the expressway, at any time when the elevation difference between adjacent lanes open to traffic equals or exceeds one inch. Signs shall be placed 500’ in advance of the drop-off, within 500’ of every entrance, and a minimum of every mile.

(c) Drums/Barricades. Check barricades shall be placed in work areas perpendicular to traffic every 1000', one per lane and per shoulder, to prevent motorists from using work areas as a traveled way. Check barricades shall also be placed in advance of each open patch, or excavation, or any other hazard in the work area, the first at the edge of the open traffic lane and the second centered in the closed lane. Check barricades, either Type I or II, or drums shall be equipped with a flashing light.

To provide sufficient lane widths (10' minimum) for traffic and also working room, the Contractor shall furnish and install vertical barricades, in lieu of Type II or drums, along the cold milling and asphalt paving operations. The vertical barricades shall be placed at the same spacing as the drums.

(d) Vertical Barricades. Vertical barricades shall not be used in lane closure tapers, lane shifts, exit ramp gores, or staged construction projects lasting more than 12 hours. Also, vertical barricades shall not be used as patch barricades or check barricades. Special attention shall be given, and ballast provided per manufacture's specification, to maintain the vertical barricades in an upright position and in proper alignment.

(e) Temporary Concrete Barrier Wall. Prismatic barrier wall reflectors shall be installed on both the face of the wall next to traffic, and the top of sections of the temporary concrete barrier wall as shown in Standard 704001. The color of these reflectors shall match the color of the edgelines (yellow on the left and crystal or white on the right). If the base of the temporary concrete barrier wall is 12 inches or less from the travel lane, then the lower slope of the wall shall also have a 6 inch wide temporary pavement marking edgeline (yellow on the left and white on the right).

(f) Full Expressway Closures. Full Expressway Closures will only be permitted for a maximum of 15 minutes during the allowable hours listed in the Keeping the Expressway Open to Traffic Special Provision. During Full Expressway Closures, the Contractor will be required to close off all lanes except one, using Freeway Standard Closures. The Contractor will be required to provide one changeable message sign to be placed at the direction of the Engineer. The sign shall display a message as directed by the Engineer. A Maintenance of Traffic Plan shall be submitted to the District One Expressway Traffic Control Supervisor 14 days in advance of the planned work; including all stage changes. The Maintenance of Traffic Plan shall include, but not be limited to: lane and ramp closures, existing geometrics, and equipment and material location. The District One Expressway Traffic Control Supervisor (847-705-4151) shall be contacted at least 3 working days in advance of the proposed road closure and will coordinate the closure operation with police forces.

Method of Measurement. This item of work will be measured on a lump sum basis for furnishing, installing, maintaining, replacing, relocating, and removing traffic control devices required in the plans and these Special Provisions. Traffic control and protection required under Standards 701101, 701400, 701401, 701402, 701406, 701411, 701416, 701426, 701428, 701446, 701901 and District details TC-8, TC-9, TC-17, TC-18 and TC-25 will be included with this item.

Basis of Payment.

(a) This work will be paid for at the contract lump sum price for TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS). This price shall be payment in full for all labor, materials, transportation, handling, and incidental work necessary to furnish, install, maintain, replace, relocate, and remove all Expressway traffic control devices required in the plans and specifications.

In the event the sum total value of all the work items for which traffic control and protection is required is increased or decreased by more than ten percent (10%), the contract bid price for TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS) will be adjusted as follows:

Adjusted contract price = .25P + .75P [1±(X-0.1)]

Where: "P" is the bid unit price for Traffic Control and Protection

Where: "X" = $\frac{\text{Difference between original and final sum total value of all work items for which traffic control and protection is required}}{\text{Original sum total value of all work items for which traffic control and protection is required.}}$

The value of the work items used in calculating the increase and decrease will include only items that have been added to or deducted from the contract under Article 104.02 of the Standard Specifications and only items which require use of Traffic Control and Protection.

(b) The Engineer may require additional traffic control be installed in accordance with standards and/or designs other than those included in the plans. In such cases, the standards and/or designs will be made available to the Contractor at least one week in advance of the change in traffic control. Payment for any additional traffic control required will be in accordance with Article 109.04 of the Standard Specifications.

(c) Revisions in the phasing of construction or maintenance operations, requested by the Contractor, may require traffic control to be installed in accordance with standards and/or designs other than those included in the plans. Revisions or modifications to the traffic control shown in the contract shall be submitted by the Contractor for approval by the Engineer. No additional payment will be made for a Contractor requested modification.

(d) Temporary concrete barrier wall will be measured and paid for according to Section 704.

(e) Impact attenuators, temporary bridge rail, and temporary rumble strips will be paid for separately.

(f) Temporary pavement markings shown on the Standard will be measured and paid for according to Section 703 and Section 780.

(g) All pavement marking removal will be measured and paid for according to Section 703 or Section 783.

(h) Temporary pavement marking on the lower slope of the temporary concrete barrier wall will be measured and paid for as TEMPORARY PAVEMENT MARKING, 6".

(i) All barrier wall reflectors will be measured and paid for according to Section 782.

(j) The Changeable Message Sign required for Full Expressway Closures shall not be paid for separately.

TRAFFIC CONTROL AND PROTECTION (ARTERIALS) (D-1)
Effective: February 1, 1996 Revised: March 1, 2011

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

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

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

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

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

TRAFFIC CONTROL FOR WORK ZONE AREA (D-1)
Effective: September 14, 1995 Revised: January 1, 2007

Work zone entry and exit openings shall be established daily by the Contractor with the approval of the Engineer. All vehicles including cars and pickup trucks shall exit the work zone at the exit openings. All trucks shall enter the work zone at the entry openings. These openings shall be signed in accordance with the details shown elsewhere in the plans and shall be under flagger control during working hours.

The Contractor shall plan his trucking operations into and out of the work zone as well as on to and off the expressway to maintain adequate merging distance. Merging distances to cross all lanes of traffic shall be no less than 1/2 mile. This distance is the length from where the trucks enter the expressway to where the trucks enter the work zone. It is also the length from where the trucks exit the work zone to where the trucks exit the expressway. The stopping of expressway traffic to allow trucks to change lanes and/or cross the expressway is prohibited.

Failure to comply with the above requirements will result in a Traffic Control Deficiency charge. The deficiency charge will be calculated as outlined in Article 105.03 of the Standard Specifications. The Contractor will be assessed this daily charge for each day a deficiency is documented by the Engineer.

TRAFFIC CONTROL SURVEILLANCE (EXPRESSWAYS)
Effective: October 25, 1995 Revised: January 21, 2015

The contractor shall provide a person with a vehicle to survey, inspect and maintain all temporary traffic control devices when a lane is closed to traffic, when hazards are present adjacent to or within 10 foot of the edge of pavement for more than 24 hours, or as directed by the Engineer.

The surveillance person is required to drive through the project, to inspect all temporary traffic control devices, to correct all traffic control deficiencies, if possible, or immediately contact someone else to make corrections and to assist with directing traffic until such corrections are made, at intervals not to exceed 4 hours. This person shall list every inspection on an inspection form, furnished by the Engineer, and shall return a completed form on the first working day after the inspections are made.

The Contractor shall supply a telephone staffed on a 24-hour-a-day basis to receive any notification of any deficiencies regarding traffic control and protection or receive any request for improving, correcting or modifying traffic control, installations or devices, including pavement markings. The Contractor shall dispatch additional men, materials and equipment as necessary to begin to correct, improve or modify the traffic control as directed, within one hour of notification by this surveillance person or by the Department. Upon completion of such corrections and/or revisions, the Contractor shall notify the Department's Communication Center at (847) 705-4612.

Method of Measurement.
Traffic Control Surveillance will be measured on calendar day basis. One calendar day is equal to a minimum of six (6) inspections. The inspections shall start within 4 hours after the lane is closed to traffic, a hazard exists within 10 foot from the edge of pavement, or as directed by the Engineer and shall end when the lane closure or hazard is removed or as directed by the Engineer.

Basis of Payment.
Surveillance will be paid for at the contract unit price per calendar day or fraction thereof for TRAFFIC CONTROL SURVEILLANCE (EXPRESSWAYS). The price shall include all labor and equipment necessary to provide the required inspection and maintenance on the expressway and on all cross streets which are included in the project. The cost of the materials for the maintenance of traffic control devices shall be included in the traffic control pay items.

TEMPORARY INFORMATION SIGNING (D-1)
Effective: November 13, 1996 Revised: January 2, 2007

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:

	Item	Article/Section
a.)	Sign Base (Notes 1 & 2)	1090
b.)	Sign Face (Note 3)	1091
c.)	Sign Legends	1092
d.)	Sign Supports	1093
e.)	Overlay Panels (Note 4)	1090.02

Note 1. The Contractor may use 5/8 inch (16 mm) instead of 3/4 inch (19 mm) thick plywood.
Note 2. Type A sheeting can be used on the plywood base.
Note 3. All sign faces shall be Type A except all orange signs shall meet the requirements of Article 1106.01.
Note 4. The overlay panels shall be 0.08 inch (2 mm) thick.

GENERAL CONSTRUCTION REQUIRMENTS

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

Signs which are placed on overhead bridge structures shall be fastened to the handrail with stainless steel bands. These signs shall rest on the concrete parapet where possible. The Contractor shall furnish mounting details for approval by the Engineer.

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.

SPEED DISPLAY TRAILER (D1)
Effective: April 1, 2015 Revised: January 1, 2017

Revise the third paragraph of Article 701.11 of the Standard Specifications to read:

"When not being utilized to inform and direct traffic, sign trailers, speed display trailers, arrow boards, and portable changeable message boards shall be treated as nonoperating equipment."

Add the following to Article 701.15 of the Standard Specifications:

"(m) Speed Display Trailer. A speed display trailer is used to enhance safety of the traveling public and workers in work zones by alerting drivers of their speed, thus deterring them from driving above the posted work zone speed limit."

Whenever the speed display trailer is not in use, it shall be considered non-operating equipment and shall be stored according to Article 701.11."

Add the following to Article 701.20 of the Standard Specifications:

"(k) "Speed Display Trailer will NOT be paid for by separate pay item, but its costs shall be included in the contract unit price of the various traffic control pay items.

Add the following to Article 1106.02 of the Standard Specifications:

"(o) Speed Display Trailer. The speed display trailer shall consist of a LED speed indicator display with self-contained, one-direction radar mounted on an orange see-through trailer. The height of the display and radar shall be such that it will function and be visible when located behind concrete barrier.

The speed measurement shall be by radar and provide a minimum detection distance of 1000 ft (300 m). The radar shall have an accuracy of ±1 mile per hour.

The speed indicator display shall face approaching traffic and shall have a sign legend of "YOUR SPEED" immediately above or below the speed display. The digital speed display shall show two digits (00 to 99) in mph. The color of the changeable message legend shall be a yellow legend on a black background. The minimum height of the numerals shall be 18 in. (450 mm), and the nominal legibility distance shall be at least 750 ft (250 m).

The speed indicator display shall be equipped with a violation alert that flashes the displayed detected speed when the posted limit is exceeded. The speed indicator shall have a maximum speed cutoff. On roadway facilities with a normal posted speed limit greater than or equal to 45 mph, the detected speeds of vehicles traveling more than 25mph over the work zone speed limit shall not be displayed. On facilities with normal posted speed limit of less than 45 mph, the detected speeds of vehicles traveling more than 15 mph over the work zone speed limit shall not be displayed. On any roadway facility if detected speeds are less than 25 mph, speed shall not be displayed. The display shall include automatic dimming for nighttime operation.

The speed indicator measurement and display functions shall be equipped with the power supply capable of providing 24 hours of uninterrupted service."

CLEANING OF TRAFFIC CONTROL DEVICES

All traffic control devices shall be kept clean as stated in Article 701 of the Standard Specifications. In addition, the contractor shall make sure the traffic control devices are cleaned after snowfalls or snow plowing if needed or as directed by the Engineer. This work will not be measured for payment or paid for separately and shall be included in the other contract pay items for TRAFFIC CONTROL AND PROTECTION (EXPRESSWAYS).

TEMPORARY PAVEMENT (D-1)
Effective: March 1, 2003 Revised: April 10, 2008

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

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

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

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

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

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

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

AGGREGATE FOR CONCRETE BARRIER (D-1)
Effective: February 11, 2004 Revised: January 24, 2008

Add the following paragraph to Article 637.02 of the Standard Specifications:

"The coarse aggregate to be used in the concrete barrier walls shall conform to the requirement for coarse aggregate used in Class BS concrete according to Article 1004.01(b), paragraph 2."

ADJUSTMENTS AND RECONSTRUCTIONS (D-1)
Effective: March 15, 2011

Revise the first paragraph of Article 602.04 to read:

"602.04 Concrete. Cast-in-place concrete for structures shall be constructed of Class SI concrete according to the applicable portions of Section 503. Cast-in-place concrete for pavement patching around adjustments and reconstructions shall be constructed of Class PP-1 concrete, unless otherwise noted in the plans, according to the applicable portions of Section 1020."

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

"Castings shall be set to the finished pavement elevation so that no subsequent adjustment will be necessary, and the space around the casting shall be filled with Class PP-1 concrete, unless otherwise noted in the plans, to the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e)(3)b."

Revise Article 603.05 to read:

"**603.05 Replacement of Existing Flexible Pavement.** After the castings have been adjusted, the surrounding space shall be filled with Class PP-1 concrete, unless otherwise noted in the plans, to the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e)(3)b."

Revise Article 603.06 to read:

"**603.06 Replacement of Existing Rigid Pavement.** After the castings have been adjusted, the pavement and HMA that was removed, shall be replaced with Class PP-1 concrete, unless otherwise noted in the plans, not less than 9 in. (225 mm) thick. The pavement may be opened to traffic according to Article 701.17(e)(3)b.

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

Revise the first sentence of Article 603.07 to read:

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

FRICTION AGGREGATE (D-1)
Effective: January 1, 2011 Revised: April 29, 2016

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	Allowed Alone or in Combination [5/]: Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete

<table>
<tr><th>Use</th><th>Mixture</th><th>Aggregates Allowed</th></tr>
<tr><td>HMA
Low ESAL</td><td>Stabilized Subbase or Shoulders</td><td><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</td></tr>
<tr><td>HMA
High ESAL
Low ESAL</td><td>Binder
IL-19.0
or IL-19.0L

SMA Binder</td><td><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/]</td></tr>
<tr><td>HMA
High ESAL
Low ESAL</td><td>C Surface and Leveling Binder
IL-9.5 or IL-9.5L

SMA
Ndesign 50
Surface</td><td><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/]</td></tr>
<tr><td rowspan="5">HMA
High ESAL</td><td rowspan="5">D Surface and Leveling Binder
IL-9.5

SMA
Ndesign 50
Surface</td><td><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/]
Crushed Concrete[3/]</td></tr>
<tr><td><u>Other Combinations Allowed:</u>

Up to... | With...</td></tr>
<tr><td>25% Limestone | Dolomite</td></tr>
<tr><td>50% Limestone | Any Mixture D aggregate other than Dolomite</td></tr>
<tr><td>75% Limestone | Crushed Slag (ACBF) or Crushed Sandstone</td></tr>
</table>

Use	Mixture	Aggregates Allowed	
HMA High ESAL	E 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>	
		Up to...	*With...*
		50% Dolomite[2/]	Any Mixture E aggregate
		75% Dolomite[2/]	Crushed Sandstone, Crushed Slag (ACBF), Crushed Steel Slag, or Crystalline Crushed Stone
		75% Crushed Gravel[2/] or Crushed Concrete[3/]	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>:	
		Up to...	*With...*
		50% Crushed Gravel[2/], Crushed Concrete[3/], 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. In SMA Ndesign 50, carbonate crushed stone shall not be blended with any of the other aggregates allowed alone in Ndesign 50 SMA binder or Ndesign 50 SMA surface.

3/ Crushed concrete will not be permitted in SMA mixes.
4/ Crushed steel slag shall not be used as leveling 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."

AGGREGATE SUBGRADE IMPROVEMENT (D-1)
Effective: February 22, 2012 Revised: April 1, 2016

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.

303.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.07
(b) Reclaimed Asphalt Pavement (RAP) (Notes 1, 2 and 3)	1031

Note 1. Crushed RAP, from either full depth or single lift removal, may be mechanically blended with aggregate gradation CS 01 but shall not exceed 40 percent by weight of the total product. The top size of the Coarse RAP shall be less than 4 in. (100 mm) and well graded.

Note 2. RAP having 100 percent passing the 1 1/2 in (37.5 mm) sieve and being well graded, may be used as capping aggregate in the top 3 in. (75 mm) when aggregate gradation CS 01 is used in lower lifts. When RAP is blended with any of the coarse aggregates, the blending shall be done with mechanically calibrated feeders. The final product shall not contain more than 40 percent by weight of RAP.

Note 3. The RAP used for aggregate subgrade improvement shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications".

303.03 Equipment. The vibratory machine shall be according to Article 1101.01, or as approved by the Engineer. The calibration for the mechanical feeders shall have an accuracy of ± 2.0 percent of the actual quantity of material delivered.

303.04 Soil Preparation. The stability of the soil shall be according to the Department's Subgrade Stability Manual for the aggregate thickness specified.

303.05 Placing Aggregate. The maximum nominal lift thickness of aggregate gradation CS 01 shall be 24 in. (600 mm).

303.06 Capping Aggregate. The top surface of the aggregate subgrade shall consist of a minimum 3 in. (75 mm) of aggregate gradations CA 06 or CA 10. When Reclaimed Asphalt Pavement (RAP) is used, it shall be crushed and screened where 100 percent is passing the 1 1/2 in. (37.5 mm) sieve and being well graded. RAP that has been fractionated to size will not be permitted for use in capping. Capping aggregate will not be required when the aggregate subgrade improvement is used as a cubic yard pay item for undercut applications. When RAP is blended with any of the coarse aggregates, the blending shall be done with mechanically calibrated feeders.

303.07 Compaction. All aggregate lifts 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.

303.08 Finishing and Maintenance of Aggregate Subgrade Improvement. 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.

303.09 Method of Measurement. This work will be measured for payment according to Article 311.08.

303.10 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) 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.** 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. The top 12 inches of the aggregate subgrade improvement shall be 3 inches of capping material and 9 inches of crushed gravel, crushed stone or crushed concrete. In applications where greater than 36 inches of subgrade material is required, rounded gravel, meeting the CS01 gradation, may be used beginning at a depth of 12 inches below the bottom of pavement.

(b) Quality. The coarse aggregate shall consist of sound durable particles reasonably free of deleterious materials. Non-mechanically blended RAP may be allowed up to a maximum of 5.0 percent.

(c) Gradation.

(1) The coarse aggregate gradation for total subgrade thicknesses of 12 in. (300 mm) or greater shall be CS 01.

Grad No.	COARSE AGGREGATE SUBGRADE GRADATIONS Sieve Size and Percent Passing				
	8"	6"	4"	2"	#4
CS 01	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20

Grad No.	COARSE AGGREGATE SUBGRADE GRADATIONS (Metric) Sieve Size and Percent Passing				
	200 mm	150 mm	100 mm	50 mm	4.75 mm
CS 01	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20

(2) The 3 in. (75 mm) capping aggregate shall be gradation CA 6 or CA 10.

COARSE AGGREGATE FOR BACKFILL, TRENCH BACKFILL AND BEDDING (D-1)
Effective: November 1, 2011 Revised: November 1, 2013

This work shall be according to Section 1004.05 of the Standard Specifications except for the following:

Reclaimed Asphalt Pavement (RAP) maybe blended with gravel, crushed gravel, crushed stone crushed concrete, crushed slag, chats, crushed sand stone or wet bottom boiler slag. The RAP used shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications". The RAP shall be uniformly graded and shall pass the 1.0 in. (25 mm) screen. When RAP is blended with any of the coarse aggregate listed above, the blending shall be done mechanically with calibrated feeders. The feeders shall have an accuracy of ± 2.0 percent of the actual quantity of material delivered. The final blended product shall not contain more than 40 percent by weight RAP.

The coarse aggregate listed above shall meet CA 6 and CA 10 gradations prior to being blended with the processed and uniformly graded RAP. Gradation deleterious count shall not exceed 10% of total RAP and 5% of other by total weight.

EMBANKMENT I (D-1)
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.

ENGINEER'S FIELD OFFICE TYPE A (SPECIAL) (D-1)
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).

HMA MIXTURE DESIGN REQUIREMENTS (D-1)
Effective: January 1, 2013 Revised: January 1, 2018

1) Design Composition and Volumetric Requirements

Revise the table in Article 406.06(d) of the Standard Specifications to read:

"MINIMUM COMPACTED LIFT THICKNESS	
Mixture Composition	Thickness, in. (mm)
IL-4.75	3/4 (19)
SMA-9.5, IL-9.5, IL-9.5L	1 1/2 (38)
SMA-12.5	2 (50)
IL-19.0, IL-19.0L	2 1/4 (57)"

Revise the table in Article 1004.03(c) of the Standard Specifications to read:

"Use	Size/Application	Gradation No.
Class A-1, 2, & 3	3/8 in. (10 mm) Seal	CA 16
Class A-1	1/2 in. (13 mm) Seal	CA 15
Class A-2 & 3	Cover	CA 14
HMA High ESAL	IL-19.0 IL-9.5	CA 11 1/ CA 16, CA 13 3/
HMA Low ESAL	IL-19.0L IL-9.5L Stabilized Subbase or Shoulders	CA 11 1/ CA 16
SMA 2/	1/2 in. (12.5mm) Binder & Surface IL 9.5 Surface	CA13 3/, CA14 or CA16 CA16, CA 13 3/

1/ CA 16 or CA 13 may be blended with the gradations listed.
2/ The coarse aggregates used shall be capable of being combined with stone sand, slag sand, or steel slag sand meeting the FA/FM 20 gradation and mineral filler to meet the approved mix design and the mix requirements noted herein.
3/ CA 13 shall be 100 percent passing the 1/2 in. (12.5mm) sieve.

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

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

Revise the 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 nomenclature table in Article 1030.01 of the Standard Specifications to read:

"High ESAL	IL-19.0 binder; IL-9.5 surface; IL-4.75; SMA-12.5, SMA-9.5
Low ESAL	IL-19.0L binder; IL-9.5L surface; Stabilized Subbase (HMA)[1/]; HMA Shoulders[2/]

1/ Uses 19.0L binder mix.

2/ Uses 19.0L for lower lifts and 9.5L for surface lift."

Revise Article 1030.02 of the Standard Specifications and Supplemental Specifications to read:

"**1030.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.03
(b) Fine Aggregate	1003.03
(c) RAP Material	1031
(d) Mineral Filler	1011
(e) Hydrated Lime	1012.01
(f) Slaked Quicklime (Note 1)	
(g) Performance Graded Asphalt Binder (Note 2)	1032
(h) Fibers (Note 3)	
(i) Warm Mix Asphalt (WMA) Technologies (Note 4)	

Note 1. Slaked quicklime shall be according to ASTM C 5.

Note 2. 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 an Elvaloy or SBS PG 76-22 for IL-4.75, except where modified herein. The elastic recovery shall be a minimum of 80.

Note 3. 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 4. Warm mix additives or foaming processes shall be selected from the current Bureau of Materials and Physical Research Approved List, “Warm Mix Asphalt Technologies”.”

Revise Article 1030.04(a)(1) of the Standard Specifications and the Supplemental Specifications to read:

"(1) High ESAL Mixtures. The Job Mix Formula (JMF) shall fall within the following limits.

High ESAL, MIXTURE COMPOSITION (% PASSING) [1/]										
Sieve Size	IL-19.0 mm		SMA [4/] IL-12.5 mm		SMA [4/] IL-9.5 mm		IL-9.5 mm		IL-4.75 mm	
	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
3/8 in. (9.5 mm)				65	90	100	90	100		100
#4 (4.75 mm)	40	60	20	30	36	50	34	69	90	100
#8 (2.36 mm)	20	42	16	24 [5/]	16	32 [5/]	34 [6/]	52 [2/]	70	90
#16 (1.18 mm)	15	30					10	32	50	65
#30 (600 μm)			12	16	12	18				
#50 (300 μm)	6	15					4	15	15	30
#100 (150 μm)	4	9					3	10	10	18
#200 (75 μm)	3	6	7.0	9.0 [3/]	7.5	9.5 [3/]	4	6	7	9 [3/]
Ratio Dust/Asphalt Binder		1.0		1.5		1.5		1.0		1.0

1/ Based on percent of total aggregate weight.

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

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

4/ The maximum percent passing the #635 (20 μm) sieve shall be ≤ 3 percent.

5/ 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.

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

Revise Article 1030.04(b)(1) of the Standard Specifications to read:

"(1) High ESAL Mixtures. The target value for the air voids of the HMA shall be 4.0 percent and for IL-4.75 it shall be 3.5 percent at the design number of gyrations. The VMA and 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.

VOLUMETRIC REQUIREMENTS High ESAL				
	Voids in the Mineral Aggregate (VMA), % minimum			Voids Filled with Asphalt Binder (VFA), %
Ndesign	IL-19.0	IL-9.5	IL-4.75[1/]	
50	13.5	15.0	18.5	65 – 78 [2/]
70				65 - 75
90				

1/ Maximum Draindown for IL-4.75 shall be 0.3 percent

2/ VFA for IL-4.75 shall be 72-85 percent"

Replace Article 1030.04(b)(3) of the Standard Specifications with the following:

"(3) SMA Mixtures.

Volumetric Requirements SMA [1/]			
Ndesign	Design Air Voids Target %	Voids in the Mineral Aggregate (VMA), % min.	Voids Filled with Asphalt (VFA), %
80 [4/]	3.5	17.0 [2/] 16.0 [3/]	75 - 83

1/ Maximum draindown shall be 0.3 percent. The draindown shall be determined at the JMF asphalt binder content at the mixing temperature plus 30 °F.

2/ Applies when specific gravity of coarse aggregate is ≥ 2.760.

3/ Applies when specific gravity of coarse aggregate is < 2.760.

4/ Blending of different types of aggregate will not be permitted.
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.

Add to the end of Article 1030.05 (d) (2) a. of the Standard Specifications:

"During production, the Contractor shall test SMA mixtures for draindown according to AASHTO T305 at a frequency of 1 per day of production."

Delete last sentence of the second paragraph of Article 1102.01(a) (4) b. 2.

Add to the end of Article 1102.01 (a) (4) b. 2.:

"As an option, collected dust (baghouse) may be used in lieu of manufactured mineral filler according to the following:

(a.) Sufficient collected dust (baghouse) is available for production of the SMA mix for the entire project.

(b.) A mix design was prepared based on collected dust (baghouse).

2) Design Verification and Production

Revise Article 1030.04 (d) of the Standard Specifications to read:

"(d) Verification Testing. High ESAL, IL-4.75, and SMA mix designs submitted for verification will be tested to ensure that the resulting mix designs will pass the required criteria for the Hamburg Wheel Test (IL mod AASHTO T-324) and the Tensile Strength Test (IL mod AASHTO T-283). The Department will perform a verification test on gyratory specimens compacted by the Contractor. If the mix fails the Department's verification test, the Contractor shall make the necessary changes to the mix and resubmit compacted specimens to the Department for verification. If the mix fails again, the mix design will be rejected.

All new and renewal mix designs will be required to be tested, prior to submittal for Department verification and shall meet the following requirements:

(1)Hamburg Wheel Test criteria. The maximum allowable rut depth shall be 0.5 in. (12.5 mm). The minimum number of wheel passes at the 0.5 in. (12.5 mm) rut depth criteria shall be based on the high temperature binder grade of the mix as specified in the mix requirements table of the plans.

Illinois Modified AASHTO T 324 Requirements [1/]

Asphalt Binder Grade	# Repetitions	Max Rut Depth (mm)
PG 70 -XX (or higher)	20,000	12.5
PG 64 -XX (or lower)	10,000	12.5

1/ When produced at temperatures of 275 ± 5 °F (135 ± 3 °C) or less, loose Warm Mix Asphalt shall be oven aged at 270 ± 5 °F (132 ± 3 °C) for two hours prior to gyratory compaction of Hamburg Wheel specimens.

Note: For SMA Designs (N-80) the maximum rut depth is 6.0 mm at 20,000 repetitions.
For IL 4.75mm Designs (N-50) the maximum rut depth is 9.0mm at 15,000 repetitions.

(2) Tensile Strength Criteria. The minimum allowable conditioned tensile strength shall be 60 psi (415 kPa) for non-polymer modified performance graded (PG) asphalt binder and 80 psi (550 kPa) for polymer modified PG asphalt binder. The maximum allowable unconditioned tensile strength shall be 200 psi (1380 kPa)."

Production Testing. Revise first paragraph of Article 1030.06(a) of the Standard Specifications to read:

"(a) High ESAL, IL-4.75, WMA, and SMA Mixtures. For each contract, a 300 ton (275 metric tons) test strip, except for SMA mixtures it will be 400 ton (363 metric ton), will be required at the beginning of HMA production for each mixture at the beginning of 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."

Add the following after the sixth paragraph in Article 1030.06 (a) of the Standard Specifications:

"The Hamburg Wheel test shall also be conducted on all HMA mixtures from a sample taken within the first 500 tons (450 metric tons) on the first day of production or during start up with a split reserved for the Department. The mix sample shall be tested according to the Illinois Modified AASHTO T 324 and shall meet the requirements specified herein. Mix production shall not exceed 1500 tons (1350 metric tons) or one day's production, whichever comes first, until the testing is completed and the mixture is found to be in conformance. The requirement to cease mix production may be waived if the plant produced mixture demonstrates conformance prior to start of mix production for a contract.
If the mixture fails to meet the Hamburg Wheel criteria, no further mixture will be accepted until the Contractor takes such action as is necessary to furnish a mixture meeting the criteria"

Method of Measurement:

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}."

Basis of Payment.

Replace the fourth paragraph of Article 406.14 of the Standard Specifications with the following:

"Stone matrix asphalt will be paid for at the contract unit price per ton (metric ton) for POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, STONE MATRIX ASPHALT, of the mixture composition and Ndesign specified; and POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, STONE MATRIX ASPHALT, of the mixture composition and Ndesign specified."

GROUND TIRE RUBBER (GTR) MODIFIED ASPHALT BINDER (D-1)
Effective: June 26, 2006 Revised: April 1, 2016

Add the following to the end of article 1032.05 of the Standard Specifications:

"(c) Ground Tire Rubber (GTR) Modified Asphalt Binder. A quantity of 10.0 to 14.0 percent GTR (Note 1) shall be blended by dry unit weight with a PG 64-28 to make a GTR 70-28 or a PG 58-28 to make a GTR 64-28. The base PG 64-28 and PG 58-28 asphalt binders shall meet the requirements of Article 1032.05(a). Compatible polymers may be added during production. The GTR modified asphalt binder shall meet the requirements of the following table.

Test	Asphalt Grade GTR 70-28	Asphalt Grade GTR 64-28
Flash Point (C.O.C.), AASHTO T 48, °F (°C), min.	450 (232)	450 (232)
Rotational Viscosity, AASHTO T 316 @ 275 °F (135 °C), Poises, Pa·s, max.	30 (3)	30 (3)
Softening Point, AASHTO T 53, °F (°C), min.	135 (57)	130 (54)
Elastic Recovery, ASTM D 6084, Procedure A (sieve waived) @ 77 °F, (25 °C), aged, ss, 100 mm elongation, 5 cm/min., cut immediately, %, min.	65	65

Note 1. GTR shall be produced from processing automobile and/or light truck tires by the ambient grinding method. GTR shall not exceed 1/16 in. (2 mm) in any dimension and shall contain no free metal particles or other 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, *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 μm)	95 ± 5
No. 50 (300 μm)	> 20

Add the following to the end of Note 1. 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 must be capable of providing continuous mechanical mixing throughout by continuous agitation and 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."

Revise 1030.02(c) of the Standard Specifications to read:

"(c) RAP Materials (Note 5) ……..…..1031"

Add the following note to 1030.02 of the Standard Specifications:

Note 5. When using reclaimed asphalt pavement and/or reclaimed asphalt shingles, the maximum asphalt binder replacement percentage shall be according to the most recent special provision for recycled materials.

RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES (D-1)
Effective: November 1, 2012 Revise: January 1, 2018

Revise Section 1031 of the Standard Specifications to read:

"**SECTION 1031. RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES**

1031.01 Description. Reclaimed asphalt pavement and reclaimed asphalt shingles shall be according to the following.

(a) Reclaimed Asphalt Pavement (RAP). RAP is the material resulting from cold milling or crushing an existing hot-mix asphalt (HMA) pavement. RAP will be considered processed FRAP after completion of both crushing and screening to size. The Contractor shall supply written documentation that the RAP originated from routes or airfields under federal, state, or local agency jurisdiction.

(b) Reclaimed Asphalt Shingles (RAS). Reclaimed asphalt shingles (RAS). RAS is from the processing and grinding of preconsumer or post-consumer shingles. RAS shall be a clean and uniform material with a maximum of 0.5 percent unacceptable material, as defined in Central Bureau of Materials Policy Memorandum, "Reclaimed Asphalt Shingle (RAS) Sources", by weight of RAS. All RAS used shall come from a Central Bureau of Materials approved processing facility where it shall be ground and processed to 100 percent passing the 3/8 in. (9.5 mm) sieve and 90 percent passing the #4 (4.75 mm) sieve. RAS shall meet the testing requirements specified herein. In addition, RAS shall meet the following Type 1 or Type 2 requirements.

(1) Type 1. Type 1 RAS shall be processed, preconsumer asphalt shingles salvaged from the manufacture of residential asphalt roofing shingles.

(2) Type 2. Type 2 RAS shall be processed post-consumer shingles only, salvaged from residential, or four unit or less dwellings not subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP).

1031.02 Stockpiles. RAP and RAS stockpiles shall be according to the following.

(a) RAP Stockpiles. The Contractor shall construct individual, sealed RAP stockpiles meeting one of the following definitions. Additional processed RAP (FRAP) shall be stockpiled in a separate working pile, as designated in the QC Plan, and only added to the sealed stockpile when test results for the working pile are complete and are found to meet tolerances specified herein for the original sealed FRAP stockpile. Stockpiles shall be sufficiently separated to prevent intermingling at the base. All stockpiles (including unprocessed RAP and FRAP) shall be identified by signs indicating the type as listed below (i.e. "Non- Quality, FRAP -#4 or Type 2 RAS", etc…).

(1) Fractionated RAP (FRAP). FRAP shall consist of RAP from Class I, HMA (High and Low ESAL) or equivalent mixtures. The coarse aggregate in FRAP shall be crushed aggregate and may represent more than one aggregate type and/or quality, but shall be at least C quality. All FRAP shall be processed prior to testing and sized into fractions with the separation occurring on or between the #4 (4.75 mm) and 1/2 in. (12.5 mm) sieves. Agglomerations shall be minimized such that 100 percent of the RAP in the coarse fraction shall pass the maximum sieve size specified for the mix the FRAP will be used in.

(2) Restricted FRAP (B quality) stockpiles shall consist of RAP from Class I, HMA (High ESAL), or HMA (High ESAL). If approved by the Engineer, the aggregate from a maximum 3.0 in. (75 mm) single combined pass of surface/binder milling will be classified as B quality. All millings from this application will be processed into FRAP as described previously.

(3) Conglomerate. Conglomerate RAP stockpiles shall consist of RAP from Class I, HMA (High and Low ESAL) or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality, but shall be at least C quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerate RAP shall be processed (FRAP) prior to testing. Conglomerate RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department.

(4) Conglomerate "D" Quality (DQ). Conglomerate DQ RAP stockpiles shall consist of RAP from HMA shoulders, bituminous stabilized subbases or HMA (Low ESAL)/HMA (Low ESAL) IL-19.0L binder mixture. The coarse aggregate in this RAP may be crushed or round but shall be at least D quality. This RAP may have an inconsistent gradation and/or asphalt binder content. Conglomerate DQ RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department.

(5) Non-Quality. RAP stockpiles that do not meet the requirements of the stockpile categories listed above shall be classified as "Non-Quality".

RAP or FRAP containing contaminants, such as earth, brick, sand, concrete, sheet asphalt, bituminous surface treatment (i.e. chip seal), pavement fabric, joint sealants, plant cleanout etc., will be unacceptable unless the contaminants are removed to the satisfaction of the Engineer. Sheet asphalt shall be stockpiled separately.

(b) RAS Stockpiles. Type 1 and Type 2 RAS shall be stockpiled separately and shall be sufficiently separated to prevent intermingling at the base. Each stockpile shall be signed indicating what type of RAS is present.

However, a RAS source may submit a written request to the Department for approval to blend mechanically a specified ratio of Type 1 RAS with Type 2 RAS. The source will not be permitted to change the ratio of the blend without the Department prior written approval. The Engineer's written approval will be required, to mechanically blend RAS with any fine aggregate produced under the AGCS, up to an equal weight of RAS, to improve workability. The fine aggregate shall be "B Quality" or better from an approved Aggregate Gradation Control System source. The fine aggregate shall be one that is approved for use in the HMA mixture and accounted for in the mix design and during HMA production.

Records identifying the shingle processing facility supplying the RAS, RAS type, and lot number shall be maintained by project contract number and kept for a minimum of three years.

1031.03 Testing. FRAP and RAS testing shall be according to the following.

(a) FRAP Testing. When used in HMA, the FRAP shall be sampled and tested either during processing or after stockpiling. It shall also be sampled during HMA production.

(1) During Stockpiling. For testing during stockpiling, washed extraction samples shall be run at the minimum frequency of one sample per 500 tons (450 metric tons) for the first 2000 tons (1800 metric tons) and one sample per 2000 tons (1800 metric tons) thereafter. A minimum of five tests shall be required for stockpiles less than 4000 tons (3600 metric tons).

(2) Incoming Material. For testing as incoming material, washed extraction samples shall be run at a minimum frequency of one sample per 2000 tons (1800 metric tons) or once per week, whichever comes first.

(3) After Stockpiling. For testing after stockpiling, the Contractor shall submit a plan for approval to the District proposing a satisfactory method of sampling and testing the RAP/FRAP pile either in-situ or by restockpiling. The sampling plan shall meet the minimum frequency required above and detail the procedure used to obtain representative samples throughout the pile for testing.

Before extraction, each field sample of FRAP, shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedure. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

(b) RAS Testing. RAS shall be sampled and tested during stockpiling according to Central Bureau of Materials Policy Memorandum, “Reclaimed Asphalt Shingle (RAS) Sources”. The Contractor shall also sample as incoming material at the HMA plant.

(1) During Stockpiling. Washed extraction and testing for unacceptable materials shall be run at the minimum frequency of one sample per 200 tons (180 metric tons) for the first 1000 tons (900 metric tons) and one sample per 1000 tons (900 metric tons) thereafter. A minimum of five samples are required for stockpiles less than 1000 tons (900 metric tons). Once a ≤ 1000 ton (900 metric ton), five-sample/test stockpile has been established it shall be sealed. Additional incoming RAS shall be in a separate working pile as designated in the Quality Control plan and only added to the sealed stockpile when the test results of the working pile are complete and are found to meet the tolerances specified herein for the original sealed RAS stockpile.

(2) Incoming Material. For testing as incoming material at the HMA plant, washed extraction shall be run at the minimum frequency of one sample per 250 tons (227 metric tons). A minimum of five samples are required for stockpiles less than 1000 tons (900 metric tons). The incoming material test results shall meet the tolerances specified herein.

The Contractor shall obtain and make available all test results from start of the initial stockpile sampled and tested at the shingle processing facility in accordance with the facility's QC Plan.

Before extraction, each field sample shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedures. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

1031.04 Evaluation of Tests. Evaluation of test results shall be according to the following.

(a) Evaluation of FRAP Test Results. All test results shall be compiled to include asphalt binder content, gradation and, when applicable (for slag), G_{mm}. A five test average of results from the original pile will be used in the mix designs. Individual extraction test results run thereafter, shall be compared to the average used for the mix design, and will be accepted if within the tolerances listed below.

Parameter	FRAP
No. 4 (4.75 mm)	± 6 %
No. 8 (2.36 mm)	± 5 %
No. 30 (600 μm)	± 5 %
No. 200 (75 μm)	± 2.0 %
Asphalt Binder	± 0.3 %
G_{mm}	± 0.03 1/

1/ For stockpile with slag or steel slag present as determined in the current Manual of Test Procedures Appendix B 21, "Determination of Reclaimed Asphalt Pavement Aggregate Bulk Specific Gravity".

If any individual sieve and/or asphalt binder content tests are out of the above tolerances when compared to the average used for the mix design, the FRAP stockpile shall not be used in Hot-Mix Asphalt unless the FRAP representing those tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

The Contractor shall maintain a representative moving average of five tests to be used for Hot-Mix Asphalt production.

With the approval of the Engineer, the ignition oven may be substituted for extractions according to the ITP, "Calibration of the Ignition Oven for the Purpose of Characterizing Reclaimed Asphalt Pavement (RAP)" or Illinois Modified AASHTO T-164-11, Test Method A.

(b) Evaluation of RAS Test Results. All of the test results, with the exception of percent unacceptable materials, shall be compiled and averaged for asphalt binder content and gradation. A five test average of results from the original pile will be used in the mix designs. Individual test results run thereafter, when compared to the average used for the mix design, will be accepted if within the tolerances listed below.

Parameter	RAS
No. 8 (2.36 mm)	± 5 %
No. 16 (1.18 mm)	± 5 %
No. 30 (600 µm)	± 4 %
No. 200 (75 µm)	± 2.5 %
Asphalt Binder Content	± 2.0 %

If any individual sieve and/or asphalt binder content tests are out of the above tolerances when compared to the average used for the mix design, the RAS shall not be used in Hot-Mix Asphalt unless the RAS representing those tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

(c) Quality Assurance by the Engineer. The Engineer may witness the sampling and splitting conduct assurance tests on split samples taken by the Contractor for quality control testing a minimum of once a month.

The overall testing frequency will be performed over the entire range of Contractor samples for asphalt binder content and gradation. The Engineer may select any or all split samples for assurance testing. The test results will be made available to the Contractor as soon as they become available.

The Engineer will notify the Contractor of observed deficiencies.

Differences between the Contractor's and the Engineer's split sample test results will be considered acceptable if within the following limits.

Test Parameter	Acceptable Limits of Precision	
% Passing:[1/]	FRAP	RAS
1/2 in.	5.0%	
No. 4	5.0%	
No. 8	3.0%	4.0%
No. 30	2.0%	4.0%
No. 200	2.2%	4.0%
Asphalt Binder Content	0.3%	3.0%
G_{mm}	0.030	

1/ Based on washed extraction.

In the event comparisons are outside the above acceptable limits of precision, the Engineer will immediately investigate.

(d) Acceptance by the Engineer. Acceptable of the material will be based on the validation of the Contractor's quality control by the assurance process.

1031.05 Quality Designation of Aggregate in RAP and FRAP.

(a) RAP. The aggregate quality of the RAP for homogeneous, conglomerate, and conglomerate "D" quality stockpiles shall be set by the lowest quality of coarse aggregate in the RAP stockpile and are designated as follows.

(1) RAP from Class I, HMA (High ESAL), or (Low ESAL) IL-9.5L surface mixtures are designated as containing Class B quality coarse aggregate.

(2) RAP from HMA (Low ESAL) IL-19.0L binder mixture is designated as Class D quality coarse aggregate.

(3) RAP from Class I, HMA (High ESAL) binder mixtures, bituminous base course mixtures, and bituminous base course widening mixtures are designated as containing Class C quality coarse aggregate.

(4) RAP from bituminous stabilized subbase and BAM shoulders are designated as containing Class D quality coarse aggregate.

(b) FRAP. If the Engineer has documentation of the quality of the FRAP aggregate, the Contractor shall use the assigned quality provided by the Engineer.

If the quality is not known, the quality shall be determined as follows. Fractionated RAP stockpiles containing plus #4 (4.75 mm) sieve coarse aggregate shall have a maximum tonnage of 5,000 tons (4,500 metric tons). The Contractor shall obtain a representative sample witnessed by the Engineer. The sample shall be a minimum of 50 lb (25 kg). The sample shall be extracted according to Illinois Modified AASHTO T 164 by a consultant laboratory prequalified by the Department for the specified testing. The consultant laboratory shall submit the test results along with the recovered aggregate to the District Office. The cost for this testing shall be paid by the Contractor. The District will forward the sample to the Central Bureau of Materials Aggregate Lab for MicroDeval Testing, according to ITP 327. A maximum loss of 15.0 percent will be applied for all HMA applications. The fine aggregate portion of the fractionated RAP shall not be used in any HMA mixtures that require a minimum of "B" quality aggregate or better, until the coarse aggregate fraction has been determined to be acceptable thru a MicroDeval Testing.

1031.06 Use of FRAP and/or RAS in HMA. The use of FRAP and/or RAS shall be the Contractor's option when constructing HMA in all contracts.

(a) FRAP. The use of FRAP in HMA shall be as follows.

(1) Coarse Aggregate Size (after extraction). The coarse aggregate in all FRAP shall be equal to or less than the nominal maximum size requirement for the HMA mixture to be produced.

(2) Steel Slag Stockpiles. FRAP stockpiles containing steel slag or other expansive material, as determined by the Department, shall be homogeneous and will be approved for use in HMA (High ESAL and Low ESAL) mixtures regardless of lift or mix type.

(3) Use in HMA Surface Mixtures (High and Low ESAL). FRAP stockpiles for use in HMA surface mixtures (High and Low ESAL) shall have coarse aggregate that is Class B quality or better. FRAP shall be considered equivalent to limestone for frictional considerations unless produced/screened to minus 3/8 inch.

(4) Use in HMA Binder Mixtures (High and Low ESAL), HMA Base Course, and HMA Base Course Widening. FRAP stockpiles for use in HMA binder mixtures (High and Low ESAL), HMA base course, and HMA base course widening shall be FRAP in which the coarse aggregate is Class C quality or better.

(5) Use in Shoulders and Subbase. FRAP stockpiles for use in HMA shoulders and stabilized subbase (HMA) shall be FRAP, Restricted FRAP, conglomerate, or conglomerate DQ.

(b) RAS. RAS meeting Type 1 or Type 2 requirements will be permitted in all HMA applications as specified herein.

(c) FRAP and/or RAS Usage Limits. Type 1 or Type 2 RAS may be used alone or in conjunction with FRAP in HMA mixtures up to a maximum of 5.0 percent by weight of the total mix.

When FRAP is used alone or FRAP is used in conjunction with RAS, the percent of virgin asphalt binder replacement (ABR) shall not exceed the amounts indicated in the table below for a given N Design.

Max Asphalt Binder Replacement for FRAP with RAS Combination

HMA Mixtures [1/ 2/ 4/]	Maximum % ABR		
Ndesign	Binder/Leveling Binder	Surface	Polymer Modified [3/]
30L	50	40	30
50	40	35	30
70	40	30	30
90	40	30	30
4.75 mm N-50			40
SMA N-80			30

1/ For Low ESAL HMA shoulder and stabilized subbase, the percent asphalt binder replacement shall not exceed 50 % of the total asphalt binder in the mixture.

2/ When the binder replacement exceeds 15 % for all mixes, except for SMA and IL-4.75, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 % binder replacement using a virgin asphalt binder grade of PG64-22 will be reduced to a PG58-28). When constructing full depth HMA and the ABR is less than 15 %, the required virgin asphalt binder grade shall be PG64-28.

3/ When the ABR for SMA or IL-4.75 is 15 % or less, the required virgin asphalt binder shall be SBS PG76-22 and the elastic recovery shall be a minimum of 80. When the ABR for SMA or IL-4.75 exceeds 15%, the virgin asphalt binder grade shall be SBS PG70-28 and the elastic recovery shall be a minimum of 80.

4/ When FRAP or RAS is used alone, the maximum percent asphalt binder replacement designated on the table shall be reduced by 10 %.

1031.07 HMA Mix Designs. At the Contractor's option, HMA mixtures may be constructed utilizing RAP/FRAP and/or RAS material meeting the detailed requirements specified herein.

(a) FRAP and/or RAS. FRAP and /or RAS mix designs shall be submitted for verification. If additional FRAP or RAS stockpiles are tested and found to be within tolerance, as defined under "Evaluation of Tests" herein, and meet all requirements herein, the additional FRAP or RAS stockpiles may be used in the original design at the percent previously verified.

(b) RAS. Type 1 and Type 2 RAS are not interchangeable in a mix design.

The RAP, FRAP and RAS stone specific gravities (G_{sb}) shall be according to the "Determination of Aggregate Bulk (Dry) Specific Gravity (G_{sb}) or Reclaimed Asphalt Pavement (RAP) and Reclaimed Asphalt Shingles (RAS)" procedure in the Department's Manual of Test Procedures for Materials.

1031.08 HMA Production. HMA production utilizing FRAP and/or RAS shall be as follows.

To remove or reduce agglomerated material, a scalping screen, gator, crushing unit, or comparable sizing device approved by the Engineer shall be used in the RAS and FRAP feed system to remove or reduce oversized material. .

If during mix production, corrective actions fail to maintain FRAP, RAS or QC/QA test results within control tolerances or the requirements listed herein the Contractor shall cease production of the mixture containing FRAP or RAS and conduct an investigation that may require a new mix design.

(a) RAS. RAS shall be incorporated into the HMA mixture either by a separate weight depletion system or by using the RAP weigh belt. Either feed system shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes. The portion of RAS shall be controlled accurately to within ± 0.5 percent of the amount of RAS utilized. When using the weight depletion system, flow indicators or sensing devices shall be provided and interlocked with the plant controls such that the mixture production is halted when RAS flow is interrupted.

(b) HMA Plant Requirements. HMA plants utilizing FRAP and/or RAS shall be capable of automatically recording and printing the following information.

(1) Dryer Drum Plants.

a. Date, month, year, and time to the nearest minute for each print.

b. HMA mix number assigned by the Department.

c. Accumulated weight of dry aggregate (combined or individual) in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).

d. Accumulated dry weight of RAS and FRAP in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).

e. Accumulated mineral filler in revolutions, tons (metric tons), etc. to the nearest 0.1 unit.

f. Accumulated asphalt binder in gallons (liters), tons (metric tons), etc. to the nearest 0.1 unit.

g. Residual asphalt binder in the RAS and FRAP material as a percent of the total mix to the nearest 0.1 percent.

h. Aggregate RAS and FRAP moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAS and FRAP are printed in wet condition.)

i. When producing mixtures with FRAP and/or RAS, a positive dust control system shall be utilized.

j. Accumulated mixture tonnage.

k. Dust Removed (accumulated to the nearest 0.1 ton (0.1 metric ton))

(2) Batch Plants.

a. Date, month, year, and time to the nearest minute for each print.

b. HMA mix number assigned by the Department.

c. Individual virgin aggregate hot bin batch weights to the nearest pound (kilogram).

d. Mineral filler weight to the nearest pound (kilogram).

f. RAS and FRAP weight to the nearest pound (kilogram).

g. Virgin asphalt binder weight to the nearest pound (kilogram).

h. Residual asphalt binder in the RAS and FRAP material as a percent of the total mix to the nearest 0.1 percent.

The printouts shall be maintained in a file at the plant for a minimum of one year or as directed by the Engineer and shall be made available upon request. The printing system will be inspected by the Engineer prior to production and verified at the beginning of each construction season thereafter.

1031.09 RAP in Aggregate Surface Course and Aggregate Wedge Shoulders, Type B. The use of RAP or FRAP in aggregate surface course and aggregate shoulders shall be as follows.

(a) Stockpiles and Testing. RAP stockpiles may be any of those listed in Article 1031.02, except “Non-Quality” and “FRAP”. The testing requirements of Article 1031.03 shall not apply. RAP used shall be according to the current Central Bureau of Materials Policy Memorandum, “Reclaimed Asphalt Pavement (RAP) for Aggregate Applications”.

(b) Gradation. The RAP material shall meet the gradation requirements for CA 6 according to Article 1004.01(c), except the requirements for the minus No. 200 (75 µm) sieve shall not apply. The sample for the RAP material shall be air dried to constant weight prior to being tested for gradation.”

MATERIAL TRANSFER DEVICE (BDE)
Effective: June 15, 1999 Revised: August 1, 2014

Description. This work shall consist of placing SMA binder and surface course mixtures, except that these materials shall be placed using a material transfer device (MTD).

Materials and Equipment. The MTD shall have a minimum surge capacity of 15 tons (13.5 metric tons), shall be self-propelled and capable of moving independent of the paver, and shall be equipped with the following:

(a) Front-Dump Hopper and Conveyor. The conveyor shall provide a positive restraint along the sides of the conveyor to prevent material spillage. MTDs having paver style hoppers shall have a horizontal bar restraint placed across the foldable wings which prevents the wings from being folded.

(b) Paver Hopper Insert. The paver hopper insert shall have a minimum capacity of 14 tons (12.7 metric tons).

(c) Mixer/Agitator Mechanism. This re-mixing mechanism shall consist of a segmented, anti-segregation, re-mixing auger or two full-length longitudinal paddle mixers designed for the purpose of re-mixing the hot-mix asphalt (HMA). The longitudinal paddle mixers shall be located in the paver hopper insert.

CONSTRUCTION REQUIREMENTS

General. The MTD shall be used for the placement of all SMA binder and surface course mixtures placed with a paver. The MTD speed shall be adjusted to the speed of the paver to maintain a continuous, non-stop paving operation.

Use of a MTD with a roadway contact pressure exceeding 25 psi (172 kPa) will be limited to partially completed segments of full-depth HMA pavement where the thickness of binder in place is 10 in. (250 mm) or greater.

Structures. The MTD may be allowed to travel over structures under the following conditions:

(a) Approval will be given by the Engineer.

(b) The vehicle shall be emptied of HMA material prior to crossing the structure and shall travel at crawl speed across the structure.

(c) The tires of the vehicle shall travel on or in close proximity and parallel to the beam and/or girder lines of the structure.

Method of Measurement. This work will be measured for payment in tons (metric tons) for all SMA binder and surface course materials placed with a material transfer device.

Basis of Payment. This work will be paid for at the contract unit price per ton (metric ton) for MATERIAL TRANSFER DEVICE.

The various HMA mixtures placed with the MTD will be paid for as specified in their respective specifications. The Contractor may choose to use the MTD for other applications on this project; however, no additional compensation will be allowed.

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES

This work shall be according to Article 669 of the Standard Specifications and the following:

Qualifications. The term environmental firm shall mean an environmental firm with at least five (5) documented leaking underground storage tank (LUST) cleanups or that is pre-qualified in hazardous waste by the Department. Documentation includes but not limited to verifying remediation and special waste operations for sites contaminated with gasoline, diesel, or waste oil in accordance with all Federal, State, or local regulatory requirements and shall be provided to the Engineer for approval. The environmental firm selected shall not be a former or current consultant or have any ties with any of the properties contained within and/or adjacent to this construction project.

General. This Special Provision will likely require the Contractor to subcontract for the execution of certain activities.

All contaminated materials shall be managed as either “uncontaminated soil” or non-special waste. This work shall include monitoring and potential sampling, analytical testing, and management of a material contaminated by regulated substances. The Environmental Firm shall continuously monitor all soil excavation for worker protection and soil contamination. **Phase I Preliminary Engineering information is available through the District’s Environmental Studies Unit.** Soil samples or analysis without the approval of the Engineer will be at no additional cost to the Department. The lateral distance is measured from centerline and the farthest distance is the offset distance or construction limit whichever is less.

The Contractor shall manage any excavated soils and sediment within the following areas:

Site 2746-1 (IDOT ROW)

Station 105+15 to Station 106+15 (I-190 EB), 0 to 10 feet LT, and 0 to 120 feet RT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC (contaminants of concern) sampling parameters: arsenic, lead, and manganese.

- Station 2994+25 to Station 2996+05 (I-90 WB), 0 to 90 feet RT, and 0 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC (contaminants of concern) sampling parameters: manganese.
- Station 2996+05 to Station 2998+25 (I-90 WB), 20 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 2998+25 to Station 3000+15 (I-90 WB), 20 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene and manganese.
- Station 3000+15 to Station 3003+75 (I-90 WB), 15 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(1) and shall be managed in accordance with Article 669.09. COC sampling parameters: lead.
- Station 1009+85 to Station 1012+75 (I-190), 0 to 40 feet RT, and 0 to 80 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3005+45 to Station 3012+30 (I-90 WB), 15 to 160 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: lead and manganese.
- Station 3012+30 to Station 3014+65 (I-90 WB), 25 to 170 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC sampling parameters: copper, lead, benzo(a)pyrene, and manganese.
- Station 3014+65 to Station 3020+80 (I-90 WB), 15 to 170 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.

- Station 3020+80 to Station 3022+85 (I-90 WB), 15 to 170 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(1) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene, benzo(b)fluoranthene, benzo(a)anthracene, dibenzo(a,h)anthracene, manganese, and pH.
- Station 3022+85 to Station 3025+00 (I-90 WB), 10 to 170 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3025+00 to Station 3027+10 (I-90 WB), 10 to 170 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene, benzo(b)fluoranthene, benzo(a)anthracene, dibenzo(a,h)anthracene, manganese, and pH.
- Station 3027+10 to Station 3029+50 (I-90 WB), 10 to 170 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(b)(1) and shall be managed in accordance with Article 669.09. COC sampling parameters: pH.
- Station 3029+50 to Station 3033+70 (I-90 WB), 15 to 120 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 906+00 to Station 911+05 (Ramp D), 0 to 90 feet RT, and 0 to 120 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 1004+90 to Station 1006+40 (Ramp DD), 0 to 100 feet RT, and 0 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90). This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene, benzo(b)fluoranthene, benzo(a)anthracene, carbazole, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and manganese.
- Station 1006+40 to Station 1010+90 (Ramp DD), 0 to 115 feet RT, and 0 to 115 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene and manganese.
- Station 3035+50 to Station 3037+50 (I-90 WB), 20 to 210 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: lead and manganese.
- Station 3037+50 to Station 3039+55 (I-90 WB), 20 to 190 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene and manganese.

- Station 3043+15 to Station 3045+35 (I-90 WB), 15 to 165 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: lead and manganese.
- Station 3047+50 to Station 3049+50 (I-90 WB), 15 to 225 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: lead and manganese.
- Station 3049+50 to Station 3053+50 (I-90 WB), 15 to 150 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3053+50 to Station 3055+60 (I-90 WB), 15 to 140 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene, lead, and manganese.
- Station 3055+60 to Station 3057+90 (I-90 WB), 15 to 140 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3062+20 to Station 3064+15 (I-90 WB), 15 to 155 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC sampling parameters: arsenic and manganese.
- Station 3070+00 to Station 3072+15 (I-90 WB), 15 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3072+15 to Station 3074+10 (I-90 WB), 15 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: lead and manganese.
- Station 3077+00 to Station 3079+00 (I-90 WB), 15 to 110 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3081+00 to Station 3083+00 (I-90 WB), 15 to 120 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.

- Station 3083+00 to Station 3085+25 (I-90 WB), 15 to 120 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene, lead, and manganese.
- Station 3085+25 to Station 3087+60 (I-90 WB), 15 to 125 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3093+80 to Station 3095+90 (I-90 WB), 15 to 90 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3103+85 to Station 3108+50 (I-90 WB), 20 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3108+50 to Station 3110+20 (I-90 WB), 20 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: lead.
- Station 3110+20 to Station 3112+55 (I-90 WB), 20 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC sampling parameters: lead.
- Station 3112+55 to Station 3115+10 (I-90 WB), 15 to 100 feet LT (IDOT ROW, PESA site 2746-1, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.

<u>Site 2746-1A (IDOT ROW – Interchange of I-90 and Cumberland Avenue)</u>

- Station 3041+35 to Station 3043+15 (I-90 WB), 20 to 185 feet LT (IDOT ROW, PESA site 2746-1A, Interchange of I-90 and Cumberland Ave): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 802+50 to Station 806+95 (Ramp CC), 0 to 120 feet LT and 0 to 160 feet RT (IDOT ROW, PESA site 2746-1A, Interchange of I-90 and Cumberland Ave): This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene, arsenic, lead, and manganese.

Site 2746-1B (IDOT ROW – Interchange of I-90 and Canfield Avenue)

- Station 3074+10 to Station 3075+55 (I-90 WB), 15 to 100 feet LT (IDOT ROW, PESA site 2746-1B Intersection of I-90 and Canfield Ave.): This material meets the criteria of Article 669.09(a)(2) and shall be managed in accordance with Article 669.09. COC sampling parameters: manganese.
- Station 3075+55 to Station 3077+00 (I-90 WB), 15 to 90 feet LT (IDOT ROW, PESA site 2746-1B Intersection of I-90 and Canfield Ave.): This material meets the criteria of Article 669.09(a)(1) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene, dibenzo(a,h)anthracene, and pH.

Site 2746-2 (Chicago Transit Authority Tracks)

- Station 105+15 to Station 108+05 (I-190 EB), 10 to 170 feet LT (Chicago Transit Authority Tracks, PESA site 2746-2, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(3) and shall be managed in accordance with Article 669.09. COC sampling parameters: benzo(a)pyrene, and manganese.
- Station 3099+60 to Station 3101+40 (I-90 WB), 15 to 90 feet LT (Chicago Transit Authority Tracks, PESA site 2746-2, 7200-8900 blocks of I-90): This material meets the criteria of Article 669.09(a)(5) and shall be managed in accordance with Article 669.09. COC sampling parameters: arsenic, manganese.

Groundwater Management. The Contractor shall manage any evacuated groundwater within the following areas:

- Station 2998+25 to Station 3000+15 (I-90 WB), 25 to 100 feet LT (IDOT ROW, PESA Site 2746-1, 7200-8900 blocks of I-90). This material meets the criteria of Article 669.09(d) and shall be managed in accordance to Article 669.09. Contaminants of concern sampling parameters: Metals.

SIGN SHOP DRAWING SUBMITTAL

Effective: January 22, 2013 Revised: January 1, 2015

Add the following paragraph to Article 720.03 of the Standard Specifications:

Shop drawings will be required, according to Article 105.04, for all Arterials/Expressways signs except standard highway signs covered in the MUTCD. Shop drawings shall be submitted to the Engineer for review and approval prior to fabrication. The shop drawings shall include dimensions, letter sizing, font type, colors and materials.

OVERHEAD SIGN STRUCTURE – BRIDGE MOUNTED
Effective: July 1, 2015

Revise Article 733.10(b) of the Standard Specification to read:

"Sign Structure – Bridge Mounted. Bridge mounted overhead sign structures will be measured for by payment in feet of the overall width of the sign panel or total width of adjacent sign panels, including spacing between adjacent sign panels, to be installed on the sign structure."

PROTECTION OF EXISTING DRAINAGE FACILITIES DURING CONSTRUCTION

All existing drainage structures are to be kept free of any debris resulting from construction operations. All work and material necessary to prevent accumulation of debris in the drainage structures will be considered as incidental to the contract. Any debris in the drainage structures resulting from construction operations shall be removed at the Contractor's own expense, and no extra compensation will be allowed. Any minor ditch grading, modifications to existing drainage structures to ensure proper roadway drainage, culverts under temporary drives, and any bulkheading as directed by the engineer necessary to provide for the interim drainage for construction staging will not be paid for separately but shall be included in the cost of earth excavation and erosion control. Should reconstruction or adjustment of a drainage structure be required by the Engineer in the field, the necessary work and payment shall be done in accordance with Section 602 and Article 104.02 respectively of the Standard Specifications.

During construction if the Contractor encounters or otherwise becomes aware of any sewers, underdrains or field drains within the right-of-way other than those shown on the plans, he shall so 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 own expense. Should the Engineer have directed the replacement of a facility, the necessary work and payment shall be done in accordance with Sections 550 and 601 and Article 104.02 respectively of the Standard Specifications.

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.

CONCRETE BARRIER, SINGLE FACE (SPECIAL)

Description: This work shall consist of the construction of the concrete barrier, single face of the height specified in the plans and shall include the concrete barrier base and the furnishing and installing of necessary materials in conformity with the lines, dimensions, sections and details shown on the plans and in accordance with the requirements of these special provisions.

Materials: Materials and equipment for concrete barrier and integral base shall be in accordance with the requirements of Section 503 and Section 637 of the Standard Specifications.

One (1) inch deep contraction joints shall be constructed in both the reinforced concrete barrier wall and base. Contraction joints shall also be constructed at both sides of all drainage structures. Maximum joint spacing shall be 25 feet. The forming of the contraction joints shall be done with an approved finishing tool or by sawing at the discretion of the engineer subject to the satisfactory control of cracking. Expansion joints shall be constructed in barrier wall at maximum joint spacing of 90 feet.

The surface of the concrete barrier transition shall be finished according to Article 503.15 of the Standard Specifications, except all holes and honeycombs shall be patched immediately. A protective coat shall be applied to the top and vertical surfaces of the barrier transition. The protective coat shall be constructed according to Article 420.18.

Method of Measurement: Concrete Barrier, Single Face (Special) of the height specified will be measured for payment in feet along the centerline of the wall.

Basis of Payment: This work will be paid for at the contract unit price per linear foot for CONCRETE BARRIER, SINGLE FACE, 42 INCH HEIGHT (SPECIAL).

CONCRETE BARRIER MEDIAN (SPECIAL)

Description: This work shall consist of the construction of the concrete barrier median in the plans and shall include the concrete barrier base and the furnishing and installing of necessary materials in conformity with the lines, dimensions, sections and details shown on the plans and in accordance with the requirements of these special provisions.

Materials: Materials and equipment for concrete barrier and integral base shall be in accordance with the requirements of Section 503 and Section 637 of the Standard Specifications.

One (1) inch deep contraction joints shall be constructed in both the reinforced concrete barrier wall and base. Contraction joints shall also be constructed at both sides of all drainage structures. Maximum joint spacing shall be 25 feet. The forming of the contraction joints shall be done with an approved finishing tool or by sawing at the discretion of the engineer subject to the satisfactory control of cracking. Expansion joints shall be constructed in barrier wall at maximum joint spacing of 90 feet.

The surface of the concrete barrier transition shall be finished according to Article 503.15 of the Standard Specifications, except all holes and honeycombs shall be patched immediately. A protective coat shall be applied to the top and vertical surfaces of the barrier transition. The protective coat shall be constructed according to Article 420.18.

Method of Measurement: Concrete Barrier Median (Special) will be measured for payment in feet along the centerline of the wall.

Basis of Payment: This work will be paid for at the contract unit price per linear foot for CONCRETE BARRIER MEDIAN (SPECIAL).

HOT-MIX ASPHALT STABILIZATION 6" AT STEEL PLATE BEAM GUARD RAIL

Description: This work shall consist of the installation of Hot-Mix Asphalt Stabilization 6" at Steel Beam Guard Rail.

Construction Requirements: The installation of Hot-Mix Asphalt Stabilization 6" at Steel Plate Beam Guard Rail shall conform to the applicable portions of Section 482 and Article 630.06 of the Standard Specifications and Standard 630201-06.

Method of Measurement: The Basis of Payment for the installation of Hot-Mix Asphalt Stabilization 6" at Steel Plate Beam Guard Rail will be paid according to Article 482.08 of the Standard Specifications.

Basis of Payment: The work Hot-Mix Asphalt Stabilization 6" at Steel Plate Beam Guard Rail will be paid for at the contract unit price per square yard for HOT-MIX ASPHALT STABILIZATION 6" AT STEEL PLATE BEAM GUARD RAIL.

TEMPORARY SEDIMENT BASIN

Description. This work shall consist of excavating and maintaining temporary sediment basins at pipe inlets or outfalls. The systems shall be constructed in accordance with applicable portions of Section 280 of the Standard Specifications, and as directed by the Engineer. Also included shall be all of the work necessary to remove all materials at the end of construction, and as directed by the Engineer.

The erosion control systems shown on the plans represent the minimum systems anticipated for the project. Revisions, or modifications of the sediment control systems shall be approved by the Engineer.

Add the following to Article 280.02:

(m) Course Aggregate Gradation CA-3……...Article 1004.01
(n) Excelsior Blanket.....Article 1081.10 (a)
(o) Riprap, Gradation 3..... Article 1005.01

The cost of excavating for sediment basins will be paid for at the contract price cubic yard (cubic meter) EARTH EXCAVATION FOR EROSION CONTROL.

The cost of aggregate used for sediment basins will be paid for at the contract price per ton (metric ton) AGGREGATE (EROSION CONTROL).

Method of Measurement. Construction and maintenance of the temporary sediment basin will be measured for payment per each at the location specified in the plans.

Basis of Payment. This work will be paid for at the contract unit price per each for TEMPORARY SEDIMENT BASIN

FENCE REMOVAL

Description: This work shall consist of the removal and satisfactory disposal of existing chain link fence of variable height as shown on the plans.

General: Post foundations shall be removed to at least 1 foot below the proposed grade elevation of subgrade or ground surface. All holes left by the removal of the fence posts and post foundations shall be filled with crushed stone screenings.

All removed items shall be disposed in accordance with Article 202.03 of the Standard Specifications.

Method of Measurement: This work will be measured for payment in feet, along the top of the fence, including the length occupied by gates.

Basis of Payment: This work will be paid for at the contract unit price per foot for FENCE REMOVAL. The unit price per foot shall include the chain link fabric, barbed wire, posts, gates, post foundations, and all accessories.

MANHOLES, WITH RESTRICTOR PLATE

Description: This work shall consist of installing manholes of the size specified with a restrictor plate at the locations specified in the plans in accordance with the applicable portions of Section 602 of the Standard Specifications and as detailed in District One standard BD-12.

The inlet and outlet pipes to and from the structure shall have a Mastic Joint Sealer for Pipe applied between the wall of the structure and the pipe, placed in accordance to and meeting the material requirements of Section 1055 of the Standard Specification.

Basis of Payment: This work will be paid for at the contract unit price each for MANHOLES, TYPE A, (OF THE DIAMETER SPECIFIED), TYPE 1 FRAME, (OF THE LID TYPE SPECIFIED), RESTRICTOR PLATE, which price shall be payment in full for all labor, equipment, and materials necessary to complete the work as specified herein.

CONCRETE GUTTER, TYPE B (SPECIAL)

Description: This work shall consist of constructing concrete gutter at the locations shown in the contract plans behind retaining wall, according to Section 606 of the Standard Specifications and as modified herein.

In order to eliminate any flat sections within the gutter flow line, and to ensure a positive longitudinal profile for water runoff, the side slopes of the proposed gutter may be gradually flattened as noted with the prior approval of the Engineer:

- Cross slope of the 9" wide section of gutter may be sloped at a minimum of 18:1, and a maximum of 6:1.

The thickness of the concrete gutter shall not be less than 6"

Method of Measurement: This work will be measured for payment in place in feet, along the flowline of the gutter. No measurement will be made for any variations in width or depth of the concrete gutter.

Basis of Payment: This work will be paid for at the contract unit price per foot for CONCRETE GUTTER, TYPE B (SPECIAL).

CLEANING EXISTING DRAINAGE STRUCTURES (D-1)
Effective: September 30, 1985 Revised: December 1, 2011

All existing storm sewers, pipe culverts, manholes, catch basins and inlets shall be considered as drainage structures insofar as the interpretation of this Special Provision is concerned. When specified for payment, the location of drainage structures to be cleaned will be shown on the plans.

All existing drainage structures which are to be adjusted or reconstructed shall be cleaned according to Article 602.15 of the Standard Specifications. This work will be paid for according to accordance with Article 602.16 of the Standard Specifications.

All other existing drainage structures which are specified to be cleaned on the plans will be cleaned according to Article 602.15 of the Standard Specifications.

Basis of Payment. This work will be paid for at the contract unit price each for DRAINAGE STRUCTURES TO BE CLEANED, and at the contract unit price per foot (meter) for STORM SEWERS TO BE CLEANED, of the diameter specified.

STORM SEWER ADJACENT TO OR CROSSING WATER MAIN

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

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

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

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

MANHOLE, SPECIAL

Description. This work consists of designing, fabricating and installing a manhole structure of 11' in diameter, as shown on the plans and according to applicable section of the 602 and the standard specifications and as specified herein.

The structure designated as MANHOLE, SPECIAL shall follow Standard 602426, except as modified below.

Concrete masonry, brick masonry and cast in place concrete will not be allowed. All construction shall be in accordance with Articles 602 of the latest edition of the IDOT Standard Specifications for Road and Bridge Construction.

For all structures greater than 10' in diameter, the Contractor shall utilize an Illinois Licensed Structural Engineer to design structure wall thickness, circumferential reinforcement size and placement, as well as bottom slab thickness, reinforcement size and placement and prepare the required drawings for construction of the Drainage structure.

Before fabrication begins:

- The Contractor shall field verify the exact size and location of the existing main drain, other sewer(s) which will be connected to this manhole structure, and all existing field conditions which may impede installation of the manhole structure.
- The Contractor shall submit design calculations and duplicate prints of shop drawings prepared and sealed by an Illinois Licensed Structural Engineer for the manhole structure, including bottom slab, to the Engineer. Shop drawings shall show all necessary details for the construction of the manhole.
- Discrepancies in the contract plans or existing conditions discovered during field verification or preparation of the shop drawings shall be reported to the Engineer for resolution prior to submitting the shop drawings. If the submitted shop drawings have significant discrepancies, revised sets shall be submitted until details comply with the contract requirements.

Basis of Payment. All costs required to manufacture, furnish, and completely install the manholes, including all excavation, concrete, reinforcing, bottom slabs, base sections, flat-slab tops, riser sections, steps, frames and lids, shall be paid for at the contract unit price per each for MANHOLE, SPECIAL.

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

Description. This work consists of designing, fabricating and installing deep manhole structures greater than 20' in total depth, as shown on the plans and as specified herein.

The structures designated as MANHOLES, TYPE A, 6'-DIAMETER, TYPE 1 FRAME, CLOSED LID, SPECIAL shall follow Standard 602406-06, except as modified below.

The manholes shall be constructed with precast reinforced concrete in accordance with AASHTO M199. Concrete masonry, brick masonry and cast in place concrete will not be allowed. All construction shall be in accordance with Articles 602 and 1042.10 of the latest edition of the IDOT Standard Specifications for Road and Bridge Construction.

For all structures greater than 20' in depth, the Contractor shall utilize an Illinois Licensed Structural Engineer to design structure wall thickness, circumferential reinforcement size and placement, as well as bottom slab thickness, reinforcement size and placement.

The Contractor shall closely coordinate and schedule all structure installation with the CTA per the Special Provisions for CTA FLAGGING AND COORDINATION and TRACK MONITORING.

Before fabrication begins:

- The Contractor shall field verify the exact location of the underlying main drain, other sewer(s) which will be connected to this manhole structure, and all existing field conditions which may impact or impede installation of the manhole structure.
- The Contractor shall submit design calculations and duplicate prints of shop drawings prepared and sealed by an Illinois Licensed Structural Engineer for the manhole structure, including bottom slab, to the Engineer for review and approval. Shop drawings shall show all necessary details for the construction of the manhole.
- Discrepancies in the contract plans or existing conditions discovered during field verification or preparation of the shop drawings shall be reported to the Engineer for resolution prior to submitting the shop drawings for review and approval. If the submitted shop drawings have significant discrepancies, revised sets shall be submitted until details comply with the contract requirements.

Basis of Payment. All costs required to manufacture, furnish, and completely install the precast manholes, including all excavation, concrete, reinforcing, bottom slabs, base sections, flat-slab tops, riser sections, steps, frames and lids, shall be paid for at the contract unit price per each for MANHOLES, TYPE A, 6'-DIAMETER, TYPE 1 FRAME, CLOSED LID, SPECIAL.

BRACED EXCAVATION, when specified in the contract, shall be paid for separately.

CHAIN LINK FENCE TO BE REMOVED AND RE-ERECTED (CTA)

Description: This work consists of the careful removal, storage, and re-erection of the chain link fence attached to CTA barrier wall to be removed and reconstructed at the location(s) shown in the contract plans according to Section 664 of the Standard Specifications and as modified herein.

General Requirements: Any new hardware, fasteners, fence posts, foundations and/or other appurtenances which are not salvageable, but are required to re-erect the fence on CTA barrier wall, shall be included in the unit price for this item. Any damage to the existing fence shall be replaced by the Contractor at no additional cost to the Department.

Existing fence may be kept on site under safeguarded conditions with the approval of the Engineer in writing.

All surplus or excess fence or appurtenances determined by the Engineer to not be necessary for the Contract shall become the property of the Contractor and must be disposed of offsite.

Method of Measurement: Chain link fence to be removed and re—erected will be measured in feet, in place at the new re-erected location. Surplus or excess fence will not be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per foot for CHAIN LINK FENCE TO BE REMOVED AND RE-ERECTED (CTA).

CHAIN LINK FENCE, 6' (SPECIAL)

Description: This work consists of fabricating, erecting, maintaining, removing and disposing of a temporary fence and access gate to maintain access control to the CTA operating area at the location(s) shown in the contract plans and according to Section 664 of the Standard Specifications and as modified herein.

General Requirements:

The fence fabric must meet the requirements of Section 1006.27(a)b of the Standard Specifications. The fence must remain in place until the permanent CTA barrier and fence in completed.

Posts must meet the requirements of Section 1006.27(b) of the Standard Specifications. The fence posts are to be driven directly into the existing CTA ballast, and are not to be set in concrete.

Access Gate:

Contractor shall coordinate location of access gate with CTA prior to placement of chain link fence.

Access gates must not swing into the CTA operating area.

Method of Measurement: CHAIN LINK FENCE, 6' (SPECIAL) will be measured in feet in place along the top of the fence from center to center of end posts, including the length occupied by the access gate.

Access gate will not be measured for payment separately.

Basis of Payment: This work will be paid for at the contract unit price per foot for CHAIN LINK FENCE, 6' (SPECIAL).

Access gate is included in the cost of CHAIN LINK FENCE, 6' (SPECIAL).

STORM SEWERS JACKED IN PLACE, 48" (SPECIAL)

Description. This work shall consist of furnishing and installing, by jacking, a metal liner (steel casing pipe) of sufficient strength and size first, then a reinforced concrete storm sewer of the required inside diameter at the locations shown on the plans. Work shall be according to the applicable portions of Section 552 of the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction and as specified herein.

This Special Provision includes specifications for pipe jacking in single-pass storm sewer construction. All excavation, jacking and boring, pumping, butt-welding, site restoration, furnishing, trenching, backfilling, labor, materials equipment, and all necessary to complete the contract work shall be included.

At the conclusion of storm sewer installation, the upstream end of the proposed sewer shall be bulkheaded with brick and mortar prior to backfilling.

General. The Contractor shall obtain additional soil information, as required, to clearly assess the existing conditions prior to starting the storm sewer jacking operations. Additional soil information, dewatering, contact grouting and monitoring requirements are included in the work.

The Contractor shall coordinate and schedule this work with the Chicago Transit Authority (CTA). The work shall adhere to the Special Provision "CTA FLAGGING AND COORDINATION." and "TRACK MONITORING".

Contractor Due Diligence Prior to Boring and Jacking

The Contractor shall be solely obligated to verify that the soil is compatible with the single-pass storm sewer construction methodology. No excavation or delivery of pipe sections shall commence until the Contractor has verified this. All efforts related to this work shall be included in the contract unit price per lineal foot for STORM SEWERS JACKED IN PLACE, 48" (SPECIAL)

Excavation Included

Included in the storm sewer jacking cost shall be all tie-back anchors, bracing, piling, shoring and thrust blocks required for the launching area and receiving area, temporary sheet piling if required, all excavation and spoil haul as required for the launching area or receiving area, including the mud-slabs in the launching area and receiving area, if deemed necessary, and all excavation and haul of earth spoil material generated by the storm sewer construction.

All the excavation and haul necessary to construct the storm sewer shall be included in the contract unit price per lineal foot for STORM SEWERS JACKED IN PLACE, 48" (SPECIAL)

Contractor Experience

The Contractor or his subcontractor must be prequalified by the Illinois Department of Transportation in contractor prequalification category number 036, "Tunnel Excavation".

The Contractor or his subcontractor must demonstrate to the Engineer that he/she has successfully constructed a minimum of two (2) similar projects in the last five (5) years, with its own forces. The Contractor shall also verify that the specific jobsite superintendent in responsible charge of this project has managed at least two (2) comparable projects within the last ten (10) years.

Tolerances

The Contractor must construct the storm sewer in accordance with all applicable provisions of the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction and acceptable industry standards, and per the Special Provision for TRACK MONITORING.

The storm sewer shall be constructed to within 1 foot of established horizontal alignment and to within 0.16 feet of established vertical grade.

Tolerance for ground settlement above the storm sewer under the CTA tracks induced by boring and jacking operations is 0 ± 1/4 inches, and per the Special Provision for TRACK MONITORING.

Submittals. The Contractor shall design and install a thrust block system for the storm sewer jacking. The thrust block capacity must be at least 50 percent greater than the anticipated maximum jacking load. Supplemental soil borings and geotechnical report for the thrust block system design, if required, shall be obtained by the Contractor. The Contractor shall submit complete design calculations and shop drawings for the thrust block system to the Engineer according to Article 1042.03(b) of the Standard Specifications. All submittals shall be sealed by an Illinois Licensed Structural Engineer and shall include all details, dimensions, quantities and cross sections necessary. No work or ordering of materials for the structure shall be done by the Contractor until the submittal has been approved in writing by the Engineer. The design shall be prepared by an Illinois Licensed Structural Engineer with a minimum of five (5) years of experience in the design of comparable thrust block systems. No work or ordering of materials for the structures shall be done by the Contractor until the submittal has been approved in writing by the Engineer.

The Contractor shall submit a Jacked Storm Sewer Work Plan that shall outline, as a minimum, the sequence of site preparation, storm sewer boring/jacking and post-jacking and boring operations, and structure placement, including dimensions as well as number and duration of daily shifts.

1. Methods of excavation, dewatering system, and equipment to be used.
2. Storm Sewer jacking machine and/or boring machine to be used including manufacturer, dimensions, propulsion system, face control capability, articulation provisions, means of installing initial ground support system and seal between the machine and leading pipe.
3. Provisions for controlling line and grade, and survey frequency with respect to progress of excavation.
4. Jacking equipment and methods, including jack arrangement and capacity.
5. Thrust block calculation, design, and capacity.
6. Lubricant composition, injection locations, and pump capacity (pressure and volume).

Materials. Casing pipe shall be made of steel that has a plain end, has a minimum tensile strength of 45,000 psi, minimum yield point strength of 66,000 psi, conforms to ASTM A252 Grade 3 and has a thickness as specified on the plans. Casing pipe shall have welded joints and have an exterior coated with minimum 5-mil coal tar epoxy or bituminous asphalt.

Construction Requirements.

General Jacking and Boring Requirements

Methods of excavation must fully support the face and control loss of soil during excavation as well as periods of shutdown. The storm sewer shall be excavated in a uniform and controlled manner. Loss of soil shall be controlled into the excavation as necessary to prevent damage, settlement, or loss of support to adjacent structures and utilities, maintain stability of the excavation, and preserve the original strength of soils surrounding the excavation.

The Contractor must be able to demonstrate to the Engineer that he/she has successfully constructed at least two (2) similar projects with its equipment and labor force.

The Contractor is solely responsible for the selection of the jacking and boring machine and its support equipment to safely complete this work.

At least once per shift, as excavation progresses, the ground surface along the excavation must be examined for cracking, subsidence, or other signs of distress that may indicate potential failure of the initial ground support system, excessive lost ground, or excessive ground movement.

Where excavation is discontinued for a period longer than two (2) hours, the entire face of the excavation shall be secured and supported.

Enlargements of the excavation for the Contractor's convenience must be backfilled completely with Controlled Low Strength Material to the satisfaction of the Engineer.

The Contractor is responsible for any damage or displacement to the CTA tracks and shall provide all necessary repairs to the satisfaction of the Engineer.

Storm Sewer Jacking Equipment Requirements

Jacking equipment must be capable of advancing the sections in a controlled manner without overstressing the pipe and joints. Jacking equipment must be equipped with both of the following features:

1. A device to measure applied jacking loads.
2. The means to prevent the main jacks from exceeding maximum allowable concentric jacking load onto the sections.

The Contractor shall be responsible for the jacking devices and a thrust ring, or other systems approved by the Engineer, to ensure uniform load distribution across the face of the joint to prevent damage to the jacking pipe.

The thrust blocks shall be designed to distribute jacking loads into the thrust block such that the thrust block support system is not loaded or deflected in a detrimental manner and that the jacking frame remains aligned. Thrust block capacity must be at least 50 percent greater than the anticipated maximum jacking load.

The guide rails shall be secured firmly and accurately positioned with respect to line and grade.

The mounting and control of the guidance system shall be the responsibility of the Contractor.

Storm Sewer Jacking Procedures

The Contractor shall examine the jacking pipe for defects on arrival at the site and prior to installation. All jacking pipe sections shall be inspected by the Engineer and approved prior to jacking.

The Contractor shall be responsible for any lubrication of the exterior of the pipe that will minimize friction loads on pipe sections during jacking operations. Lubricant may consist of water mixed with bentonite, polymers, or other lubricants having no deleterious effect on the pipe, soil or groundwater. Injection pressure shall be monitored to minimize loss of lubricant.

Full penetration welds meeting the requirements of AWS D1.1 shall be used to joint sections of smooth steel pipe.

Pipe damaged in jacking or boring operations shall be repaired in place to the satisfaction of the Engineer. Pipe damage beyond repair shall be left in paced, filled with grout, and a new pipe will be installed. Repair or replacement of damaged pipe shall be done at the Contractor's' expense.

Protection of Adjacent Structures

In the event that systematic ground losses during pipe excavation cause or threaten to cause structures (including railroad tracks and utilities) to settle or move in excess of allowable limits, as indicated by settlement monitoring, cease pipe excavation and modify equipment and methods of excavation to reduce ground movements to within allowable limits.

Illumination

The Contractor shall provide lighting for the entire length of storm sewer whenever the storm sewer is occupied. The lighting must be sufficient to ensure the safety of those entering the storm sewer, and must conform to OSHA requirements, as a minimum.

The Contractor shall provide temporary portable lighting in the storm sewer as necessary for the Engineer to evaluate conformance of structure with Contract requirements.

Emergency Measures

The Contractor shall provide emergency electric power supply that is independent of the primary electric power supply, and which is capable of powering the storm sewer lighting and dewatering systems.

Whenever there is a condition which is likely to endanger the stability of the excavation or adjacent work or structures, the Contractor shall operate with a full crew for 24 hours per day including weekends and holidays without interruption until those conditions are mitigated.

Survey

The Contractor shall maintain line and grade to provide for placement of the pipe within specified tolerances and shall survey each pipe section placed to determine line and grade along the culvert invert. The survey data shall be reported to the Engineer within one working day of performing said survey.

The pipe surveys must be sealed by a Professional Engineer or Land Surveyor licensed in the State of Illinois. All efforts for this work are incidental to the unit cost for STORM SEWERS JACKED IN PLACE, 48" (SPECIAL)

Completion of Storm Sewer

At the completion of jacking operations, the Contractor shall be responsible for removal of any structure utilized for pipe jacking to the satisfaction of the Engineer.

Method of Measurement: This work will be measured by the actual lineal feet of pipe in place, measured along the centerline of the pipe from end section to end section. Measurement will be based on surveys taken at the site as directed by the Engineer.

Basis of Payment: This work will be paid for at the contract unit price per lineal foot of pipe in place for STORM SEWERS JACKED IN PLACE, 48" (SPECIAL) including all labor, equipment, tools, monitoring, testing and incidentals described herein and as necessary to complete the item within the tolerances specified, and to the satisfaction of the Engineer. This price shall include coordination with the railroad (CTA) and bulkhead of the upstream end of the sewer prior to backfilling.

If rock, man-made obstructions, or soil conditions are encountered during the storm sewer construction, which differ from the soil conditions indicated in the geotechnical data or encountered by the exploratory borings, and the obstruction prevents the forward progress of the installation, the Contractor shall promptly advise the Engineer of the condition. If it is determined by the Engineer that extra work or special equipment will be required to advance the storm sewer, and the project documents do not contain a differing site condition clause, then payment for this extra work will be made in accordance with Article 109.04 of the Standard Specifications.

Track monitoring for CTA requirements will be paid for separately per the Special Provision for TRACK MONITORING.

BRACED EXCAVATION

Description. This work shall include the installation of a bracing system, excavation, and backfilling to the elevation of the existing grade according to Section 502 of the Standard Specifications and as specified herein. The bracing system shall be designed and installed to prevent the movement of soil, structures, pavements and/or utilities adjacent to the excavated area.

Design and Construction Requirements.

The bracing system shall support excavations by the use of sheeting, timber or plates.

Water Infiltration / Dewatering

- The excavation shall be kept free of water by pumping during construction activities.
- The contractor shall submit a plan-of-action (Plan) in the case of heavy rainfall events. The Plan shall outline measures to protect the excavation, the construction works and personnel during rainfall events, and measures to resume the work when the water levels permit. The Plan will be subject to approval by the Engineer.

CTA

- All braced excavation activities including, but not limited to, preparation, installation, work within, removal and backfilling, shall be coordinated closely with the adjacent railroad (CTA).
- The Contractor shall adhere to the Special Provision requirements for CTA FLAGGING AND COORDINATION and TRACK MONITORING.
- The braced excavation system shall be designed to allow a maximum of ¼" deflection in order to minimize CTA track movement.
- Daily survey of adjacent CTA track movement (pertaining to braced excavation) is to be taken starting when the braced excavation installation begins and concludes once excavation is completely backfilled and compacted.
- If the braced excavation limits fall within the adjacent CTA clear zone, then the placement of braced excavation shall be performed in coordination with the CTA to ensure no conflict with train schedules.
- the Contractor shall outline and detail in the CTA Construction Process Plan how the braced excavation shall be performed within the vicinity of the CTA tracks and within the CTA clear zone, and how/if the braced excavation will be left in place and protected at/below ground level prior to periods when the CTA trains are allowed to run adjacent to the braced excavation.
- Work will not be allowed within the braced excavation at any time while CTA train traffic is allowed to run along the south rail, without the written consent of the CTA.

The Contractor shall submit design calculations and shop drawings prepared and sealed by an Illinois Licensed Structural Engineer for the bracing system. Shop drawings shall show all necessary details for the construction of the bracing system, and indicate the method for keeping the excavation and 48" main drain free of water. The design calculations and shop drawings shall be submitted to the Engineer for review and approval a minimum of 8 weeks prior to installation. The Contractor shall also submit these same design calculations and sealed shop drawings to the CTA for review a minimum of 8 weeks prior to installation.

The excavation and bracing system installation shall not proceed without the written approval and authorization of the Engineer and CTA. However, in any event, the Contractor shall be fully responsible for the safety, stability and adequacy of the bracing system and shall be solely responsible and liable for all damages resulting from his construction operations or from failure or inadequacy of the bracing system.

In the event the bracing system fails or is otherwise deemed inadequate, in the judgment of the Engineer or by CTA, the Contractor shall, at his own expense, take all necessary steps to prevent the movement of soil, structures, pavements and/or utilities adjacent to the excavated area, and restore the excavated area to a safe working condition to the satisfaction of the Engineer.

Bracing members shall be installed as soon as an excavation level is reached to permit their installation. Bracing members shall be completely removed after the excavation is backfilled.

Method of Measurement. Braced excavation shall be measured in cubic yards according to the requirements for structure excavation as specified in Section 502.12 of the Standard Specifications.

Basis of Payment. Braced excavation will be paid for at the contract unit price per cubic yard for BRACED EXCAVATION. Payment for BRACED EXCAVATION will be limited to those locations shown on the plans. All sheeting and bracing members associated with braced excavation will not be measured for payment but shall be included in the cost for BRACED EXCAVATION. The cost of keeping excavation and the 48" main drain sewer free of water during construction activities shall be included in the cost of BRACED EXCAVATION.

The cost of preparing and submitting and implementing the Plan shall be included in the cost of BRACED EXCAVATION.

No separate payment will be made for structure excavation where braced excavation is shown.

TEMPORARY END SECTION

Description: This work shall consist of the construction, maintenance and removal of temporary end sections at the locations shown on the plans in accordance with Section 542 of the Standard Specifications.

This work shall include the removal of the temporary end sections when its use is no longer required, in accordance with Article 551.03 of the Standard Specifications. Any material having salvage value will remain property of the Contractor.

Materials: The temporary end sections shall be in accordance with Article 542.07 except that the materials need not be new.

Method of Measurement: This work will be measured for payment in place per EACH.

Basis of Payment: This work will be paid for at the contract unit price per each for TEMPORARY END SECTION, of the diameter specified on the plans.

Removal of temporary end sections will not be paid for separately but shall be included in the contract unit price for TEMPORARY END SECTION.

TEMPORARY STORM SEWER

Description: This work shall consist of the construction, maintenance and removal of temporary storm sewers at the locations shown on the plans in accordance with the applicable portions of Section 542 and 550 of the Standard Specifications.

This work shall include the removal of the temporary storm sewers, when its use is no longer required, in accordance with Article 551.03 of the Standard Specifications. Any material having salvage value will remain the property of the Contractor.

Materials: The temporary storm sewers may be any material class of pipe permitted by Article 542.03 and 550.03 except the material need not be new.

Method of Measurement: This work will be measured for payment in place in feet according to Article 550.09.

Basis of Payment: This work will be paid for at the contract unit price per foot for TEMPORARY STORM SEWER 12”, of the diameter specified.

Removal of temporary storm sewers will not be paid for separately but shall be included in the contract unit price for TEMPORARY STORM SEWER, of the diameter specified.

TEMPORARY DRAINAGE STRUCTURES

Description: This work shall consist of the construction, maintenance and removal of temporary catch basins and temporary inlets at the locations shown on the plans in accordance with Section 602 of the Standard Specifications.

This work will include the removal of the temporary catch basins and temporary inlets, when their use is no longer required, in accordance with Section 605 of the Standard Specifications. Any material having salvage value will remain the property of the Contractor.

Materials: The temporary catch basins and temporary inlets shall be in accordance with Article 602.02 except the materials need not be new.

Method of Measurement: This work will be measured for payment in place per EACH.

Basis of Payment: This work will be paid for at the contract unit price per each for TEMPORARY CATCH BASINS and TEMPORARY INLETS, of the type or type and diameter specified on the plans, and with the type of frame and grate specified on the plans.

Removal of the temporary catch basins and temporary inlets will not be paid for separately but shall be included in the respective contract unit price for TEMPORARY CATCH BASINS and TEMPORARY INLETS.

FILL EXISTING STORM SEWERS

Description: This work shall consist of plugging and filling existing storm sewers as required to construct the pipe abandonment as shown on the plans.

The ends of the pipe shall be securely sealed as described in Section 605.

The ends of the storm sewer shall be excavated, if necessary, to the bottom flow line and to a minimum of 6 inches inside the barrel of the pipe. The inside of the storm sewer at the excavated ends shall be cleaned of all earth and debris to the satisfaction of the Engineer.

The Contractor shall construct a suitable plug at the opening of the storm sewer consisting of mortared concrete masonry blocks or a Class SI Concrete plug.

The cost of cleaning and plugging pipe ends will not be paid for separately but will be considered as included in the contract unit price for FILL EXISTING STORM SEWERS, of the diameter specified.

The controlled low-strength material used to fill the storm sewer and the filling operation will be in accordance with Section 593 of the Standard Specifications.

Method of Measurement: This work will be measured in place and the volume computed in cubic yards.

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for FILL EXISTING STORM SEWERS.

STORM SEWERS (SPECIAL) 8”

Description: This work shall consist of the construction 8-inch storm sewers at the locations shown on the plans in accordance with the applicable portions of Section 542 and 550 of the Standard Specifications.

Materials: The 8-inch storm sewers may be any material class of pipe permitted by Article 542.03 and 550.03.

Method of Measurement: This work will be measured for payment in place in feet per Article 550.09.

Basis of Payment: This work will be paid for at the contract unit price per foot for STORM SEWER (SPECIAL) 8”.

PIPE UNDERDRAIN REMOVAL

Description: This work shall consist of pipe underdrain removal at the locations shown on the plans or as directed by the Engineer. The work shall be performed in accordance with the applicable portions of Section 551 of the Standard Specifications or as directed by the Engineer.

Materials: Coarse aggregate backfill shall conform to the requirements of Article 1004.05 of the Standard Specifications.

Construction Requirements: Where portions of the existing pipe underdrains are to remain in service, portions to be removed shall be removed in such a manner as to leave the remaining pipe underdrain undamaged in proper condition for continued use. Repairs shall be made as directed by the Engineer at no additional cost.

The trench backfill material for trenches resulting from the removal of the pipe underdrain made in the subgrade of the proposed improvement, and trenches where the inner edge of the trench is within 2 ft of the proposed edge of pavement, curb, curb and gutter, stabilized shoulder or sidewalk, shall be coarse aggregate and shall be backfilled up to the bottom of the aggregate subgrade improvement.

Method of Measurement: This work will be measured for payment in feet. Trench backfill for pipe underdrain removal will be measured for payment according to Article 208.03 of the Standard Specifications.

Basis of Payment: This work will be paid for at the contract unit price per foot for PIPE UNDERDRAIN REMOVAL.

TRENCH DRAIN REMOVAL

Description: This work shall consist of trench drain removal at the locations shown on the plans or as directed by the Engineer. The work shall be performed in accordance with the applicable portions of Sections 208 and 551 of the Standard Specifications or as directed by the Engineer.

Construction Requirements: The backfill material for trenches resulting from the removal of the trench drain made in the subgrade of the proposed improvement shall be trench backfill according to Section 208 and shall be backfilled in accordance with Method 1 up to the bottom of the aggregate subgrade improvement.

Method of Measurement: This work will be measured for payment in feet. Trench backfill shall be furnished for backfilling to the width of the trench. It will be measured in cubic yards in place, except that the quantity for which payment will be made shall not exceed the volume of the trench as computed by using the width of the existing trench drain and the actual depth of the trench drain invert below the proposed aggregate subgrade.

Basis of Payment: This work will be paid for at the contract unit price per foot for TRENCH DRAIN REMOVAL.

HEADWALL AND SLOPED HEADWALL

Description: This work shall consist of constructing a cast-in-place or precast sloped headwall structure in accordance with the applicable portions of Sections 503 and 504 of the Standard Specifications and the Plans and/or as directed by the Engineer.

Materials: Materials shall be in accordance with Articles 503.02 and 504.02 of the Standard Specifications.

Portland Cement Concrete (Class SI) shall be used throughout the structure.
Reinforcement Bars, Epoxy Coated shall be used throughout the structure.

Equipment: Equipment shall be in accordance with Articles 503.03 and 504.03 of the Standard Specifications.

Construction Requirements: Construction shall conform to the details shown in the Plans, all applicable Illinois Tollway Standard Drawings and all applicable portions of Sections 503 of the Standard Specifications.

Headwalls and Sloped Headwalls are to be used only in slopes specified per the Illinois Tollway Standard Drawings and shall be constructed flush with the existing or proposed final grade.

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

Non-shrink grout used to fill between the headwall and the pipe(s) will not be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per each, for SLOPED HEADWALL, of the type and diameter specified, and if the slope specified. The price shall constitute full payment for the required excavation, backfilling, restoration, ditch grading and all labor, equipment, tools and incidentals necessary to complete the work as specified.

Pay Item Number	Designation	Unit of Measure
JI680130	SLOPED HEADWALL TYPE III, 6", 1:4	EACH
JI680132	SLOPED HEADWALL TYPE III, 15", 1:4	EACH

PIPE UNDERDRAINS, FABRIC LINED TRENCH

Description. This work shall consist of furnishing and installing pipe underdrain at the locations shown in the plans. The perforated pipe shall be enclosed in a fabric envelope with CA-16 trench backfill to the dimensions shown on the plans. The work shall be performed in accordance with Section 601 of the Standard Specifications, and the IDOT Recurring Special Provision for Pipe Underdrain, except as modified herein.

Materials. The perforated pipe underdrain shall be according to Article 601.02 of the Standard Specifications. Outlet pipes or pipes connecting to separate storm sewer system shall not be perforated.

Method of Measurement. This work will be measured for payment in feet, in place. No distinction between perforated underdrain and non-perforated outlet drain shall be made upon measurement.

Basis of Payment. This work shall be paid for at the contract unit price per foot for PIPE UNDERDRAINS, FABRIC LINED TRENCH, of the specified diameter, which price shall include all labor materials and equipment necessary to install the underdrain. No additional payment shall be made for the fabric sleeve lining the pipe, or the fabric lining the trench.

Pay Item Number	Designation	Unit of Measure
JI601320	PIPE UNDERDRAINS, FABRIC LINED TRENCH 6"	FOOT

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.

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

A. 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.

B. 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.

C. Damages:

1. In the event that a tree not scheduled for removal is injured such that potential irreparable damage may ensure, 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.

3. 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.

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.)
- Hackberry (Celtis occidentalis)
- Hawthorn (Crataegus spp.)
- Black Walnut (Juglans nigra)
- Crabapple (Malus spp.)
- Black Tupelo (Nyssa sylvatica)
- American Hophornbeam (Ostraya virginiana)
- Oak (Quercus spp.)
- Baldcypress (Taxodium distichum)
- American Linden (Tilia americana)

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

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. No plant material shall be installed prior to the final grade of the planting soil. Trees must be installed first to establish proper layout and to avoid damage to other plantings.

Add the following to Article 253.05 Transportation:

Cover plants during transport. Plant material transported without cover shall be automatically rejected.

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

The Engineer will place the marking flags. Allow a minimum of seven working (7) days prior to installation for layout. The Contractor shall be responsible for:

1. Providing marking flags to the Engineer for locating plants.
2. Contacting utility companies to identify any conflicts with the proposed planting locations after flags have been placed.
3. Obtaining approval from the Engineer for any relocation of proposed plantings due to utility conflicts, or other conflicts.

Delete Article 253.08 Excavation of Plant Holes and substitute the following:

Protect structures, utilities, sidewalks, knee walls, fences, pavements, utility boxes, other facilities, lawns and existing plants from damage caused by planting operations.

Holes for trees shall be dug at the location indicated by the marking stakes. Holes for shrubs shall be dug within the marked outline of the planting bed. The spacing of plants will be designated on the plans. Spacing shall be measured form center-to–center, and alternate rows shall be staggered.

Excavate with sides vertical, bottom flat but with high center for drainage. Deglaze sides. The planting hole shall be twice the diameter of the root ball if possible, but in no case shall the hole be less than twelve (12) inches wider. Any soil covering the tree's root flair shall be removed to expose the crown, along with any secondary root growth, prior to planting. Remove all excavated subsoil from the site and dispose as specified in Article 202.03. The excavated material shall not be stockpiled on turf or in ditches.

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

Trees, shrubs, and vines shall be thoroughly watered with a method approved by the Engineer. 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.

Set plants in the excavated hole with top of ball 2 to 3 inches above finished grade. Add soil as required under ball to achieve plumb. Remove all burlap and wire baskets from 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 wires shall be removed from the root ball and tree trunk.

The hole shall be half (1/2) filled with soil, firmly packed, then saturated with water. After the water has soaked in, more soil shall be added to the top of the hole, and then the hole shall be saturated again. Maintain plumb during backfilling. Visible root flair shall be left exposed, uncovered by the addition of soil. By mounding up the soil around the hole, create a saucer depression around the tree to hold future water. In most cases, the backfill around the root ball shall be the same soil that was removed from the hole. Where rocks, gravel, heavy clay or other debris are encountered, clean top soil shall be used. Do not backfill excavation with subsoil.

Delete Article 253.11 and substitute the following:

Within 48 hours after planting, mulch shall be placed around all plants in the entire mulched bed or at the base of each tree to its dripline specified to a depth of 4 inches (100 mm). No weed barrier fabric will be required for tree and shrub planting.

The mulch shall consist of wood chips or shredded tree bark free not to exceed two (2) inches in its largest dimension, free of foreign matter, sticks, stones, and clods. A sample and request for material inspection form must be supplied to the Engineer for approval prior to performing any work.

Care shall be taken not to bury leaves, stems, or vines under mulch material. The mulch shall be pulled away 6” from the tree trunk, allowing the root flair at the base of the tree to be exposed and free of mulch contact. 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.

Delete Article 253.12 Wrapping and substitute the following:

Any paper or cardboard trunk wrap must be removed before placing the tree in the tree hole in order to inspect the condition of the trunks. Within 48 hours, "A layer of commercial screen wire mesh shall be wrapped around the trunk of all deciduous trees. The screen wire 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 the lowest major branch.

Add the following to Article 253.13 Bracing:

Trees required to be braced shall be braced within 24 hours of planting.

Add the following to the first paragraph of Article 253.14 Period of Establishment:

Prior to being accepted, the plants shall endure a period of establishment. This period shall begin as soon as the tree is installed and end in December of the same year.

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

This may require pruning, cultivating, tightening and repairing supports, repair of wrapping, and furnishing and applying sprays as necessary to keep the plants free of insects and disease. The Contractor shall provide plant care a minimum of every two weeks, or within 3 days following notification by the Engineer. 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 the following:

During plant care additional watering shall be performed at least every two weeks during the months of May through December. 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.

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, or VINES, of the species, root type, and plant size specified; and per unit for SEEDLINGS. 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. Upon inspection and acceptance of the plant material, or upon execution of a third party bond, the remaining 25 percent of the pay item(s) will be paid."

CONSTRUCTION AIR QUALITY – DUST CONTROL

Description. This work shall consist of developing and implementing a detailed Dust Control Plan (DCP) in accordance with Article 107.36 of the Standard Specifications. Development of a DCP is required. All construction activities shall be governed by the DCP. The nature and extent of dust generating activities, and specific control techniques appropriate to specific situations shall be discussed at the pre-construction meeting, with subsequent development of the DCP to include but not be limited to the requirements below.

General Requirements. The Contractor is responsible for the control of dust at all times during the duration of the contract, 24 hours per day, 7 days per week, including non-working hours, weekends, and holidays. This work shall be considered complete after the completion of all permanent erosion control measures required for the contract, and after all temporary and permanent seeding is established.

The DCP shall describe the plan for the implementation of control measures before, during and after conducting any dust generating operation. These controls must be in place on non-working days and after working hours, not just while work is being done on the site. The DCP must contain information specific to the project site, proposed work, and dust control measures to be implemented. A copy of the DCP must be available on the project site at all times.

The DCP must contain, at a minimum, all of the following information:

1. Name, address and phone number of the person(s) responsible for the dust generating operation and for the submittal and implementation of the DCP.
2. A drawing specifying the site boundaries of the project with the areas to be disturbed, the locations of the nearest public roads, and all planned exit and entrance locations to the site from any paved public roadways.
3. Control measures to be applied to all actual and potential fugitive dust sources before, during and after conducting any dust generating operation, including non-work hours and non-work days.
4. A contingency plan consisting of at least one contingency measure for each activity occurring on the site in case the primary control measure proves inadequate.

The Contractor shall submit two copies of the DCP that outlines in detail the measures to be implemented by the Contractor complying with this section, including prevention, cleanup, and other measures at least 14 days before beginning any dust generating activity. The Contractor shall not begin any dust generating activities until the Engineer approves the DCP in writing.

Materials.

1. Dust Suppression Agents: Water shall meet the requirements of Section 1002 of the Standard Specifications.
2. Soil stabilizers shall consist of seed and mulch meeting the requirements of Article 1081.06 (a) (2) and (3).
3. Covers for stockpiles shall be commercially available plastic tarps, or other materials approved by the Engineer.

Construction Methods. Water shall be used to provide temporary control of dust on entrances/exits to the job site, haul roads and other active work areas. Several applications per day may be necessary to control dust depending upon meteorological conditions and work activity. The Contractor shall apply water on a routine basis as necessary or as directed by the Engineer to control dust. Wet suppression consists of the application of water. Wet suppression equipment shall consist of sprinkler pipelines, tanks, tank trucks or other devices approved by the Engineer, capable of providing a regulated flow, uniform spray and positive shut off.

Haul truck cargo areas shall be securely covered during the transport of materials on public roadways that are prone to cause dust.

Public Roadway Dust Control. Trackout, including carryout and spillage of material that adheres to the exterior surfaces of or are spilled from motor vehicles and/or equipment and subsequently fall onto a paved public roadway must be controlled at all times. Cleanup of carryout and spillage is required immediately if it extends a cumulative distance of 50 feet or more on a paved public roadway. If the extent of carryout is less than 50 feet, clean up at the end of the day is permissible. Cleanup of paved surfaces shall be by wet spray power vacuum street sweeper. Dry power sweeping is prohibited.

Control of Earthwork Dust. During batch drop operations (i.e. earthwork with a front-end loader, clamshell bucket, or backhoe), the free drop height of excavated or aggregate material shall be reduced to minimum heights as necessary to perform the specified task, and to minimize the generation of dust. To prevent spills during transport, a minimum of 2 inches of freeboard space shall be maintained between the material load and the top of the truck cargo bed rail. A maximum drop height of two feet (or minimum height allowed by equipment) will be allowed, or to heights as directed by the Engineer.

Control of Dust on Stockpiles and Inactive Work Areas. The Contractor shall use the following methods to control dust and wind erosion of stockpiles and inactive areas of disturbed soil:

1. Water shall be used during active stockpile load-in, load-out, and maintenance activities.
2. Soil stabilizers (hydraulic or chemical mulch) may be applied to the surface of inactive stockpiles and other inactive areas of disturbed soil. Final grading and seeding of inactive areas shall occur immediately after construction activity is completed in an area and as directed by the Engineer.
3. Plastic tarps may be used on small stockpiles, secured with sandbags or an equivalent method approved by the Engineer, to prevent the cover from being dislodged by the wind. The Contractor shall repair or replace the covers whenever damaged or dislodged at no additional cost.

Method of Measurement. Water used as a dust suppression measure shall be measured for payment in units of 1000 Gallons of water applied. All measuring devices shall be furnished by the Contractor and approved by the Engineer. All other dust control measures will not be measured for payment.

Basis of Payment. The application of water as a dust suppression agent will be paid for at the contract unit price per unit for DUST CONTROL WATERING.

All other dust control measures, along with preparation of the DCP, will not be paid for directly but shall be considered as included in the various items involved and no additional compensation will be allowed.

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 one (1) season's experience in the use of their chemicals in spraying highway right-of-way or at least three (3) season's experience in their use in farm or custom spraying. The Contractor shall observe and comply with all sections of the Illinois Custom Spray Law, including licensing.

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 five (5) 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.

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.

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.

WEED CONTROL, TEASEL (TRANSLINE)

Description: This work shall consist of the application of a broadleaf herbicide (Transline or equal) along highway roadsides for control of teasel and thistle.

Materials: The broadleaf herbicide (Transline or equal) shall have the following formulation:

A. Active Ingredient Clopyralid: 3,6-dichloro-2-pyridinecarboxylic acid, monoethanolamine salt	40.9%
B. Inert Ingredients	59.1%
TOTAL	100.00%

The Contractor shall submit a certificate, including the following, prior to starting work:

1. The chemical names of the compound and the percentage by weight of the ingredients which must match the above specified formulation.

2. A statement that the material is in a solution which will form a satisfactory emulsion for use when diluted with water for normal spraying conditions.

3. A statement that the Transline or equal, when mixed with water, will be completely soluble and dispersible and remain in suspension with continuous agitation.

4. A statement describing the products proposed for use when the manufacturer of Transline or equal requires that surfactants, drift control agents, or other additives be used with the product. These tank mix additives shall be used as specified by the manufacture. Required additives will not be paid for separately.

All material shall be brought to the spray area in the original, unopened containers supplied by the manufacturer.

Schedule: Spraying will not be allowed when temperatures exceed 90º F or under 45º F, when wind velocities exceed fifteen (15) miles per hour, when foliage is wet or rain is eminent, when visibility is poor or during legal holiday periods.

Application Rate: The Transline or equal broadleaf herbicide shall be applied at the rate of one (1) pint per acre (1.2 liters per hectare).

One (1) pint of Transline or equal formulation shall be diluted with a minimum of forty (40) gallons (one hundred fifty (150) liters) of water and applied as a mixture. Water for dilution of the mixture will not be paid for separately.

Method of Measurement: Weed Control, Teasel will be measured for payment in gallons (liters) of undiluted Transline or equal applied as specified. The gallons (liters) for payment will be determined based on the gallons (liters) specified on the label attached to the original container supplied by the manufacturer.

Basis of Payment: Weed Control, Teasel will be paid for at the contract unit price per gallon (liters) for WEED CONTROL, TEASEL. Water for dilution of the mixture and additives required for application will not be paid for as separate items, but the costs shall be considered as included in the contract unit price for Weed Control, Teasel, and no additional compensation will be allowed.

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 (Snapshot 2.5 TG or equivalent) 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.

WEED CONTROL, NON-SELECTIVE AND NON-RESIDUAL (WETLAND - RODEO)

Description: This work shall consist of the application of a non-selective and non-residual herbicide (Rodeo or equal) for the control of broadleaf weeds in wetland areas.

Materials: The non-selective and non-residual herbicide (Rodeo or equal) shall have the following formulation:

Active Ingredient		
*Glyphosate, N-(phosphonomethyl) glycine, in the form of its isopropylamine salt		53.80%
B. Inert Ingredients		46.20%
TOTAL		100.00%

*Equivalent to 4 lbs. per U.S. gallon of the acid, glyphosate.

The Contractor shall submit a certificate, including the following, prior to starting work:

1. The chemical names of the compound and the percentage by weight of the ingredients which must match the above specified formulation.

2. A statement that the material is in a solution which will form a satisfactory emulsion for use when diluted with water for normal spraying conditions.

3. A statement that the Rodeo or equal, when mixed with water, will be completely soluble and dispersible and remain in suspension with continuous agitation.

4. A statement describing the products proposed for use when the manufacturer of Rodeo or equal requires that surfactants, drift control agents, or other additives be used with the product. These tank mix additives shall be used as specified by the manufacturer. Required additives will not be paid for separately.

All material shall be brought to the spray area in the original, unopened containers supplied by the manufacturer.

Application Rate: The Rodeo or equal non-selective and non-residual herbicide shall be applied according to the label instructions.

Water for dilution of the mixture will not be paid for separately.

Method of Measurement: Weed Control, Non-selective and Non-Residual (Wetland) will be measured for payment in gallons of undiluted Rodeo or equal applied as specified. The gallons for payment will be determined based on the gallons specified on the label attached to the original container supplied by the manufacturer.

Basis of Payment: Weed Control, Non-selective and Non-Residual (Wetland) will be paid for at the contract unit price per gallon for WEED CONTROL, NON-SELECTIVE AND NON-RESIDUAL (WETLAND). Water for dilution of the mixture and additives required for application will not be paid for as separate items, but the costs shall be considered as included in the contract price for Weed Control, Non-selective and Non-Residual (Wetland), and no additional compensation will be allowed.

SUPPLEMENTAL WATERING

Scope: This work will include watering turf, trees, shrubs, vines and perennial plants 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.

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. A minimum of 10 units of water per day must be applied until the work is complete. Damage to plant material that is a result of the Contractor's failure to water in a timely way must be repaired or replaced at the Contractor's expense.

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.

Perennial Plants: 5 gallons per square yard
Trees: 30 gallons per tree
Shrubs: 7 gallons per shrub
Vines: 3 gallons per vine

Method of Application: A spray nozzle that does not damage small plants must be used when watering perennial plants or turf. 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 vines if mulch and soil are not displaced by watering. Water shall trickle slowly 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 (3,785 liters) 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 4 (MODIFIED)

This work shall consist of Seeding of Class 4 (Modified) in areas as shown in the plans or a 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 seed mixture shall be supplied in separate bags of the three mixture components: Temporary Cover, Permanent Grasses, and Forbs. 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. Fertilizer is not required.

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

CLASS – TYPE	SEEDS	PURE LIVE SEED LB/ACRE
4 (Modified) Native Grass		15.0
	Andropogon gerardii (Big Bluestem)	7.0
	Andropogon scoparius (Little Bluestem)	7.0
	Koeleria cristata (macrantha) (Prairie Junegrass)	1.0
Temporary Cover		50 (lb/acre)
	Annual Ryegrass	35.0
	Northern Sea Oats	15.0

Notes:

1. Each bag shall be labeled. The label shall bear the dealer's guarantee of mixture and year grown, purity and germination, and date of test. Purity and germination tests no older than twelve (12) months of the date of sowing must be submitted to verify all bulk seed required to achieve LB PLS specified.
2. No seed shall be sown until the purity testing has been completed for seeds to be used and shows the seed meets the noxious weed requirements.
3. Seed, which has become wet, moldy, or otherwise damaged will not be acceptable. Prior to application, the Engineer must approve seed mix in the bags.
4. The seedbed shall be prepared and approved by the Engineer prior to seeding. The Contractor shall delineate the perimeter of the seedbed with wooden lathe. The wooden lathe shall remain in place.
5. Temporary cover seed shall be kept separate from the Native Grass seed mixture. It shall be mixed on site under the direction of the Engineer.
6. In order to eliminate potential introduction of invasive or exotic species, all equipment used on the planting site shall be free of mud and/or plant material. This includes tires, mower decks, undercarriage, etc.
7. The Cover Crop shall be thoroughly mixed with the Class 4 (Modified) seed mix and seeded using a mechanical seeder that applies the seed uniformly at a depth of 1/4 inch. The seedbed shall be immediately covered as specified.

If specified seed material is unavailable, the Engineer shall approve the substitutes in writing. Adjustments will be made at no cost to the contract. Approval of substitutes shall in no way waive any requirements of the contract.

Article 250.09 – Add Seeding, Class 4 (Modified)
Article 250.10 – Add Seeding, Class 4 (Modified)

SEEDING, CLASS 4B (MODIFIED)

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

The Class 4B (Modified) seed mix shall be supplied in pounds of Pure Live Seed. All native species will be local genotype and will be from a radius of 150 miles from the site. The Class 4B (Modified) seed mix shall be supplied with the appropriate innoculants. Fertilizer is not required.

Article 250.07 Seeding Mixtures – Add the following to Table 1:

Class 4B (Modified) – Sedge Mixture

Seeds	Lb/Acre
Carex bicknellii (Bicknell's Sedge)	0.4
Carex cephalophora (Oval Headed Sedge)	0.4
Carex plantaginea (Plantain Leaved Sedge)	0.4
Carex vulpinoidea (Fox Sedge)	0.4
Temporary Cover	
Annual Ryegrass	35.0
Northern Sea Oats	15.0

Notes:
8. Temporary cover seed shall be kept separate from the wetland type mixture. It shall be mixed on site under the direction of the Engineer.
9. Purity and germination tests no older than twelve months old must be submitted for all seed supplied to verify quantities of bulk seed required to achieve LB PLS specified.

If specified seed material is unavailable, the Engineer shall approve the substitutes. Adjustments will be made at no cost to the contract. Approval of substitutes shall in no way waive any requirements of the contract.

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

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

SEEDING, CLASS 5 (MODIFIED) WILDFLOWERS

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

The Class 5 (Modified) seed mix shall be supplied in separate bags of the two mix components: Temporary Cover and Wildflower. All native species will be local genotype and will be from a radius of 150 miles from the site. The Class 5 (Modified) seed mix shall be supplied with the appropriate innoculants. Fertilizer is not required.

Article 250.07 Seeding Mixtures – Delete sentences 4. Delete the following species from Class 5 Forb with Annuals Mixture of Table 1:

CLASS – TYPE SEEDS
5 - Forb with Wildflowers

Echinacea pallida
(Pale Purple Coneflower)
Silphium laciniatum
(Compass Plant)
Silphium laciniatum
(Compass Plant)
Silphiumterebinthinaceum
(Prairie Dock)
Solidago rigida
(Rigid Goldenrod)

Notes:

10. The seeding time for this work shall be October 15 to April 30. Seeding done outside of this time frame will not be measured for payment.
11. The seedbed shall be prepared and approved by the Engineer prior to seeding. The Contractor shall delineate the perimeter of the seedbed with wooden lathe. The wooden lathe shall remain in place.
12. The Temporary Cover shall consist of seed according to Article 1081.04 and shall consist of Lolium multiflorum (Annual Rye Grass) – 10 lb/acre and Chasmanthium latifolium (Northern Sea Oats) – 22 lb/acre. The Temporary Cover seed shall be thoroughly mixed with the Wildflower seed and 2 bushels of moistened horticultural grade vermiculite per acre and uniformly seeded at a depth of 1/8 inch. The seedbed shall be immediately mulched as specified and lightly compacted with a roller.
13. Within two hours after the seeding and mulching are complete, water shall be applied at a rate of 25 L/sq m (5 gal/sq yd). Water shall be applied every three days at a rate of 15L/sq m (3 gal/sq yd) for a total of 15 additional waterings.
14. The Contractor shall have on hand enough equipment to completely water all Seeding, Class 5 (Modified) seed areas in two days at the watering rate specified above. The Engineer will make periodic checks of the Contractor's watering equipment to determine its adequacy and operating condition.
15. All watering describe shall be done with a spray application. An open-end hose will not be acceptable. The method of watering shall meet the approval of the Engineer.
16. Supplemental Watering: During periods exceeding 26 degree C (80 degree F) or subnormal rainfall (Less than 1" of rainfall per week) supplemental watering may be required after the initial and additional waterings and prior to acceptance of the work. Supplemental watering shall be performed when directed by the Engineer. Water shall be applied at the rate specified by the Engineer within 24-hour notice.
17. Purity and germination tests no older than twelve months old must be submitted for all seed supplied to verify quantities of bulk seed required to achieve KG PLS (LB PLS) specified.

Article 250.09 – Add Seeding, Class 5 (Modified) Wildflowers

Seeding, Class 5 (Modified) watering will not be measured for payment.

Supplemental watering will be measured for payment as specified in Special Provision for SUPPLEMENTAL WATERING.

Article 250.10 – Add Seeding, Class 5 (Modified) Wildflowers

ROOT PRUNING METHOD CONTAINER GROWN WOODY PLANTS

Description: This work shall consist of woody plants grown in special containers that enhances vigorous root production but inhibits circling roots. These plants shall be propagated, harvested, transported and installed as specified in the plans. All work shall be in accordance with the applicable portions of Section 253 of the Standard Specifications except as modified herein.

Root Pruning Method is a special, multistep method for woody plant (trees or shrubs) production in containers. The production places emphasis on the root system which ultimately determines the plants' survival and performance in its outplanted environment. This particular container production has been developed to advance root volume production, in a high-quality woody plant with good height-caliper balance.

Revise the following to Article 253.03(a)(3) Planting Time- Spring Planting.
"Planting time for container grown trees and shrubs shall be determined by the Engineer."

Add the following to Article 253.03(b) Planting Time- Fall Planting.
"The planting time for container grown trees and shrubs shall be between August 1 and September 30."

Delete Article 253.04.

Delete the 2rd sentence of Article 253.08(a) and the 3rd paragraph of Article 253.08(b) and substitute with the following:
"Holes for plant materials shall be 1 foot wider than the root ball and 10" to 12" deep minimum. If planting with an auger, the 30 inch hole is a suitable size."

Add the following to Article 253.10 Planting Procedures:
"If the root flare of the plants is not visible at the soils surface then a light shaving of the soil from the top of the ball is required. Use a shovel to remove the top inch soil with a very light hand."

Delete the 3rd sentence of Article 253.10(b) and substitute with the following:
"All plastic and fabric containers shall be removed prior to planting. All ball covering material be removed from the ball before planting, including the removal of all rope, burlap, nylon bag and cap on the bottom of the ball."

Materials: The containers for growing the woody plants shall be either special plastic containers or fabric containers as a method of aeration to prune roots, or with coatings to prevent roots from encircling the containers or equal. They should have the following characteristics.

1. Plastic Containers- made of polyethylene plastic, molded with a series of inward and outward projections and air holes.
2. Fabric Containers- Fabric bags used to manipulate root growth to develop a fibrous root system within the bag, without manual root pruning.
    a. Above Ground Fabric Containers. Woven fabric containers with white exterior coating. The interior of the fabric container allows root tips trapped and produce additional root branching system once reaching the walls of the container.
    b. In-Ground Fabric Bags. Knit fabric bags allow small roots extend through the fabric but are unable to expand which leads to vigorous root branching system.

All plants shall be according to the current standards adopted by American Nurseries and Landscape Associations. When these referenced standards conflict with the specifications contained herein, the specifications shall prevail. The standards include the following:

1. ANSI Z-60.1 American Standard for nursery Stock.
2. ANSI A-300 Standard Practices for Tree, Shrub and other Woody Plant Maintenance.

The following specification of the woody plants shall also be met.

The woody plants specified to be provided under the root pruning system containers have unique requirements for provenance, propagation, culture and container size and type.

The root pruning method container grown plants must possess a provenance or propagule place of origin within a 150 mile radius of the project site unless prior approval of the Engineer is granted.

Root pruning method container grown plants shall be propagated by seed, rooted stem cutting or root cutting depending on the species. Grafted plants shall not be accepted.

Plants shall be grown from propagule to finished plant size in root pruning container under a graduated container size system which transplants the plant in increasingly larger containers when maximum container root volume is achieved. All plant material will be inspected at the nursery by the Engineer, or a duly authorized representative, at least once during each growing phase and prior to the plants proceeding to the next phase of the propagation process. Plants shall be in the appropriate size and type of container for each individual phase of the process at the time of inspection to be accepted. Contractor shall submit the inspection schedule to the Engineer. Finished plants may be delivered to the work site in standard smooth wall containers or balled and burlapped only when the source nursery has been inspected and approved by the Engineer. Any plants grown in plug trays, or in smooth, conventional containers or in contacts with copper shall not be accepted.

Due to the specific growing process required under the root pruning method container system, plant material suppliers will be limited to the following nurseries unless the contractor provides information in writing proving another facility can propagate the required plant material utilizing the same process:

Possibility Place Nursery
7548 W. Monee Road
Monee, Illinois 60449
(708) 534-3988
www.possibilityplace.com

Majestic Oaks
8714 Richardon Road,
Spring Grove, IL 60081
(815) 675-6240
www.majesticoaksnursery.com

St. Aubin Nursery
35445 Irene Road
Kirkland, Illinois 60146
(815)522-3535
www.StAubin.com

Woody Warehouse Nursery Inc.
3216 W. 850 N.
Lizton, IN 46149
(866) 766-8367
www.woodywarehouse.com

The root systems of the root pruning method container grown plants shall be fibrous, vigorous and extensive such that the root / soil ball fills the entire container and stays intact when removed from the container without excessive root circling that cannot be remedied by corrective pruning. Plants which have not matured in the specified container size and severely ‘root bound’ plants shall be rejected. Container sizes shall be suitable for the plant sizes specified such that the plant is provided adequate root mass volume for the plant size specified. Plants in over congested root system will be rejected.

Plants shall be provided according to the following guidelines for container size to plant size ratios:

Container Size Designation	Plant Size
3 Gallon Molded Plastic	Shrubs: 12”-18”, Trees: 12”-24” H min.
5 Gallon Molded Plastic	Shrubs: 18”-36”, Trees: 1/2” cal. or 3’H min.
10 Gallon Fabric	Trees: 3/4” – 1-1/4” cal. and 6’ H min.
15 Gallon Fabric	Trees: 1-1/4” – 1-3/4” cal. and 8’ H min.
20 Gallon Fabric	Trees: 1-1/2” – 2-1/4” cal. and 10’ H min.
30 Gallon Fabric	Trees: 2” - 3” cal. and 12’ H min.
12” In-Ground Fabric	Trees: 1” – 1-1/4” cal.
16-18” In-Ground Fabric	Trees: 1” – 1-1/2” cal.
24” In-Ground Fabric	Trees: 1-1/2” – 2-1/4” cal.

Note: Species that are known to produce a minimal stem growth to root mass ratio such as *Carya spp*. shall be exempt from the above requirement.

Method of Measurement: The ROOT PRUNING METHOD CONTAINER GROWN Woody Plants, of the species, will be measured as each individual plant in accordance with Article 253.16.

Basis of Payment: This work will be paid for at the contract unit price per each ROOT PRUNING METHOD CONTAINER GROWN Woody Plant, of the species, container types and plant size specified in accordance with Article 253.17.

EROSION CONTROL BLANKET (SPECIAL)

This Special Provision revises Section 251 of the Standard Specifications for Road and Bridge Construction to eliminate the use of Excelsior Blanket for Erosion Control Blanket. This work shall consist of furnishing, transporting, and placing 100 % biodegradable erosion control blanket over seeded areas as detailed on the plans, according to Section 251 except as modified herein.

Delete Article 1081.10(a) Excelsior Blanket.

Delete the first paragraph of Article 1081.10 (b) Knitted Straw Mat and substitute the following:

> Knitted Straw Mat. Knitted straw mat shall be a machine-produced mat of 100% clean, weed free agricultural straw. The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the blanket. The blanket shall be covered on top and bottom sides with a 100% biodegradable woven natural organic fiber netting such as North American Green S150BN or equal. No plastic netting will be allowed. The top netting shall consist of machine directional strands formed from two intertwined yarns with cross directional strands interwoven through the twisted machine stands to form an approximate 0.50 x 1.0 (1.27 x 2.54 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread. The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches (5-12.5cm) from the edge) as an overlap guide for adjacent mats.
>
> Short-term photodegradable erosion control blanket will not be allowed.

Delete Article 1081.10(d) Wire Staples.

Add the following to Article 1081.10 (e) Wood Stakes:
Biodegradable plastic stakes will be allowed. The biodegradable plastic anchor shall be approximately 6 in (15.24 cm) in length. No metal wire stakes will be allowed.

MAINTENANCE MOWING (FOR PRAIRIE AND TURF)

Description: This work shall consist of mowing of: 1) prairie grass areas as close to the ground as possible and 2) turf grass areas to a height not more than 75 mm (3 inches). Prairie grass areas shall include only those areas seeded with Seeding Classes 4, 4A, 4B, and 5. Turf grass shall include only those areas sodded and seeded with Seeding Class 2A.

Schedule: Prairie grass mowing shall take place once between March 15 and April 15 and turf grass mowing shall be performed two (2) times per month from May to September.

Equipment: The Contractor shall keep all mowing equipment sharp and properly equipped for operation along an urban arterial route. The equipment used shall be capable of completely severing all growth at the cutting height and distributing it evenly over the mowed area. Special equipment may be required for prairie grass cutting, on steep slopes, in narrow areas, and for trimming around posts, poles, fences, trees, shrubs, seedlings, etc.

Method: All mowing and trimming operations are to proceed in the direction of traffic flow. The cut material shall not be windrowed or left in a lumpy or bunched condition. Additional mowing or trimming may be required to obtain the height specified or to disperse mowed material. Prairie grass shall have trimmings removed or very finely mulched to avoid thatch build-up and to expose the soil surface and encourage soil warming in the absence of prescribed burning.

Debris encountered during the mowing operations which hampers the operation or is visible from the roadway shall be removed and disposed of according to Article 202.03. All trimmings, windrowed material, and debris removal must be complete to the satisfaction of the Engineer. Damage to the turf, such as ruts or wheel tracks more than 2 inches (50 MM) in depth, or other plantings or highway appurtenances caused by the mowing or trimming operation shall be repaired at the Contractor's expense.

Method of Measurement: Mowing and trimming will be measured in acres (hectares) of surface area mowed at the completion of each mowing cycle.

Plan quantities are estimates only. Actual quantities will be measured in place. Agreement to plan quantities will not be allowed. Shrub beds or perennial beds within the mowed area that are less than 1000 square feet (90 square meters) will not be subtracted from the area mowed.

Basis of Payment: This work will be paid for at the contract unit price per acre (hectare) for MAINTENANCE MOWING. Any additional mowing or trimming required to obtain the height specified or to disperse mowed material will be considered as included in the cost of the initial mowing. Payment for mowing and trimming shall include the cost of all material, equipment, labor, removal, disposal and incidentals required to complete the work as specified herein and to the satisfaction of the Engineer.

GENERAL ELECTRICAL REQUIREMENTS (D-1)
Effective: April 1, 2016

This special provision replaces Articles 801.01 – 801.07, 801.09 – 801-16 of the Standard Specifications.

Definition. Codes, standards, and industry specifications cited for electrical work shall be by definition the latest adopted version thereof, unless indicated otherwise.

Materials by definition shall include electrical equipment, fittings, devices, motors, appliances, fixtures, apparatus, all hardware and appurtenances, and the like, used as part of, or in connection with, electrical installation.

Standards of Installation. Materials shall be installed according to the manufacturer's recommendations, the NEC, OSHA, the NESC, and AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

All like materials shall be from the same manufacturer. Listed and labeled materials shall be used whenever possible. The listing shall be according to UL or an approved equivalent.

Safety and Protection. Safety and protection requirements shall be as follows.

Safety. Electrical systems shall not be left in an exposed or otherwise hazardous condition. All electrical boxes, cabinets, pole handholes, etc. which contain wiring, either energized or non-energized, shall be closed or shall have covers in place and be locked when possible, during nonworking hours.

Protection. Electrical raceway or duct openings shall be capped or otherwise sealed from the entrance of water and dirt. Wiring shall be protected from mechanical injury.

Equipment Grounding Conductor. All electrical systems, materials, and appurtenances shall be grounded. Good ground continuity throughout the electrical system shall be assured, even though every detail of the requirements is not specified or shown. Electrical circuits shall have a continuous insulated equipment grounding conductor. When metallic conduit is used, it shall be bonded to the equipment grounding conductor, but shall not be used as the equipment grounding conductor.

Detector loop lead-in circuits, circuits under 50 volts, and runs of fiber optic cable will not require an equipment grounding conductor.

Where connections are made to painted surfaces, the paint shall be scraped to fully expose metal at the connection point. After the connection is completed, the paint system shall be repaired to the satisfaction of the Engineer.

Bonding of all boxes and other metallic enclosures throughout the wiring system to the equipment grounding conductor shall be made using a splice and pigtail connection. Mechanical connectors shall have a serrated washer at the contact surface.

All connections to structural steel or fencing shall be made with exothermic welds. Care shall be taken not to weaken load carrying members. Where connections are made to epoxy coated reinforcing steel, the epoxy coating shall be sufficiently removed to facilitate a mechanical connection. The epoxy coating shall be repaired to the satisfaction of the Engineer. Where connections are made to insulated conductors, the connection shall be wrapped with at least four layers of electrical tape extended 6 in. (150 mm) onto the conductor insulation.

Submittals. At the preconstruction meeting, the Contractor shall submit a written listing of manufacturers for all major electrical and mechanical items. The list of manufacturers shall be binding, except by written request from the Contractor and approval by the Engineer. The request shall include acceptable reasons and documentation for the change.

Major items shall include, but not limited to the following:

Type of Work (discipline)	Item
All Electrical Work	Electric Service Metering Emergency Standby System Transformers Cable Unit Duct Splices Conduit Surge Suppression System
Lighting	Tower Pole Luminaire Foundation Breakaway Device Controllers Control Cabinet and Peripherals
ITS	Controller Cabinet and Peripherals CCTV Cameras Camera Structures Ethernet Switches Detectors Detector Loop Fiber Optic Cable

Within 30 calendar days after contract execution, the Contractor shall submit, for approval, one copy each of the manufacturer's product data (for standard products and components) and detailed shop drawings (for fabricated items). Submittals for the materials for each individual pay item shall be complete in every respect. Submittals which include multiple pay items shall have all submittal material for each item or group of items covered by a particular specification, grouped together and the applicable pay item identified. Various submittals shall, when taken together, form a complete coordinated package. A partial submittal will be returned without review unless prior written permission is obtained from the Engineer.

The submittal shall be properly identified by route, section, county, and contract number.

The Contractor shall have reviewed the submittal material and affixed his/her stamp of approval, with date and signature, for each individual item. In case of subcontractor submittal, both the subcontractor and the Contractor shall review, sign, and stamp their approval on the submittal.

Illegible print, incompleteness, inaccuracy, or lack of coordination will be grounds for rejection.

Items from multiple disciplines shall not be combined on a single submittal and transmittal. Items for lighting, signals, surveillance and CCTV must be in separate submittals since they may be reviewed by various personnel in various locations.

The Engineer will review the submittals for conformance with the design concept of the project according to Article 105.04 and the following. The Engineer will stamp the drawings indicating their status as "Approved", "Approved as Noted", "Disapproved", or "Information Only". Since the Engineer's review is for conformance with the design concept only, it shall be the Contractor's responsibility to coordinate the various items into a working system as specified. The Contractor shall not be relieved from responsibility for errors or omissions in the shop, working, or layout drawings by the Engineer's approval thereof. The Contractor shall still be in full compliance with contract and specification requirements.

All submitted items reviewed and marked "Disapproved" or "Approved as Noted" shall be resubmitted by the Contractor in their entirety, unless otherwise indicated within the submittal comments.

Work shall not begin until the Engineer has approved the submittal. Material installed prior to approval by the Engineer, will be subject to removal and replacement at no additional cost to the Department.

Unless otherwise approved by the Engineer, all of the above items shall be submitted to the Engineer at the same time. Each item shall be properly identified by route, section, and contract number.

Certifications. When certifications are specified and are available prior to material manufacture, the certification shall be included in the submittal information. When specified and only available after manufacture, the submittal shall include a statement of intent to furnish certification. All certificates shall be complete with all appropriate test dates and data.

Authorized Project Delay. See Article 801.08

Maintenance 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 seven (7) 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 304.8 mm (one (1) foot) 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."

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.

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.

Testing. Before final inspection, the electrical work shall be tested. Tests may be made progressively as parts of the work are completed, or may be made when the work is complete. Tests shall be made in the presence of the Engineer. Items which fail to test satisfactorily shall be repaired or replaced. Tests shall include checks of control operation, system voltages, cable insulation, and ground resistance and continuity.

The forms for recording test readings will be available from the Engineer in electronic format. The Contractor shall provide the Engineer with a written report of all test data including the following:

- Voltage Tests
- Amperage Tests
- Insulation Resistance Tests
- Continuity tests
- Detector Loop Tests

Lighting systems. The following tests shall be made.

(1) Voltage Measurements. Voltages in the cabinet from phase to phase and phase to neutral, at no load and at full load, shall be measured and recorded. Voltage readings at the last termination of each circuit shall be measured and recorded.

(2) Insulation Resistance. Insulation resistance to ground of each circuit at the cabinet, with all loads connected, shall be measured and recorded.

On tests of new cable runs, the readings shall exceed 50 megohms for phase and neutral conductors with a connected load over 20 A, and shall exceed 100 megohms for conductors with a connected load of 20 A or less.

On tests of cable runs which include cables which were existing in service prior to this contract, the resistance readings shall be the same or better than the readings recorded at the maintenance transfer at the beginning of the contract. Measurements shall be taken with a megohm meter approved by the Engineer.

(3) Loads. The current of each circuit, phase main, and neutral shall be measured and recorded. The Engineer may direct reasonable circuit rearrangement. The current readings shall be within ten percent of the connected load based on material ratings.

(4) Ground Continuity. Resistance of the system ground as taken from the farthest extension of each circuit run from the controller (i.e. check of equipment ground continuity for each circuit) shall be measured and recorded. Readings shall not exceed 2.0 ohms, regardless of the length of the circuit.

(5) Resistance of Grounding Electrodes. Resistance to ground of all grounding electrodes shall be measured and recorded. Measurements shall be made with a ground tester during dry soil conditions as approved by the Engineer. Resistance to ground shall not exceed 10 ohms.

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 60 months from the date of delivery.

(b) The Contractor's written guarantee that, for a period of six months after the date of final acceptance of the work, all necessary repairs to or replacement of said warranted material or apparatus for reasons not proven to have been caused by negligence on the part of the user or acts of a third party shall be made by the Contractor at no additional cost to the 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 neatly and plainly marked in red by the Contractor on the full-size set of record drawings kept at the Engineer's field office for the project. These drawings shall be updated on a daily basis and shall be available for inspection by the Engineer during the course of the work. The record drawings shall include the following:

- Cover Sheet
- Summary of Quantities, electrical items only
- Legends, Schedules and Notes
- Plan Sheet
- Pertinent Details
- Single Line Diagram
- Other useful information useful to locate and maintain the systems.

Any modifications to the details shall be indicated. Final quantities used shall be indicated on the Summary of Quantities. Foundation depths used shall also be listed.

As part of the record drawings, the Contractor shall inventory all materials, new or existing, on the project and record information on inventory sheets provided by the Engineer.

The inventory shall include:

- Location of Equipment, including rack, chassis, slot as applicable.
- Designation of Equipment
- Equipment manufacturer
- Equipment model number
- Equipment Version Number
- Equipment Configuration
    - Addressing, IP or other
    - Settings, hardware or programmed
- Equipment Serial Number

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 on CDROM as well as hardcopy's for review and approval.

In addition to the record drawings, PDF copies of the final catalog cuts which have been Approved and Approved as Noted with applicable follow-up shall be submitted along with the record drawings. The PDF files shall clearly indicate either by filename or PDF table of contents the respective pay item number. Specific part or model numbers of items which have been selected shall be clearly visible. Hard copies of the catalog are not required with this submittal.

The Contractor shall provide two sets of electronically produced drawings in a moisture proof pouch to be kept on the inside door of the controller cabinet or other location approved by the Engineer. These drawings shall show the final as-built circuit orientation(s) of the project in the form of a single line diagram with all luminaires numbered and clearly identified for each circuit.

Final documentation shall be submitted as a complete submittal package, i.e. record drawings, test results, inventory, etc. shall be submitted at the same time. Partial piecemeal submittals will be rejected without review. A total of five hardcopies and CDROMs of the final documentation shall be submitted.

GPS Documentation. In addition to the specified record drawings, the Contactor shall record GPS coordinates of the following electrical components being installed, modified or being affected in other ways by this contract:

- All light poles and light towers.
- Handholes and vaults.
- 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.
- 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 and in print form. The electronic format shall be compatible with MS Excel. Latitude and Longitude shall be in decimal degrees with a minimum of 6 decimal places. Each coordinate shall have the following information:

1. District
2. Description of item
3. Designation
4. Use
5. Approximate station
6. Contract Number
7. Date
8. Owner
9. Latitude
10. Longitude
11. Comments

A spreadsheet template will be available from the Engineer for use by the Contractor.

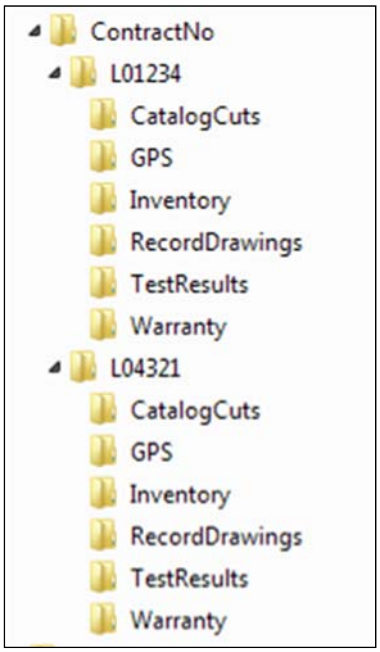
Prior to the collection of data, the contractor shall provide a sample data collection of at least six data points of known locations to be reviewed and verified by the Engineer to be accurate within 20 feet. Upon verification, data collection can begin. Data collection can be made as construction progresses, or can be collected after all items are installed. If the data is unacceptable the contractor shall make corrections to the data collection equipment and or process and submit the data for review and approval as specified. **Data collection prior to the submittal and review of the sample data of existing data points will be unacceptable and rejected.**

Accuracy. Data collected is to be mapping grade. A handheld mapping grade GPS device shall be used for the data collection. The receiver shall support differential correction and data shall have minimum 5 meter accuracy after post processing.

GPS receivers integrated into cellular communication devices, recreational and automotive GPS devices are not acceptable.

The GPS shall be the product of an established major GPS manufacturer having been in the business for a minimum of 6 years."

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.

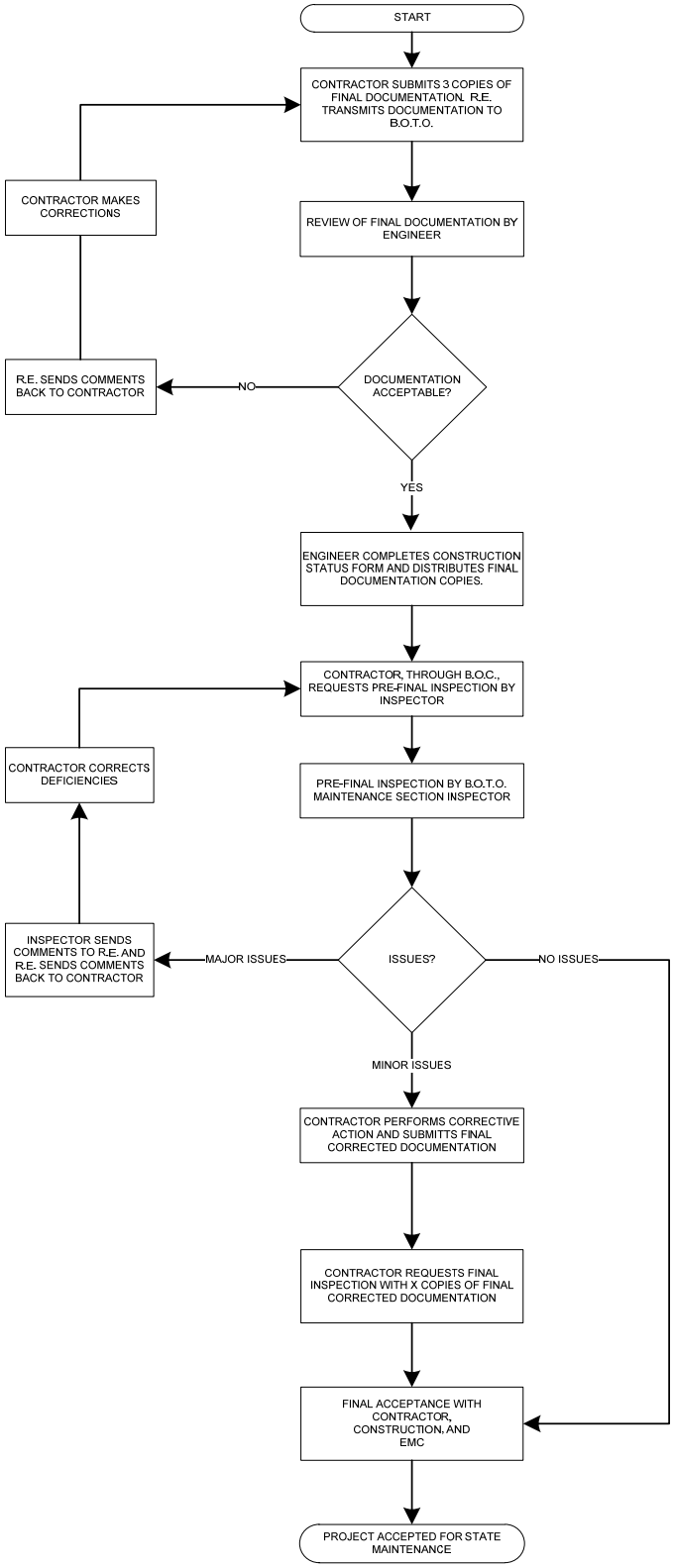
The Final Acceptance Documentation Checklist shall be completed and is contained elsewhere herein.

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.


START
CONTRACTOR SUBMITS 3 COPIES OF FINAL DOCUMENTATION. R.E. TRANSMITS DOCUMENTATION TO B.O.T.O.
REVIEW OF FINAL DOCUMENTATION BY ENGINEER
DOCUMENTATION ACCEPTABLE?
NO
R.E. SENDS COMMENTS BACK TO CONTRACTOR
CONTRACTOR MAKES CORRECTIONS
YES
ENGINEER COMPLETES CONSTRUCTION STATUS FORM AND DISTRIBUTES FINAL DOCUMENTATION COPIES.
CONTRACTOR, THROUGH B.O.C., REQUESTS PRE-FINAL INSPECTION BY INSPECTOR
PRE-FINAL INSPECTION BY B.O.T.O. MAINTENANCE SECTION INSPECTOR
ISSUES?
MAJOR ISSUES
INSPECTOR SENDS COMMENTS TO R.E. AND R.E. SENDS COMMENTS BACK TO CONTRACTOR
CONTRACTOR CORRECTS DEFICIENCIES
NO ISSUES
MINOR ISSUES
CONTRACTOR PERFORMS CORRECTIVE ACTION AND SUBMITTS FINAL CORRECTED DOCUMENTATION
CONTRACTOR REQUESTS FINAL INSPECTION WITH X COPIES OF FINAL CORRECTED DOCUMENTATION
FINAL ACCEPTANCE WITH CONTRACTOR, CONSTRUCTION, AND EMC
PROJECT ACCEPTED FOR STATE MAINTENANCE

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 -Five hardcopies (11" x 17") -Scanned to Five CD-ROMs	☐ ☐	☐ ☐
Field Inspection Tests -Voltage -Amperage -Cable Insulation Resistance -Continuity -Controller Ground Rod Resistance	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐
GPS Coordinates -Excel file	☐	☐
Job Warranty Letter	☐	☐
Catalog Cut Submittals -Approved & Approved as Noted	☐	☐
Lighting Inventory Form	☐	☐
Lighting Controller Inventory Form	☐	☐
Light Tower Inspection Form (if applicable)	☐	☐

Four Hardcopies & scanned to four CD's shall be submitted for all items above. The CD ROM shall be labeled as shown in the example contained herein.

CD LABEL FORMAT TEMPLATE.

Label must be printed; hand written labels are unacceptable and will be rejected.

MAINTENANCE OF LIGHTING SYSTEMS (D-1)
Effective: January 1, 2012

Replace Article 801.11 and 801.12 of the Standard Specifications with the following:
COMED

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. The request for the maintenance preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date.

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.

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. The affected circuits shall be isolated by means of in-line waterproof fuse holders as specified elsewhere and as approved by the Engineer.

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.

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.

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 equipment 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 for. 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, which shall include all work as described herein.

ELECTRIC UTILITY SERVICE CONNECTION (COMED)
Effective: January 1, 2012

Description.
This item shall consist of payment for work performed by ComEd in providing or modifying electric service as indicated. THIS MAY INVOLVE WORK AT MORE THAN ONE ELECTRIC SERVICE. For Electrical Service Drop Locations see the plans.

CONSTRUCTION REQUIREMENTS

General.
It shall be the Contractor's responsibility to contact ComEd. The Contractor shall coordinate his work fully with the ComEd both as to the work required and the timing of the installation. No additional compensation will be granted under this or any other item for extra work caused by failure to meet this requirement. **Please contact ComEd, New Business Center Call Center, at 866 NEW ELECTRIC (1-866-639-3532) to begin the service connection process. The Call Center Representatives will create a work order for the service connection. The representative will ask the requestor for information specific to the request. The representative will assign the request based upon the location of project.**

The Contractor should make particular note of the need for the earliest attention to arrangements with ComEd for service. In the event of delay by ComEd, no extension of time will be considered applicable for the delay unless the Contractor can produce written evidence of a request for electric service within 30 days of execution.

Method of Payment.
The Contractor will be reimbursed to the exact amount of money as billed by ComEd for its services. Work provided by the Contractor for electric service will be paid separately as described under ELECTRIC SERVICE INSTALLATION. No extra compensation shall be paid to the Contractor for any incidental materials and labor required to fulfill the requirements as shown on the plans and specified herein.

For bidding purposes, this item shall be estimated as $20,000

Basis of Payment.
This work will be paid for at the contract lump sum price for ELECTRIC UTILITY SERVICE CONNECTION which shall be reimbursement in full for electric utility service charges.

ELECTRIC SERVICE DISCONNECT
Effective Date: January 1, 2005 Revised: October 10, 2008

Description. This item shall consist of furnishing and installing an Electric Service Disconnect, mounted on a wood pole or wall as specified below, shown on accompanying details drawing and as directed by the Engineer.

Materials. The disconnect box shall be NEMA 4X stainless steel, nominally 12" x 18" x 8" with piano hinged door, steel back panel, fast acting stainless steel enclosure clamps, padlock provisions and door stop kit, Hoffman catalog #A-16H1208SS6LP/A-16P12/A-DSTOPK/C-PMK12, or approved equal.

Circuit Breakers shall be thermal magnetic bolt-on type with a minimum interrupt capacity of 10,000 symmetrical amperes at 120 volts. Breakers shall be lockable in the off position for lock out/tag-out compliance.

Disconnect surge protector shall be suitable for 240/120 volt single phase 60 Hz. AC electrical service. Protector shall have a surge energy capability of 3600 joules or better at 8/20 microseconds, rated –40 to 60 degrees C., with LED operating indicators and shall be UL listed per UL 1449. Protector shall be a Cutler Hammer CMOV230L65XST or approved equal.

Conduit and wire to complete the installation of the disconnect box shall be paid for via pay items elsewhere herein.

Bus bars, connectors and lugs shall be copper, insulated and isolated, and configured to prevent shorted conditions from tightening terminations. Lug and connectors shall be rated for 75 degrees C. Overall bus section shall be configured behind an insulating barrier shield which is removable for access to connections.

Combination ground and neutral bar shall be configured with separate ground and neutral sections and spare terminals as indicated. The heads of ground screws shall be painted green. The heads of neutral screws shall be painted white.

A plastic laminated layout and circuit diagram shall be affixed to the interior side of the enclosure door.

A 2-color engraved plastic nameplate, attached with screws and engraved as indicated, shall be provided for each main breaker.

The exact mounting height of the box shall be field determined and marked by the Engineer.

Electrical service shall be of the voltage indicated. Where 120 volt service is indicated, service drop cable shall be installed accordingly.

The electric service equipment assembly shall be UL labeled, suitable for use as service equipment.

Stainless steel unistrut channel, stainless steel "L" shaped brackets, and stainless steel hardware shall be provided for proper installation of the disconnect, as shown on disconnect mounting details. (TY-1TSC-400 #20).

Installation. When mounting on pole, the box shall be installed as per accompanying disconnect mounting detail (TY-1TSC-400#19&#20)

When mounting on wall, the box shall be installed as per accompanying disconnect details (TY-1TSC-400#25 and #26).

Note detail drawing for installation of stainless steel straps and iron conduit straps (TY-1TSC-400#19).

Pole mounted disconnect shall be installed a minimum of 10 feet above final grade, as shown on electric service detail TY-1TSC-400#20. Wall mounted disconnect shall be installed a minimum of 4 feet above final grade, as shown on electric service detail TY-1TSC400#25 One Electric Service Disconnect may be used for more than one location as shown on plans. If so, an extra circuit breaker shall be installed to control the 2nd location. The 2nd circuit breaker supplied shall be considered incidental to the Electric Service Disconnect pay item.

Removal of existing Electric Service Type "C" shall be considered as incidental to Electric Service Disconnect pay item. Contractor shall not be entitled to extra compensation for removal of Type "C" service.

All work beginning to end shall be coordinated with the power utility company. Contractor shall call the power utility company to set up all service calls.

Method of Measurement. Each Electric Service Disconnect mounted on a wood pole or on a wall for the Surveillance System, installed as per the above specifications and as directed by Engineer, shall count as a unit for payment.

Basis of Payment. This item shall be paid at the contract unit price each for ELECTRIC SERVICE DISCONNECT, which shall be payment in full for the material and work as described herein. To make Electric Service and Disconnect complete, ground rod and miscellaneous hardware shall be included in contract unit price for ELECTRIC SERVICE DISCONNECT.

POWER DISTRIBUTION CENTER, PEDESTAL MOUNT

Description. This item shall consist of furnishing and installing a DMS meter pedestal cabinet as specified below, shown on plan details and as directed by the Engineer.

Materials. The pedestal mounted disconnect box shall be NEMA 4X stainless steel, nominally 30” x 16” x 8” with piano hinged door, steel back panel, fast acting stainless steel enclosure clamps, padlock provisions and door stop kit, Hoffman catalog #A-16H1208SS6LP/A-16P12/A-DSTOPK/C-PMK12, or approved equal.

Disconnect surge protector shall be suitable for 240/120-volt single phase 60 Hz. AC electrical service. Protector shall have a surge energy capability of 3600 joules or better at 8/20 microseconds, rated –40 to 60 degrees C., with LED operating indicators and shall be UL listed per UL 1449. Protector shall be a Cutler Hammer CMOV230L65XST or approved equal.

Conduit and wire to complete the installation of the disconnect box shall be paid for via pay items elsewhere herein.

Bus bars, connectors and lugs shall be copper, insulated and isolated, and configured to prevent shorted conditions from tightening terminations. Lug and connectors shall be rated for 75 degrees C. Overall bus section shall be configured behind an insulating barrier shield which is removable for access to connections.

Combination ground and neutral bar shall be configured with separate ground and neutral sections and spare terminals as indicated. The heads of ground screws shall be painted green. The heads of neutral screws shall be painted white.

A plastic laminated layout and circuit diagram shall be affixed to the interior side of the enclosure door.

A 2-color engraved plastic nameplate, attached with screws and engraved as indicated, shall be provided for each main breaker.

The exact location of the pedestal shall be field determined and marked by the Engineer.

Electrical service shall be of the voltage indicated. Where 120-volt service is indicated, service drop cable shall be installed accordingly.

Disconnect box shall be equipped with a 100A, 2-pole main breaker, a 60A, 2-pole circuit breaker (for DMS sign), an AC R.F.I. line filtering surge protector and cable mounting connections. Cable mounting will not be paid for separately.

Circuit Breakers shall be thermal magnetic bolt-on type with a minimum interrupt capacity of 10,000 symmetrical amperes at 120 volts. Breakers shall be lockable in the off position for lock out/tag-out compliance.

Pedestal post shall be made of carbon steel.

Pedestal shall be made of cast iron with handhole built-in.

All electric service equipment assembly materials shall be UL listed for the U.S. per UL Standard 231. Receptacles shall conform to NEMA and/or ANSI configurations as specified by the National Electrical Code.

Installation. When mounting on pole, the box shall be installed as per accompanying DMS disconnect pedestal detail in plans.

All work beginning to end shall be coordinated with Comed. Contractor shall call the power utility company to set up all service calls and for installation of meter. The Contractor shall coordinate his work fully with the ComEd both as to the work required and the timing of the installation. No additional compensation will be granted under this or any other item for extra work caused by failure to meet this requirement. **Please contact ComEd, New Business Center Call Center, at 866 NEW ELECTRIC (1-866-639-3532) to begin the service connection process. The Call Center Representatives will create a work order for the service connection. The representative will ask the requestor for information specific to the request. The representative will assign the request based upon the location of project.**

The Contractor should make particular note of the need for the earliest attention to arrangements with ComEd for service. In the event of delay by ComEd, no extension of time will be considered applicable for the delay unless the Contractor can produce written evidence of a request for electric service within 30 days of execution.

Method of Measurement. Each Power Distribution Center, Pedestal Mount mounted on a carbon steel pole per the above specifications and as directed by Engineer, shall count as a unit for payment.

Basis of Payment. This item shall be paid at the contract unit price each for POWER DISTRIBUTION CENTER, PEDESTAL MOUNT, which shall be payment in full for the material and work as described herein. Ground rod and miscellaneous hardware shall be included in contract unit price for POWER DISTRIBUTION CENTER, PEDESTAL MOUNT.

EXPOSED RACEWAYS (D-1)
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 105º 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 0º 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 105º 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, **PVC COATED GALVANIZED STEEL."**

UNDERGROUND RACEWAYS (D-1)
Effective: March 1, 2015

Revise Article 810.04 of the Standard Specifications to read:

"Installation. All underground conduits shall have a minimum depth of 30-inches (700 mm) below the finished grade."

Add the following to Article 810.04 of the Standard Specifications:

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

Add the following to Article 810.04 of the Standard Specifications:

"All raceways which extend outside of a structure or duct bank but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum or 300 mm (12") or the length shown on the plans beyond the structure or duct bank. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped.

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

The ends of rigid nonmetallic conduit and coilable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 3 mm (0.125") thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring."

UNIT DUCT (D-1)
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 (D-1)
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."

TEMPORARY LUMINAIRE (D-1)
Effective: January 1, 2012

Add the following to first paragraph of Article 1067(c) of the Standard Specifications:

"The reflector shall not be altered by paint or other opaque coatings which would cover or coat the reflecting surface. Control of the light distribution by any method other than the reflecting material and the aforementioned clear protective coating that will alter the reflective properties of the reflecting surface is unacceptable"

Add the following to Article 1067(f) of the Standard Specifications:

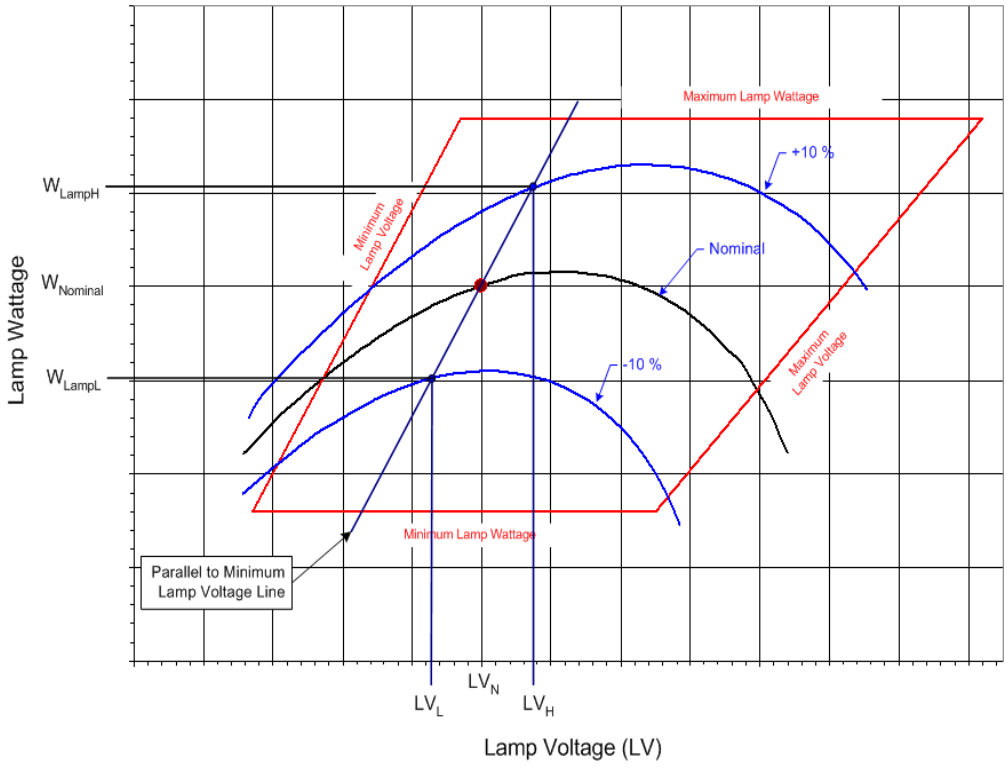
"The ballast shall be a High Pressure Sodium, high power factor, constant wattage auto-regulator, lead type (CWA) for operation on a nominal 240 volt system."

Revise Article 1067(f)(1) of the Standard Specifications to read:

"The high pressure sodium, auto-regulator, lead type (CWA) ballast shall be designed to ANSI Standards and shall be designed and rated for operation on a nominal 240 volt system. The ballast shall provide positive lamp ignition at the input voltage of 216 volts. It shall operate the lamp over a range of input voltages from 216 to 264 volts without damage to the ballast. It shall provide lamp operation within lamp specifications for rated lamp life at input design voltage range. Operating characteristics shall produce output regulation not exceeding the following values:

Nominal Ballast Wattage	Maximum Ballast Regulation
1000	25%
750	25%
400	26%
310	26%
250	26%
150	24%
70	18%

For this measure, regulation shall be defined as the ratio of the lamp watt difference between the upper and lower operating curves to the nominal lamp watts; with the lamp watt difference taken within the ANSI trapezoid at the nominal lamp operating voltage point parallel to the minimum lamp volt line:



$$\text{Ballast Regulation} = \frac{W_{LampH} - W_{LampL}}{W_{LampN}} \times 100$$

where:
W_{LampH} = lamp watts at +10% line voltage when Lamp voltage = LV_H
W_{LampL} = lamp watts at - 10% line voltage when lamp voltage = LV_L
W_{lampN} = lamp watts at nominal lamp operating voltage = LV_N

Wattage	Nominal Lamp Voltage, LV_N	LV_L	LV_H
1000	120v	115v	125v
750	120v	115v	125v
400	100v	95v	105v
310	100v	95v	105v
250	100v	95v	105v
150	55v	50v	60v
70	52v	47v	57v

Ballast losses, based on cold bench tests, shall not exceed the following values:

Nominal Ballast Wattage	Maximum Ballast Losses
750	15%
750	15%
400	20%
310	21%
250	24%
150	26%
70	34%

Ballast losses shall be calculated based on input watts and lamp watts at nominal system voltage as indicated in the following equation:

$$\text{Ballast Losses} = \frac{W_{Line} - W_{Lamp}}{W_{Lamp}} \times 100$$

where:
W_{line} = line watts at nominal system voltage
W_{lamp} = lamp watts at nominal system voltage

Ballast output to lamp. At nominal system voltage and nominal lamp voltage, the ballast shall deliver lamp wattage with the variation specified in the following table.

Nominal Ballast Wattage	Output to lamp variation
750	± 7.5%
750	± 7.5%
400	± 7.5%
310	± 7.5%
250	± 7.5%
150	± 7.5%
70	± 7.5%

Example: *For a 400w luminaire, the ballast shall deliver 400 watts ±7.5% at a lamp voltage of 100v for the nominal system voltage of 240v which is the range of 370w to 430w.*

Ballast output over lamp life. Over the life of the lamp the ballast shall produce average output wattage of the nominal lamp rating as specified in the following table. Lamp wattage readings shall be taken at 5-volt increments throughout the ballast trapezoid. Reading shall begin at the lamp voltage (L_V) specified in the table and continue at 5 volt increments until the right side of the trapezoid is reached. The lamp wattage values shall then be averaged and shall be within the specified value of the nominal ballast rating. Submittal documents shall include a tabulation of the lamp wattage vs. lamp voltage readings.

Nominal Ballast Wattage	LV Readings begin at	Maximum Wattage Variation
750	110v	± 7.5%
750	110v	± 7.5%
400	90v	± 7.5%
310	90v	± 7.5%
250	90v	± 7.5%
150	50v	± 7.5%
70	45v	± 7.5%

Example: *For a 400w luminaire, the averaged lamp wattage reading shall not exceed the range of ±7.5% which is 370w to 430w*"

Add the following to Article 821.08 of the Standard Specifications:

"This work will be paid for at the contract unit price per each for TEMPORARY LUMINAIRE, of the lamp type, mount type, and wattage specified.

Revise Article 1067.06(a)(1) of the Standard Specifications to read:

"The lamps shall be of the clear type and shall have a color of 1900° to 2200° Kelvin."

Add the following table(s) to Article 1067 of the Standard Specifications:

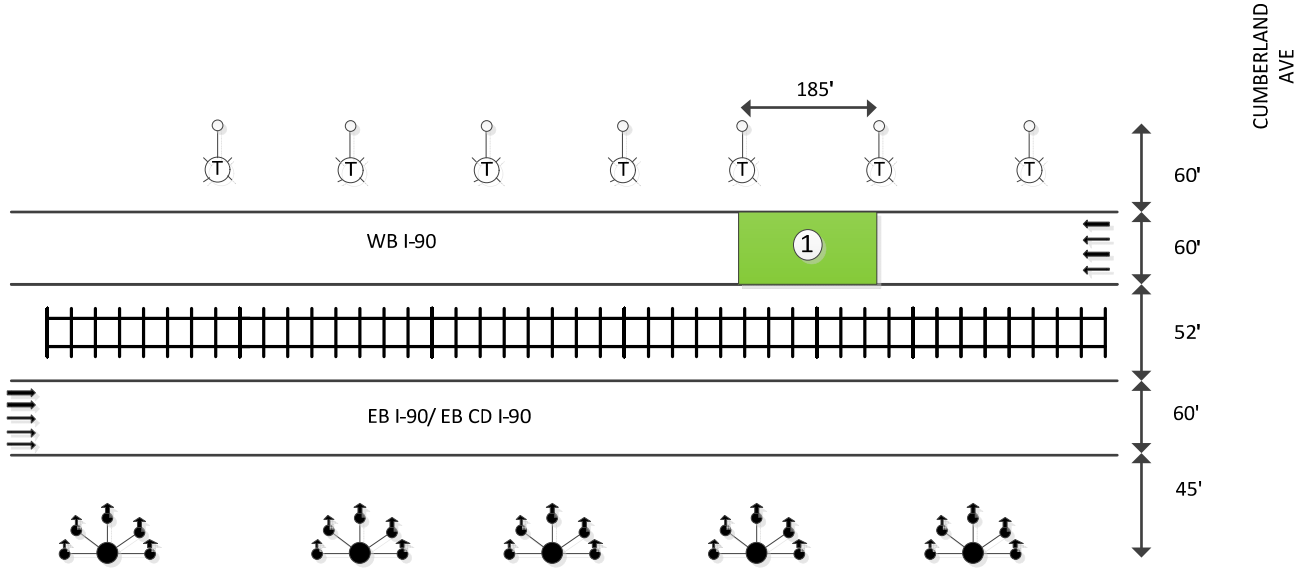
IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
I-90 EB Temporary Lighting – 5 Lanes (Typical)

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	See Sketch
	Number of Lanes	See Sketch
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height *	See Sketch
	Mast Arm Length *	See Sketch
	Pole Set-Back From Edge of Pavement	See Sketch
	** Typical data, see plans for other configurations*	
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	See Sketch
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	See Sketch
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	See Sketch
	Configuration	See Sketch
	Luminaire Overhang over edge of pavement	0 (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		
LUMINANCE	Average Luminance, L_{AVE}	0.8 Cd/m^2
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0 (Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0 (Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3 (Max)

NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.



Cumberland Ave to I-190/I-90 Interchange

LEGEND

PROPOSED TEMPORARY LIGHT POLE
1000W, MC-II HPS, FULL CUT OFF,
130,000 LUMENS, 15 FT MA, 80 FT MH

1 PHOTOMETRIC CALCULATION GRID & ID

EXISTING LIGHT TOWER WITH MC-III,
(6)400W HPS, 120' MH,CUT OFF, 6FT MA, 50,000 LUMENS

NOT TO SCALE

LUMINAIRE SAFETY CABLE ASSEMBLY (D-1)
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.

TEMPORARY WOOD POLE

Description. This special provision describes the installation of wooden poles in support of temporary lighting design, temporary vehicle detectors, and power cables identified at the locations in the plans.

Materials. Materials shall be according to Article 1069.04 of Standard Specifications for Road and Bridge Construction, adopted January 1, 2012.

Installation. Install shall be according to Article 830.0 of Standard Specifications for Road and Bridge construction, adopted January 1, 2012 and in accordance to IDOT District 1 standard detail BE-800.

Basis of Payment. This work will be paid for according to Article 830.05 of Standard Specifications for Road and Bridge Construction, adopted January 1, 2012 with the exception that these poles shall be paid for without mast arms. Payment shall be at the contract unit price each for WOOD POLE, of the **length** and **class** specified installed at the location and depth indicated on plan and details.

TEMPORARY MAST ARM

Description. This special provision describes the installation of a 15 foot mast arm on wooden poles. Locations are identified on plan.

Materials. Materials shall be according to Article 1069.02.(a) of Standard Specifications for Road and Bridge Construction, adopted January 1, 2016.

Installation. Install shall be according to Article 830-03 of Standard Specifications for Road and Bridge construction, adopted January 1, 2012. The mast arm shall be installed on wooden poles as per IDOT District 1 temporary light pole detail BE-800.

Basis of Payment. This work will be paid for according to Article 830.05 of Standard Specifications for Road and Bridge Construction, adopted January 1, 2012 at the contract unit price each for TEMPORARY MAST ARM, ALUMINUM, 15FT installed at the mounting height indicated on plan and details.

GROUNDING OF ITS SUBSYSTEMS
Effective: March 12, 2009

The grounding of ITS subsystems shall meet the requirements of Section 806 of the Standard Specifications. In addition, amend Article 806.03 of the Standard Specifications to include:

General. All ITS subsystems (CCTV camera system, dynamic message sign system, etc.), associated equipment, and appurtenances shall be properly grounded in strict conformance with the NEC and as shown on the Plans.

Testing shall be according to Section 801. 13(a)(5) of the Standard Specifications:

(a) The grounded conductor (neutral conductor) shall be white color-coded. This conductor

shall be bonded to the equipment-grounding conductor only at the Electric Service installation. All power cables shall include one neutral conductor of the same size as the phase (hot) conductors.

(b) The equipment-grounding conductor shall be green color-coded. The following is in addition to Section 801.04 of the Standard Specifications.

(1) Equipment grounding conductors shall be XLP insulated No. 6, unless otherwise noted on the Plans, and bonded to the grounded conductor (neutral conductor) only at the Electric Service Installation. The equipment-grounding conductor is paid for separately and shall be continuous. The Earth shall not be used as the equipment-grounding conductor.

(2) Equipment grounding connectors shall be bonded, using a listed grounding conductor, to all ramp meters, DMS, and detector cabinets, handholes, and other metallic enclosures throughout the ITS subsystems, except where noted herein. A listed electrical joint compound shall be applied to all conductor terminations, connector threads, and contact points.

(3) All metallic and non-metallic raceways containing ITS circuit runs shall have a continuous equipment grounding conductor, except raceways containing only detector loop lead-in circuits, circuits under 50 volts and/or fiber optic cable will not be required to include an equipment grounding conductor.

(c) The grounding electrode conductor shall be similar to the equipment grounding conductor in color-coding (green) and size. The grounding electrode conductor is used to connect the ground rod to the equipment grounding conductor and is bonded to ground rods via exothermic welding, listed pressure connectors, listed clamps or other approved listed means.

Basis of Payment. Payment shall be included in the various items associated with ITS.

TRAFFIC SURVEILLANCE – GENERAL (D-1)
Effective: June 1, 1994 Revised: July 21, 2001

The following supplements applicable sections of Section 800 of the Standard Specifications for Road and Bridge Construction.

The intent of this Special Provision is to prescribe the materials and construction methods commonly used in traffic surveillance installations. All material furnished shall be new. The locations and the details of all installations shall be as indicated on the Plans or as directed by the Engineer.

When the road is open to traffic, except as otherwise provided, the Contractor may request a turn on and inspection of all complete traffic surveillance installations system. This request must be made to the Engineer a minimum of seven (7) working days prior to the time of the requested inspection. Upon demonstration that all surveillance is operational and all work is completed in accordance with the contract and to the satisfaction of the Bureau of Traffic Operations Electrical Engineer, The Bureau of Traffic Operations Electrical Engineer will then allow all of the surveillance to be placed in continuous operation. The Agency that is responsible for the maintenance of the traffic surveillance installations will assume the maintenance upon successful completion of this inspection.

Projects which call for the storage and re-use of existing traffic surveillance equipment shall have a 30 day test period prior to project acceptance.

DEFINITION OF TERMS

Whenever in these Special Provisions the following terms are used, the intent and meaning shall be interpreted as follows:

- Induction Loop - A continuous non-spliced wire, three turns, permanently placed and sealed in sawcuts in the roadway and adjacent area, used in conjunction with an induction loop detector sensor unit.

- State Highway Communications Center - The main communication control facility of the Illinois Department of Transportation with present offices at 201 W. Center Court, Schaumburg, Illinois 60196-1096.

PROSECUTION OF SURVEILLANCE WORK

The work shall be as indicated on the Plans and as required by the Specifications. Unless otherwise indicated, the Contractor shall furnish and install all required materials and equipment, including all associated appurtenances, to produce a complete and operational installation. The appurtenances shall be as indicated, and the costs shall be included in the unit prices bid for the pay items of this contract. The work shall be done in a workmanlike manner.

CONNECTIONS TO EXISTING INSTALLATIONS

Where new work connects to existing installations, the Contractor shall do all necessary cutting, fitting and foundation drilling to the existing installation and shall remove all existing work, as required, to make satisfactory connections, with the work to be performed under these Provisions, so as to leave the entire work in a finished and workmanlike manner, as approved by the Bureau of Traffic Operations Electrical Engineer. No raceways shall be allowed to enter cabinet through the sides or back walls.

Some contracted work which does not call for a complete rebuilding of a surveillance location but the replacement of detector loops and lead-in cable only in conjunction with work such as pavement overlay, cut and grind, curb and gutter replacement and other similar type work where existing appurtenances have been in place for several years. This at times has created pre-existing conditions (such as blocked/broken lead-in conduits, buried handholes) which the contractor may have to repair/replace to make the location fully functioning. The Contractor will be compensated for such work utilizing contract items after a complete inspection by the Bureau of Traffic Operations Electrical Engineer, Resident Engineer and Electrical Maintenance Contractor's Rep. with a full review on a case by case basis. Upon completing such work the Contractor shall notify the R.E. to contact the Bureau of Traffic Operations Electrical Engineer for checks and test to insure the location is on-line and working correctly.

The Contractor shall furnish all labor and material to the furtherance of this end, whether or not distinctly shown on the plans, in any of the "Standard Specifications" or in the Special Provisions.

Note that the Contractor shall be entitled to only one request for location marking of existing systems by the Electrical Maintenance Contractor and that multiple requests may only be honored at the Contractor’s expense.

STANDARD GUARANTEE

Manufacturers' warranties or guarantees on all electrical and mechanical equipment consistent with those provided as customary trade practice shall be obtained and transferred to the State.

IN-SERVICE WARRANTIES OR GUARANTEES

The Contractor shall provide warranties or guarantees that will provide for satisfactory in-service operation of the mechanical and electrical equipment and related components. These warranties or guarantees shall cover a period of two (2) years following project acceptance. The cost of these warranties and guarantees shall be considered incidental to the Contract.

EQUIPMENT DOCUMENTS

The Contractor shall furnish five (5) diagrams of the internal and external connection of the equipment in each Bureau of Traffic Operations Electrical cabinet. Contractor shall also furnish the Operating and maintenance instructions for all equipment supplied. One copy of the wiring diagrams for each cabinet shall be retained in each field cabinet. A wiring diagram shall be contained in a plastic pouch that shall be permanently mounted to the door of each cabinet. Contractor shall permanently mark the cabinet for each termination and each terminal connection as to loop, tone, closure, phone, and lane function of each termination in the cabinet and provide a completed cable log and location as-built diagram at each location.

TERMINAL BLOCKS

Terminal blocks provided in field cabinets shall be the heavy duty barrier type. The terminal block shall be a minimum of 2 inches (50.8 mm) wide and 1-3/16 inch (30.16 mm) deep. Center to center of the terminal screws or studs shall be a minimum of 21/32 inch (16.67 mm) with barriers in between. Terminal blocks shall be rated at 45 amps 600 volts breakdown RMS line to line 11,000 V. and breakdown RMS line to ground 13,800 V. A marking strip shall be provided with each terminal block.

EXISTING EQUIPMENT

All existing equipment, replaced by new equipment shall remain the property of the State and shall be delivered to the Electrical Maintenance Contractor. The cost of removing and delivering the replaced equipment shall be paid for under separate pay item for Cabinet Housing Equipment - Removal.

TELECOMMUNICATION CABLE

When installing the telecommunication cable, the Contractor shall extend his installation and connections of the cable to the next adjacent Surveillance installations or junction box, beyond the limits of his contract section. He shall be responsible for insuring that the cable is continuous and connected from one contract section to the other.

The Contractor shall comply with the agreement between the State of Illinois and IBT/Ameritech as to connections, locations, and terminations of the phone lines (Telephone Company, Engineering, General Service Engineering Division, Outside Plant Engineering Notes 14-36A., March 1971, Administrative Aids and Procedures).

EXISTING SURVEILLANCE EQUIPMENT AND APPURTENANCES

Before starting work, the Contractor, in the presence of the Resident Engineer, Bureau of Traffic Operations Electrical Engineer and the State Electrical Maintenance Contractor's rep., shall inspect the existing equipment to be delivered or maintained by the Contractor and shall take an inventory of all defective, broken, and/or missing parts. Those parts found broken, defective, and/or missing shall be repaired or replaced by the State Electrical Maintenance contractor and shall be recorded as such. The Contractor shall be required to maintain all tone transmitters, tone receivers, tone power supplies, tone mounting frames, harnesses, controller and wiring. The Contractor shall be required to maintain all metering and surveillance cabinets, foundation, concrete handhole, vehicle detection equipment, all interconnecting cables and all Surveillance appurtenances including signal heads. Contractor shall number each cabinet as indicated on the plans, with reflective decals as those used on lighting pole standard.

Should damage occur to any surveillance items during the Contractor's contract period, the Contractor shall repair or replace all damaged equipment at his own expense. The Bureau of Traffic Operations Electrical Engineer shall determine what equipment shall be reusable and what shall be replaced. Replaced equipment shall be of equal or better quality and type.

The Contractor, prior to the commencement of his work, shall notify the Bureau of Traffic Operations Electrical Engineer for a pre-construction inspection. If construction begins prior to this meeting, the Contractor assumes maintenance responsibilities of the locations within his contract limits and shall make any repairs or replace any damaged equipment pre-existing or damaged as a result of his own negligence at his own expense. This also relieves the Electrical Maintenance Contractor of providing one free locate of the surveillance installations within the contract limits.

AS-BUILT PLANS

Upon completion of the work, the Contractor shall furnish one (1) copy of “as-built” drawings on CD compatible with Micro Station V8-2004 Edition software at the Bureau of Traffic Operations Electrical Design Section and four (4) full size sets of "as-built" plans to the Resident Engineer. The plans shall include definite locations and length of all cables, duct, conduit pushes, induction loop, lead-in, foundations, handhole and P-duct. The cost of the "as-built" plans shall be incidental to the contract. The Engineer will not authorize final inspection of any installations until the said plans are in his possession.

PROTECTION OF THE WORK

Electrical work, equipment and appurtenances shall be protected from damage during construction until final acceptance. Electrical raceway or duct openings, shall be capped or sealed from the entrance of water and dirt. Wiring shall be protected from mechanical injury.

STANDARDS OF INSTALLATION

Electrical work shall be installed in a neat and workmanlike manner in accordance with the best practices of the trade. Unless otherwise indicated, materials and equipment shall be installed in accordance with the manufacturer's recommendations.

Except as specified elsewhere herein, materials and equipment shall be in conformance with the requirements of Section 800 & 1088 of the Standard Specifications for Road and Bridge Construction.

In addition to the requirements of the Standard Specifications relating to control of materials, the Contractor shall comply with the following requirements.

The Contractor shall supply samples of all wire, cable, and equipment and shall make up and supply samples of each type of cable splice proposed for use in the work for the Engineer's approval.

Before equipment and/or material including cabinet, telemetry, and detectors are delivered to the job site, the Contractor shall obtain and forward to the Engineer a certified, notarized statement from the manufacturer, containing the catalog numbers of the equipment and/or material, guaranteeing that the equipment and/or material, after manufacture, comply in all respects with the requirements of the Specifications and these Special Provisions. Re-manufactured or modified equipment other than by the original manufacturer shall not be allowed. Original manufacturer shall certify that he made modification to the equipment.

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 equipment are paid, and no additional materials and equipment are paid, and no additional compensation will be allowed. Materials and equipment not complying with the above requirements that have been installed on the job will be done at the Contractor's own risk and may be subject to removal and disposal at the Contractor's expense.

PROCUREMENT

Materials and equipment shall be the products of established manufacturers, shall be new, and suitable for the service required. The Contractor is obligated to conduct his own search into the timely availability of the specified equipment and to ensure that all materials and equipment are in strict conformance with the contract documents. 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 paid for extra but shall be included into the pay item bid price for the respective material or work.

EXCEPTIONS, DEVIATIONS AND SUBSTITUTIONS

Exceptions to and deviations from the requirements of the Contract Documents shall not be allowed without approval by Engineer and Bureau of Traffic Operations Electrical Engineer. 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 substitutions shall be permitted without the approval of the Engineer, and Bureau of Traffic Operations Electrical Engineer.

SUBMITTALS

Within 30 days after 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). All of the submittal information shall be assembled by the Contractor and submitted to the Engineer at one time. All equipment samples shall be submitted at this time. Partial and sporadic 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 a partial submittal. However, no additional compensation or extension of time shall be allowed for extra costs or delays incurred due to partial or late submittals.

TESTING

Before final acceptance, the electrical equipment, material, induction loops and work provided under this contract shall be tested. Tests will not be made progressively, as parts of the work are completed they shall be all made at one time. Items which fail to test satisfactorily shall be repaired or replaced. Bureau of Traffic Operations Electrical Engineer will witness all testing.

INSTALLATION/INSPECTION PROCEDURES

After all control boxes and equipment to be installed has been physically inspected and approved by Bureau of Traffic Operations Electrical Engineer, the equipment supplier shall then deliver all equipment to the job site. The Contractor shall then install/safeguard all the equipment which has been delivered prior to requesting an inspection. No unapproved equipment shall be on the job site or installed as part of the job. This does not relieve the Contractor from replacement/repairs of equipment found to be damaged or in non-compliance of these provisions.

Certain items such as conduit, wire, duct, anchor bolts, and junction boxes will be inspected and may be tested by the Department's Bureau of Materials and these items shall not be delivered to the job site without inspection approval. Items such as cabinets shall be inspected by the Engineer at the contractor's or manufacturer's shop and these items shall not be delivered to the job site without Bureau of Traffic Operations Electrical Engineer inspection approval. It shall be the Contractor's responsibility to arrange inspection activities with the Engineer thirty (30) days prior to installation. 30 days prior to installation of the tone equipment being supplied and, prior to request for a turn-on, the Bureau of Traffic Operations Electrical Engineer will be contacted for the correct frequencies, controller addresses and "DB" setting for each location to be installed. When the work is complete, all equipment fully operational, the Contractor shall schedule a turn-on inspection with the Engineer. Acceptance will be made as a total system, not as parts. The Contractor shall request the inspection no less than seven (7) working days prior to the desired inspection date.

No inspection shall be made until the delivery of acceptable "as built" drawings, specified certifications, and the required guarantees.

It will be the responsibility of the installing contractor to provide a qualified technician representing the tone equipment supplier to be at the turn-on inspection of each location to provide the technical expertise to bring each location on line.

The Contractor shall furnish the necessary manpower and equipment to make the Inspection. The Engineer may designate the type of equipment required for the inspection tests.

A written record of the loop analyzer readings shall be submitted to the Bureau of Traffic Operations Electrical Engineer prior to the final inspection.

Any part or parts of the installation that are missing, broken, defective, or not functioning properly during the inspection shall be noted and shall be adjusted, repaired, or replaced as directed by the Engineer and another inspection shall be made at another date. Only upon satisfaction of all points shall the installation be acceptable.

After the subject inspections are completed the Bureau of Traffic Operations Electrical Engineer will provide the contractor with a complete punch list of items necessary to be completed prior to final inspection and acceptance for maintenance.

The Contractor shall furnish a written guarantee for all materials, equipment and work performed under the contract for a period of not less than two (2) years from the date of final acceptance.

MAINTENANCE OF EXISTING TRAFFIC SURVEILLANCE
Effective: June 1, 1994 Revised: May 29, 2015

This item shall consist of maintaining the existing Traffic Surveillance locations in place as shown on the plans and as described herein. The energy charges for the operation of the Traffic Surveillance Installation shall be paid for by others.

The maintenance of existing Traffic Surveillance Installation shall meet the requirements of Section Art. 801.11 of the Standard Specifications, except as follows:

Full maintenance responsibility shall start as soon as the General Contractor or Subs begins any physical work on the Contract or any portion thereof. The General Contractor shall maintain the existing surveillance Installations located within the Contract limits, in compliance with the current State Electrical Maintenance Contract by a qualified electrical Sub-Contractor.

At least five days prior to maintenance assumption of the existing Traffic Surveillance Installation(s) under this Contract, the Contractor shall request that the Resident Engineer contact TSC for an inspection of the Installation(s). The TSC Engineer shall establish a date and time of inspection and at that time shall check the Installation to determine if any corrective work should be done by the State's Electrical Maintenance Contractor prior to the Contractor taking over maintenance of the Installation. The Resident Engineer, TSC Engineer, and the Contractor shall mutually agree on the date of maintenance transfer to the Contractor for this section.

Maintenance Procedures: The Electrical Sub-Contractor shall perform the following maintenance procedures for each existing Installation designated to remain in operation during Construction.

The electrical Sub-Contractor shall:

1. Patrol and inspect each surveillance Installation every two (2) weeks for general operation of the tone equipment and loop amplifiers to insure that they are functioning properly, check cabinet and or signal foundation tighten where necessary, check for proper alignment of signal heads (if applicable), lamp failures (if applicable), and shall be logged on the Surveillance Inspection and Repair Check List..

2. Provide immediate corrective action to replace burned out lamps or damaged sockets. When lamps are replaced, the reflector and lens shall be cleaned. All replacement lamps shall meet the approval of the Resident Engineer. The electrical Sub-Contractor shall repair or replace all defective equipment from any cause whatsoever.

3. Maintain in stock at all times a sufficient amount of materials and equipment to provide effective temporary and permanent repairs.

4. Provide immediate corrective action when any part or parts of the system fail to function properly. Two heads facing each approach shall be considered the minimum acceptable signal operation.

5. Replace defective or damaged equipment.

6. A Record tag shall be attached to each individual piece of equipment, with the following information: (1) date originally installed by the Engineer. The interval between successive dates of cleaning shall not exceed one year. Any component which fails in a manner which affects the intended operation of any Installation shall be repaired before it is returned to service. The Electrical Sub-Contractor shall be required to maintain the existing type of equipment during the period of time that the original equipment is being repaired.

7. Provide the Resident Engineer with the names, addresses, and telephone numbers of two (2) persons qualified and assigned to the maintenance of the Traffic Surveillance Installation. These people must be made available 24 hours per day, each and every day of the year for emergency calls by the Engineer.

8. Respond to all emergency calls from the Department within one hour after notification and provide immediate corrective action. When equipment has been damaged or becomes faulty beyond repair, the Contractor shall replace it with new and identical equipment. The cost of furnishing and installing the replaced equipment shall be borne by the General Contractor at no additional charge to the State. The General Contractor may institute action to recover damages from a responsible third party. If at any time the Contractor fails to perform all work as specified herein to keep the Traffic Surveillance Installation in proper operating condition or if the Resident Engineer cannot contact the Contractor's designated personnel, the Resident Engineer shall have the State's Electrical Maintenance Contractor perform the maintenance work required. The State's Electrical Maintenance Contractor shall bill the General Contractor for the total cost of the work. The General Contractor shall pay this bill within thirty (30) days of the date of receipt of the invoice or the cost of such work shall be deducted from the amount due the Contractor.

9. All dispatch tickets reporting malfunctions shall be responded to and cleared within one (1) hour, and immediate corrective action shall be taken to correct the problem. He shall report back via telephone his findings and clear any dispatch tickets. If follow-up work is necessary, it shall commence within 10 days of notice, and permanent repairs shall be completed within 45 days!

10. The Contractor shall maintain all devices and appurtenances at the surveillance locations including but not limited to tone equipment, loop detectors, CB radios, inductance loops, flashing beacons, interconnecting cables, and wooden posts.

11. Upon completion of all Contract work, it shall be required prior to inspection that the cabinet be vacuumed and dusted and all handholes be pumped.

Basis of Payment

This item shall be paid for at the Lump Sum Contract unit price for MAINTENANCE OF EXISTING TRAFFIC SURVEILLANCE, which price shall be payment in full for all materials, equipment, and labor needed to perform the work described herein.

COMMUNICATIONS VAULT (D-1)
Effective: March 1, 2010

Description. Work under this item shall consist of constructing a composite concrete handhole and cover, in accordance with the details shown on the plans and as specified herein.

Materials. The composite concrete handhole and two piece vault lid shall be constructed of polymer concrete material, and shall be gray in color. The composite concrete handhole shall be 48 inches x 48 inches and shall have an effective depth of 36 inches.

The composite concrete handhole and cover shall have a design/test loading of 22,500/33,750 lbs respectively. The cover shall have a permanently recessed logo that reads "IDOT COMMUNICATIONS", or as otherwise designated by the Engineer. The composite concrete handhole lid shall have two ½-in x 4-in pull slots. The lid surface shall have a coefficient of friction of 0.50 in accordance with ASTM C-1028.

The Contractor shall install manufacturer-approved gasketing between the lid and the handhole to prevent water from entering the composite concrete handhole.

The composite concrete handhole lid shall be secured to the vault with two 3/8-inch NC stainless steel penta-head bolts and washers to lock the lid. In addition, a "lock tool" shall be provided for composite concrete handhole entry.

A fiber optic cable support assembly shall be recommended by the manufacturer and approved by the Engineer for fiber optic cable and splice enclosures used in the vault. Each support assembly shall consist of multiple brackets, racks, and/or rails required to suspend the required surplus cabling and any splice enclosures required.

The support assembly shall be made from or coated with weather resistant material such that there is no corrosion of the supports. The support assemblies shall be anchored to the vault using stainless steel hardware.

The fiber optic cable support assemblies shall be included in the Contract unit price for the composite concrete handhole. Void areas between openings and conduit shall be filled with self-curing caulking consisting of a permanent, flexible rubber which is unaffected by sunlight, water, oils, mild acids or alkalis. The caulking shall be mildew resistant and non-flammable. The material shall provide a permanent bond between the conduit entering the vault and the polymer concrete. The caulking shall be gray in color.

CONSTRUCTION REQUIREMENTS

Composite concrete handholes shall be installed in accordance with applicable requirements of Section 800 of the Standard Specifications and as provided herein.

A manufacturer-approved knockout punch driver shall be used to provide openings in the vaults for conduit, or the required openings may be machined at the time of stackable vault fabrication. Voids between entering conduits and punch driven or machined openings shall not exceed ½ inch.

Any void areas shall be caulked from the interior and exterior of the composite concrete handhole. The caulk shall be allowed to fully cure per the manufacturer's specifications, prior to backfilling.

The composite concrete handhole shall be placed on 12 inches of coarse aggregate, CA-5 or CA 7 Class A, as specified in Section 1004 of the Standard Specifications. Seal and flash test the vault per the manufacturer's recommendations.

A minimum of 150 feet of excess cable per cable run shall be coiled in each composite concrete handhole containing splices to allow moving the splice enclosure to the splicing vehicle unless otherwise indicated in the plans.

Basis of Payment. This item will be paid for at the contract unit price each for COMMUNICATIONS VAULT, which shall be payment in full for all material and work as specified herein.

HANDHOLE

Effective: June 1, 1994 Revised: May 19, 2009

Description. Work under this item shall consist of constructing a handhole, a heavy-duty handhole, or a double handhole, cast in place, complete with frame and cover and in accordance with the following requirements and conforming in all respects to the lines, grades, and dimensions shown on the plans or as directed by the Engineer. All handholes shall be installed in accordance with the Standard Specifications Sec. 814.

Materials. All handholes shall be constructed of Class SI concrete meeting the requirements of the Standard Specifications for Road and Bridge Construction Section 1020.

Construction Details. Handhole of the type specified shall be constructed in accordance with the details shown on the plans and conform to the following requirements:

1. Concrete: Concrete construction shall be done in accordance with the provisions of Concrete for Structures and Incidental Construction contained in the Standard Specifications for Road and Bridge Construction Sec. 503.

2. Placing Castings: Castings shall be set accurately to the finished elevation so that no subsequent adjustment will be necessary. Castings shall be set flush with a sidewalk or pavement surface. When installed in an earth shoulder away from the pavement edge, the top surface of the casting shall be 1 in. (25.4mm) above the finished surface of the ground.

3. Backfilling: Any backfilling necessary under a pavement, shoulder, sidewalk or within 2 ft. (60 cm) of the pavement edge shall be made with sand or stone screenings.

4. Forming: Forms will be required for the inside face of the handhole wall, and across all trenches leading into the handholes excavation. The ends of conduits leading into the handhole shall fit into a conduit bell which shall fit tightly against the inside form and the concrete shall be carefully placed around it so as to prevent leakage.

5. French Drain: A french drain conforming to the dimensions shown on the plans shall be constructed in the bottom of the handhole excavation.

6. Steel Hooks: Each handhole shall be provided with four galvanized steel hooks of appropriate size, one on each wall of the handhole.

7. Frame and Cover: The outside of the cover shall contain a recessed ring Type “G” for lifting and a legend "IDOT TSC" cast-in.

8. Cleaning: The handhole shall be thoroughly cleaned of any accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

Basis of Payment. This work will be paid for at the contract unit price each for HANDHOLE or HEAVY DUTY HANDHOLE, or CONCRETE HEAVY DUTY HANDHOLE (SPECIAL), as the case may be, for all necessary excavating, backfilling, disposal of surplus material and form work, frame and cover, and furnishing all materials.

REMOVE EXISTING HANDHOLE

Description. This work shall consist of removal and disposal of existing handholes or communications vaults.

Materials. None, backfill and restoration shall be incidental to other construction.

Removal. Removal shall be in accordance with Section 895.05(b) of the Standard Specifications. Removed items become property of Contractor and shall be removed from site within 48 hours.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING HANDHOLE.

REMOVE EXISTING CONCRETE FOUNDATION

Description. This work shall consist of the removal of a concrete foundation.

Materials. None, backfill and restoration shall be incidental to other construction.

Construction. Removal shall be in accordance with Section 895.05(c) of the Standard Specifications. Removed items become property of Contractor and shall be removed from site within 48 hours.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING CONCRETE FOUNDATION.

DIGITAL LOOP DETECTOR SENSOR UNIT (4 CHANNEL)

Description. This work shall consist of furnishing and installing digital four or two channel loop detector sensor units complete with associated enclosures, cable harness, quick disconnect plugs, and operation manuals in strict accordance with these specifications.

Functional Requirements.

- The sensor unit shall operate on a regulated 117 VAC. The sensor unit shall be of solid state design throughout. Each sensor unit shall include four or two complete loop detector channels in the space that is normally occupied by an INDUCTION LOOP DETECTOR SENSOR UNIT.
- The loop connected to each of the four channels or two shall be sequentially scanned at a rate of not less than 148 times per second. Only one loop shall operate at a time in the system to eliminate cross-talk.
- The digital loop sensor unit shall be automatically and instantaneously self-tuning requiring no burn-in or warm-up time. Then it shall also track environmental changes.
- The digital loop sensor unit shall be self-tracking and fully automatic in its recovery from power failure.
- The digital loop sensor unit shall be of sufficient sensitivity to detect the smallest licenseable motor vehicle, including motorbikes. The sensor unit shall detect a Honda CT-170 and hold the detection for minimum of four minutes.
- The sensor unit shall be designed to operate in conjunction with three turns of a loop of wire embedded up to 3” (76.2mm) deep in a reinforced concrete roadway. The loop and lead-ins will measure at least 100 megohms above ground and have a minimum inductance of 50 microhenries and a continuity resistance of not more than 2 ohms. Digital sensor unit shall be capable of tuning to an inductance range of 0 to 2000 microhenries.
- Vehicle detection shall be indicated by a single optically isolated solid state output per channel.
- Output circuit shall be an optically coupled output. It shall be a 2N37. Polarity of interface between telemetry and sensor unit must be observed.
- Any size or type of motor vehicle from motorcycle to a high bed tractor-trailer moving over the loop shall be detected and each vehicle shall produce only one output for the length of time the vehicle is over the loop.
- Detection shall be positive for all vehicle speeds 0 to 129km (80 mi.) per hour.
- The sensor unit shall be capable of reliable operations when placed up to 1000 ft. (304.8m) away from loops and connected with type No. 14 AWG, stranded copper wire. The loops will vary in size from 5 ft. x 6 ft (1.52m by 1.83m) up to 18 ft. x 6 ft. (5.49m by 1.83m). Loop system with 1000 ft (304.8m.) of lead-in shall perform with sensitivity to detect and hold the smallest motorbike.

- Each detection channel shall have its own output incandescent indicator lamp and 16 position thumbwheel switch. The thumbwheel switch shall select the sensitivity and mode. The thumbwheel switch shall provide eight sensitivities, .0025% to .33% and 3 modes: off, pulse, and presence.
- In the pulse mode each new vehicle shall produce an output pulse of 225 milliseconds duration. A vehicle remaining on a loop for more than two seconds shall be "tuned out" allowing operation of the loop to other vehicles.
- In the presence mode output duration shall be equal to the percent of time the vehicle is present on the loop. Vehicle detection and hold times shall not be less than 30 minutes.
- Electrical connections from the sensor unit to incoming and outgoing circuits shall be made by one MS type multiple positive connection plug and jack, or equivalent arrangement, to permit rapid replacement with similar existing units without disconnecting or reconnecting individual wires.
- All the tuning adjustments shall be made with controls provided on the sensor unit without requiring movement of the sensor unit.
- These controls shall be identified and it shall not be necessary to remove or change wires or contacts nor to use any tools other than a screw driver in tuning or making sensitivity adjustments.
- A properly tuned sensor unit shall detect all high vehicles (truck) with chassis 4 feet (1.22m) above pavement surface with one contact closure and yet shall not detect vehicles passing in lanes adjacent to loop installation.
- All transistors shall be silicon type. The main logic of the unit shall be a single MOSLSI chip to simplify the electronics, increase reliability and improve maintainability.
- The sensor unit shall be contained in a rigid high quality metal enclosure providing complete protection to all components and electrical connections.
- During normal detection operation the state of the output indicator shall correspond exactly to the state of the optically coupled output.
- A frequency switch shall be provided to raise or lower the loop oscillator frequency for the elimination of cross-talk between sensor unit, should it ever occur.
- The digital sensor unit shall be provided with a circuit breaker.
- Special circuitry shall be provided so that the sensor unit shall continue in proper operation even though the induction loop is shorted or leaking to ground.
- Induction loops shall be coupled to a transformer to provide for rejection of induction loop lead-in cable noise and shall allow low inductance operation (0 to 50 microhenries).
- A reset shall be provided to reset all channels.
- There shall be a write-on pad mounted on sensor to identify traffic lane with channel indication.

Basis of Payment. This work will be paid for at the contract unit price per each for DIGITAL LOOP DETECTOR SENSOR UNIT, of the number of channels specified, installed, operating and completely in place. Terminal boards, cable harness wiring and miscellaneous will not be paid for separately, but shall be considered as incidental to the cost of the item.

TONE EQUIPMENT
Effective: April 8, 2016

General.

(a) Telemetering equipment shall be furnished and installed in the Traffic Systems Center Office and along expressway at locations designated in these Special Provisions and Plans, and in strict accordance with these specifications.

(b) Communication link from field located cabinets to the Traffic Systems Center Office will be via 3002 Channel, C1 conditioning, Type 7 FDDC telephone pairs leased by the Traffic Systems Center, or telecommunication cable in barrier wall.

(c) All tone transmitters and tone receivers shall be three frequency frequency-shift; that is equipment which the center frequency is normally on at all times and is electrically shifted +30 Hz to a higher frequency (mark) or -30 Hz to a lower frequency (space). Other frequency shifts from +10 to +300 shall be user selectable.

(d) All transmitters, receivers, and power supplies shall be of the modular plug-in type construction. The circuitry of each unit shall be protected by a U-shaped metal chassis, cadmium-plated, with iridite finish.

(e) All tone equipment shall be physically interchangeable with existing Traffic Systems Center tone equipment, that is furnished tone equipment shall be directly compatible with and replaceable by existing tone equipment with no modification to any hardware.

(f) All transmitters, receivers, and power supplies shall be solid state. All transistors shall be silicon, excepting the power transistors in power supplies. All transmitters and receivers I.C.s shall be plug in.

(g) All transmitters and receivers shall be programmable frequency-shift key units. These units shall have a universal card which is field programmable for any channel frequency or shift. The frequencies available shall be in the range of 120 Hz to 3800 Hz in increments of 5 Hz. The shifts available shall be 10, 25, 30, 35, 42.5, 60, 70, 75, 120, 150, 240 and 300 Hz. A new center frequency or shift shall be field programmed by simply changing setting of the program switch.

(h) All transmitters and receivers shall be capable of being operated at any frequency program switches. The center frequency shall be clearly visible through or on the front of each transmitter and receiver. Such indication shall always correspond to the frequency of the elements currently operating in each module. Contractor shall supply 500 complete sets of pre-printed tags for labeling the units indicating the center frequency.

(i) Transmitters and receivers shall work into a communication link with standard impedance of 600 ohms.

(j) Transmitters and receivers shall be individually fused.

Materials.

(a) General

(1) Receivers, transmitters and power supplies shall be capable of operation in field cabinets which provide protection against direct contact with the elements with no special provisions for environment control.

(2) All field located tone equipment shall be mounted in the surveillance cabinets as designated elsewhere in these specifications.

(3) All field located tone equipment shall be capable of operation on a temperature range of -22 degrees F to 140 degrees F (-30° to +60° C) and shall have P.C. boards coated for protection against humidity in the range of 0% to 96%.

(4) All field tone equipment shall be capable of being tipped, while in operation, from the vertical to the horizontal position and back again, without having adverse effect on the continuous operation of the transmitter, receiver or power supply

(b) Power Supply

(1) The power supply shall operate on input voltage of 117 VAC allowing for 10% variation in line voltage.

(2) The power supply shall provide a regulated 12 VDC output at 1.7 amps.

(3) Each tone equipment mounting frame field located or office located, shall have its own regulated power supply, capable of operating at least ten tone modules in any combination of transmitters and receivers.

(4) The front panel of the power supply shall have an on/off switch and a Red LED that indicates the status of the output DC voltage.

(5) The power supply shall contain a switch and L.E.D. on the front panel to permit the monitoring of the supply voltage with the existing Traffic Systems Center tone test meter.

(6) The power supply shall be fused.

(7) The power supply shall have a DC voltage control.

(c) Transmitter

(1) The tone transmitter shall operate on an input of a regulated 12 VDC.

(2) The tone frequencies shall be programmable in the audio frequency range between 120 and 3800 hertz.

(3) The transmission quality shall be such that there may be as many as 20 channels of tone transmitters operating over one telephone pair with perfect discrimination by the associated tone receivers. The frequency of one tone transmitter shall have no adverse effect on the operation of the frequency of any other transmitter connected to the same telephone pair.

(4) Output level of tone transmitters shall be adjustable over a range of -40 to +13 dBm.

(5) Transmitter harmonic output shall be at least 42 dB down from the fundamental for each harmonic component.

(6) Each unit furnished shall have an external jumper wire on the barrier type terminal block to provide a two frequency space-hold operation.

(7) The transmitter shall be capable of holding any of its assigned frequencies (mark, space) continuously without degradation in life of performance.

(8) Each transmitter shall be capable of test operation of at least 30 pulses per second.

(9) No transmitter plugs shall be required for tone output. A toggle switch thru the faceplate shall put the transmitter "on line" and "off line".

(10) The transmitter shall have L.E.D. indicators for Mark-Red, Space-Yellow and Carrier-Green visible through the face panel.

(11) Test points through front face plate shall be provided to test for DC voltage levels.

(d) Receiver

(1) The requirements as to the programmable channel frequency range, channel spacing, holding of shifted frequency, and operating voltage shall be the same as those for 3 Frequency Transmitter.

(2) Input sensitivity of tone receiver shall be adjustable down to -45 dBm. The dynamic range shall be 25 dB.

(3) Adjacent channel attenuation shall be at least 35 dB.

(4) Each receiver shall be capable of test operation of at least 30 pulses per second.

(5) Each receiver shall have one single pole, double throw, mark relay output and one single pole, double throw space output relay.

(6) Each receiver shall also have a carrier detector circuit with one single pole, double throw relay output.

(7) All output relay contacts shall be capable of handling a minimum of 30 VA continuously. Any substitution shall be subject to written approval of the Engineer.

(8) Receiver shall have L.E.D. indicators for Mark-Red, Space-Yellow and Carrier-Green, visible through the face panel.

(9) Receiver shall operate in a space hold, 2 state operation.

(10) An attenuation plug shall be provided to set sensitivity level of receiver.

(11) Each receiver shall come with 2 spare relays as outlined in Sec. (d) (5) of this material specification.

(12) Test points through front face plate shall be provided to test for DC voltage levels.

(e) Mounting Frame

(1) Under this item, for a unit price each, the Contractor shall furnish and install an Iniven 1X 11-1 mounting rack or equivalent in strict accordance with the requirements specified herein.

(2) Each tone equipment mounting frame field located or office located, shall have with power supply added, 11 slots capable of operating at least ten tone modules in any combination of transmitters and receivers.

(3) Each mounting frame shall provide a separate barrier type terminal block with screw-type terminal for each transmitter, receiver, and power supply.

(4) Each mounting frame shall be constructed of steel with zinc bonderizing and hard baked finish of gold metallic epoxy paint.

(5) Where the mounting frame is not completely filled with tone modules, the unused modules spaces shall be provided with the barrier type terminal blocks, within each mounting frame, shall be wired to the 12 VDC power supply.

(6) Each mounting frame for the field equipment shall be of a size that shall hold the power supply, all transmitters and all receivers required at each field cabinet as specified elsewhere in these Special Provisions.

(7) In all field cabinet locations where mounting frames are specified the mounting frames shall be bolted to the rear wall of the cabinet by means of a swing bracket as per field mounting frame with cradle assembly drawing #TY-1TSC 400#6.

(8) The bracket cradle shall have three (3) position stops: horizontal, 45 degree and vertical.

(9) The bracket cradles shall be constructed of ¼" (6.35mm) steel, cadmium plated with an irridite finish, as shown on plan for cradle assembly drawing #TY-1TSC 400#7.

Basis of Payment.

Power Supply

This item shall be paid for at the contract unit price each for TONE EQUIPMENT - POWER SUPPLY, installed, operating, and completely in place.

Terminal boards, wiring, and miscellaneous hardware will not be paid for separately, but shall be considered as incidental to the cost of this item.

Transmitter

This item will be paid for at the contract unit price each for TONE EQUIPMENT - 3 FREQUENCY TRANSMITTER PROGRAMMABLE, installed, operating and completely in place.

Terminal boards, wiring, and miscellaneous hardware will not be paid for separately, but shall be considered as incidental to the cost of this item.

Receiver

This item will be paid for at the contract unit price each for TONE EQUIPMENT - 3 FREQUENCY RECEIVER PROGRAMMABLE, installed, operating, and completely in place.

Terminal boards, wiring, optical-isolator, relays, cable assemblies and miscellaneous hardware will not be paid for separately, but shall be considered as this item.

Mounting Frame

This work shall be paid at the contract unit price each for TONE EQUIPMENT – MOUNTING FRAME, which shall be payment in full for all work as described herein and as directed by the Engineer.

REMOVE EXISTING SURVEILLANCE CAMERA EQUIPMENT

Description. This work shall consist of removal and transportation of equipment as shown on the plans and described in this Special Provision. Work includes the following:

(a) Removal of a vehicle detection surveillance station cabinet, including all equipment inside the cabinet.
(b) Securely packing surveillance tone equipment and associated components, cabinets and internal equipment, and safely delivering all items to the Department (District 1 headquarters) or Electrical Maintenance Contractor as directed by the Engineer.
(c) There is no CCTV camera equipment to be removed for this contract.

Materials. None.

CONSTRUCTION REQUIREMENTS

General. No removal work will be permitted without approval from the Engineer. The Contractor shall set up a meeting with the State's Electrical Maintenance Contractor (EMC) and the Traffic Systems Center (TSC) Engineer. The EMC and TSC Engineer shall be notified at least 48 hours in advance of the meeting. This meeting shall be scheduled within two weeks after contract is awarded.

The meeting shall be at each cabinet to determine the condition of equipment. Any equipment that is to be salvaged that is damaged after this meeting shall be repaired or replaced at the contractor's expense, to the satisfaction of the Engineer. The equipment that is not salvaged shall be disposed of as directed by the Engineer and all debris removed beyond the right-of-way.

The condition of the equipment shall be documented and signed by representatives of the TSC, EMC and the Contractor. A copy shall be given to the Engineer.

If this meeting does not occur, then all of the equipment will be assumed to be in working condition. Any equipment that is not in working condition upon delivery shall be repaired or replaced at the Contractor's expense.

Removal Details. The equipment shall be removed in accordance with the following applicable sections of the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction:

(a) **Concrete Foundation**: Section 895. This shall be paid for in the Remove Existing Concrete Foundation pay item.
(b) **Handhole**: Section 895. This shall be paid for in the Remove Existing Handhole pay item.
(c) **Electric service installation**: Section 845. This shall be paid for in the Removal of Electric Service Installation pay item.
(d) **Cabinet**: Section 845. All cabinets shall be removed and salvaged as directed by the Engineer. This shall be paid for under this pay item.
(e) **Conduits**: Existing underground conduits shall be abandoned.
(f) **Induction Loops**: Existing Induction Loops to be abandoned
(g) **Cabinet Electronic Equipment**: All of the Transmitters, Receivers, Power Supplies and Loop Detectors shall be salvaged and sent to the Electrical Maintenance Contractor or Department as directed by the Engineer. This shall be paid for under this pay item

The Contractor shall provide and utilize equipment appropriate for removing the designated equipment.

Protection of Equipment. Upon removal, equipment shall be immediately packaged in suitable containers for protection for delivery. Containers shall become the property of IDOT upon delivery. The contents of each container shall clearly identify the contents, source location and date of removal on the outside of the container.

The Contractor shall deliver the cabinet and equipment inside the cabinet to the Department or EMC as directed by the Engineer. All components which the Engineer designates as salvage shall be removed, boxed in containers, approved by the Engineer, and delivered and unloaded at a facility of the Department, as designated by the Engineer. Packaging material required for proper shipping shall be included. Materials that are not salvaged shall become the property of the Contractor and shall be disposed of according to Article 202.03.

The Contractor shall prepare a printed delivery receipt to be signed by a representative of the recipient. A copy of this signed receipt shall be provided to the Engineer.

Any damage resulting from the removal and/or transportation of equipment and associated hardware that are to be salvaged, shall be repaired or replaced in kind. The Engineer will determine the extent of damage and the suitability of repair and/or replacement.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE EXISTING SURVEILLANCE CAMERA EQUIPMENT, which shall be payment in full for all labor, material removal, and transportation to EMC or Department necessary to complete the work as described above.

SURVEILLANCE CABINET, MODEL 334 (D-1)
Effective: Nov. 11, 2009

Description

Work under this item shall consist of furnishing and installing a Model 334 cabinet for field equipment including fiber optic communications, ramp meter and system detector stations, and dynamic message signs as shown on the Plans and hereinafter provided.

Materials

General

Cabinet, Model 334 shall be a durable, weatherproof enclosure, constructed of 3/16 in. (4.75mm) thick aluminum or 1/8 inch (3.175 mm) thick aluminum lined with bullet resistant fiberglass panels that shall be UL listed and tested for UL752 Level 3 with a nominal thickness of ½ inch (12.7mm) maximum, and a nominal weight of 5.0 lbs. per square foot (24.5 kg per square meter) maximum. The cabinet shall have a nominal outside dimension of 66 in. (1.7m) height x 24 inches (600mm) wide X 30 inches (762mm) deep. Cabinet, Model 334 shall consist of the following components: double door each equipped with a Corbin # 2 Brass lock or equal for front and rear cabinet entry, housing, mounting cage, power distribution assembly, service panel, thermostatically controlled fan, and all necessary mounting hardware and wiring, and other equipment, as shown on the Plans and specified in these special provisions.

All bolts, nuts, washers, screws, hinges, and hinge pins that are subject to corrosion shall be stainless steel unless otherwise specified. All equipment under this item shall be in accordance with Section 1074.03 of the Standard Specifications except as modified herein.

Cabinet Components

The housing and the mounting cage assembly shall conform to those of the Model 334 cabinet provisions of the “Traffic Signal Control Equipment Specifications” (TSCES) issued by the State of California, Department of Transportation, and to all addenda thereto current at the time of project advertising. The housing shall be rainproof with the top of the enclosure crowned to prevent standing water. All exterior seams for the enclosure and doors shall be continuously welded and shall be smooth. The housing shall have no provisions for a police panel or door.

The cabinet shall have single front and rear doors, each equipped with a Corbin # 2 lock. The enclosure door frames shall be double flanged out on all 4 sides and shall have strikers to hold tension on and form a firm seal between the door gasketing and the frame. The front and rear doors shall be provided with catches to hold the door open at both 90 and 180 +/- 10 degrees. Gasketing shall be provided on all door openings and shall be dust-tight. For horizontal support and bolt attachment, cage bottom support mounting angles shall be provided on either side, level with the bottom edge of the door.

The latching handles on the doors shall have provisions for padlocking in the closed position. When the door is closed and latched, the door shall be locked. The locks and handles shall be on the right side of the front door and the left side of the rear door. The lock and lock support shall be rigidly mounted to the door. The locks shall be Corbin #2 and two keys shall be supplied to the Department with each lock. The keys shall be removable in the locked position only.

The front and rear doors shall be provided with louvered vents. A removable and reusable air filter shall be housed behind the door vents. The filter filtration area shall cover the vent opening area, and the filter shell shall be provided that fits over the filter providing mechanical support for the filter. The shell shall be louvered to direct the incoming air downward.

The intake (including filter with shell) and exhaust areas shall pass a minimum of 60 cubic feet (1.7 cubic meters) of air per minute for housing #1 and 26 cubic feet (0.74 cubic meters) of air per minute for housing #2. The thermostatically controlled fan with ball or roller bearings shall be mounted within the housing and vented. The fan shall provide a capacity of at least 150 cubic feet (4.25 cubic meters) of free air delivery per minute of ventilation. The fan shall be thermostatically controlled and activated when the temperature inside the cabinet exceeds 75º F (24º Celsius), and shut off when the temperature is less than 64ºF (18º Celsius). In addition, the fan shall be manually adjustable for automatic turn on and off. The fan circuit shall be protected at 125% of the fan motor ampacity.

The housing shall also be equipped with a heating element installed in the bottom front of the cabinet and mounted along the side of the rack. The heating element shall draw 500 watts and have an output of at least 1500 watts (7900 Btu/hr). The heater shall have a built-in quick response thermostat with sealed contacts that has a temperature control range 40 to 100º F (5 to 39 degrees Celsius), and have a built-in thermal cut-off to automatically shut off the heater in the event of overheating.

All subassemblies shall be mounted in removable 19 in. (482 mm) EIA self-standing rack assemblies. The EIA rack portion of the cage shall consist of 2 pairs of continuous, adjustable equipment mounting angles that comply with Standard EIA RS-310-B. The cage shall be centered within the cabinet and bolted to the cabinet at 4 points.

Each cabinet shall be equipped with 2 shelves. Shelves shall be the full width of the rack and 12 in. (300mm) deep. The shelves shall be designed to support a minimum of 50 lbs. (23 kg).

The power distribution assembly shall be as shown on Plans and shall consist of input files that are common to both 332 and 336 type cabinets and provides 9 AC outputs and up to 28 isolated inputs. The power distribution assembly shall consist of the following: one 30A, 120V main circuit breaker; three 15A, 120V single pole secondary circuit breakers; eight standard 117 VAC controller and equipment receptacles; and one duplex, 3-prong, NEMA GF1 Type 5-15R grounded utility type outlet.

Rating of breakers shall be shown on face of breaker or handle. Breaker function shall also be labeled below breakers on front panel. The first equipment receptacle in the circuit shall have ground-fault circuit interruption as defined in the NEC. Circuit interruption shall occur on 6 mA of ground-fault current. All conductors from the power distribution assembly routed to the cabinet wiring shall be connected to the terminal block on the common side, except for the AC power conductor between the service terminal block and main circuit breaker. All internal conductors terminating at the blocks shall be connected to the other side of the blocks.

Two side panels shall be provided and mounted on the cabinet sidewalls. In viewing from the front door, the left side panel shall be designated as the “input/Communications” and the right side panel shall be designated as the “Service Panel”. The panel shall be drilled and tapped, as necessary, to mount the terminal blocks and other attachments described herein, as well as to mount the panel to the cabinet wall.

The terminal blocks shall be barrier type rated at 20 A 600 V RMS minimum. The terminal screws shall be nickel-plated brass binder head type with screw inserts of same material. The terminals of the power line service terminal block shall be labeled “AC+, AC-, and AC GND”, and shall be covered with a clear insulating material to prevent inadvertent contact. Terminating lugs large enough to accommodate No. 2 conductors shall be furnished for the service terminal block. The terminal block shall be rated for 50 A at 600 V peak, minimum.

The power distribution assembly shall also protect the equipment powered by the assembly from power transients. Over voltage protection shall be provided for the power distribution assembly and shall contain, as a minimum, a surge arrestor, which shall reduce the effect of power line voltage transients and be mounted to the service panel. The arrestor shall have the following minimum features:

Recurrent Peak Voltage:	184 V
Energy Rating (Minimum):	50 J
Power Dissipation, Average:	0.85 W
Peak Current for pulses less than 7 microseconds	1250 A
Stand-by Current for 60 Hz Sinusoidal:	1mA or less

Each cabinet shall be equipped with one fluorescent lighting fixture mounted to the inside top front portion of the cabinet. The fixture shall have an F15-T8 cool white lamp; operated from a normal power factor, UL listed cold weather ballast. A door-activated switch shall be installed to turn the cabinet light on when the front door is opened. The door switch shall be on a separate circuit by itself and used only to turn on the cabinet light.

Each cabinet shall be supplied with a heavy-duty plastic envelope to store plans, wiring diagrams, schematics, etc. This envelope shall have metal grommets so that it hangs from the door hooks. The envelope shall have minimum dimensions of 10 in. (250mm) x 15 in. (381mm).

Foundations shall conform to those shown on Detail sheet “Cabinet Model 334 Details” of the plans. The foundation is paid for separately.

Each Induction Loop shall have lightning protection. The Contractor shall furnish and install stud-mounted lightning protection devices. The device shall have three-terminals, two of which are connected across the loop input of the detector for differential mode protection and the third terminal grounded to protect against common mode damage. Differential mode surge shall be clamped by the semi-conductor array instantly and common mode surge shall be handled by three element gas discharge tube which fires at 400VDC and thereafter clamps the two loop leads to 30 volts in respect to ground. The device shall be installed in close proximity to the loop input. Extension of the factory leads of the device shall not be allowed.

Identification

The Cabinet, Model 334 shall be identified and labeled with external markings as specified in Article 1069.06 of the Standard Specifications and as shown on the Plans.

Construction Requirements

The Contractor shall deliver the Cabinet Model 334 mounted on a plyboard-shipping pallet that is bolted to the cabinet base. The cabinet shall be enclosed in a slipcover cardboard packaging shell. The housing doors shall be blocked to prevent movement during transportation to the site.

The Contractor shall securely fasten the Cabinet Model 334 on the new concrete foundation at the locations shown on the Plans. The Contractor shall confirm the orientation of the Cabinet Model 334 installation and its front door side with the Engineer prior to installation. Stainless steel bolted connections shall be provided with lock-washers, locking nuts, or other approved means to prevent the connection nuts from backing off. Dissimilar materials shall be isolated from one another by stainless steel fittings.

The Contractor shall make all power connections to the cabinet in accordance with the Plans and as required. The neutral bus shall be isolated from the cabinet and equipment ground. It shall terminate at the neutral lug ultimately attached to the meter pedestal. All conductors used in cabinet wiring shall terminate with properly sized non-insulated (if used, for DC logic only) or clear insulated spring-spade type terminals except when soldered to a through-panel solder lug on the rear side of the terminal block or as specified otherwise. All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor. Cabling shall be routed to prevent conductors from being in contact with metal edges. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

All equipment in the cabinet, when required, shall be clearly and permanently labeled using marker strips. The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item that they are to identify and must be clearly visible with the items installed.

Tests

Cabinet Acceptance Test – in addition to the environmental and design approval tests specified in the FHWA Type 170 Traffic Signal control System Hardware Specification, the following water spray test shall be performed for each type of cabinet:

> Spray water from a point directly overhead at an angle of 60º from the vertical axis of the cabinet. Repeat for each of eight equally spaced positions around the cabinet for a period of five minutes in each position. The water shall be sprayed using a domestic type sprinkling nozzle at a rate of not less than 10 gal./min (40 liters/min) per square foot (0.1 meters) of surface area. The cabinet shall then be inspected for leakage. Evidence of water leakage shall be cause for rejection.

Operational Standalone Test: The operational standalone test for each Cabinet, Model 334 installed shall consist of the following:

Visual inspection of the cabinet and its contents for workmanship
Verification of the cabinet grounding in accordance with Article 1074.03 (a)(4) of the Standard Specifications
Measurement of the voltage at the input panel

Documentation

Shop drawings and wiring lists showing the proposed layout of each type of cabinet shall be submitted to the Engineer for approval prior to the start of fabrication. Wiring lists for the internal manufacturer cut sheets for all electrical equipment included in each type of cabinet shall be included in the submission.

Four copies of drawings showing the wiring for each cabinet shall be provided. One copy shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

For each cabinet, four copies of a configuration of the equipment reporting to that cabinet shall be provided. The sheet shall also list field settable options for the equipment contained in the cabinet. This shall include device addresses and output voltage settings for power supplies. One of these copies shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

Warranty

The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. The warranty shall warrant and guarantee repair of the component parts of the Cabinet Model 334 furnished by the Contractor that prove to be defective in workmanship and materials during the first two years of operation as defined and noted above at no additional cost to the Department.

The Engineer will notify the Contractor that a warranted item needs repair. The Contractor shall acknowledge the notification within 24 hours and replace or correct any part or parts of materials and equipment that are found defective within the two-year in-service warranty period. All items needing repair shall be returned to the Department in two weeks from the date of receipt at the Contractor's facility or replaced in-kind by the Contractor, and the Contractor shall be responsible for any return shipping costs. No compensation will be made to the Contractor for such replacements or corrections.

The Contractor shall provide a warranty certificate for this item and its related components to the Department. The Department reserves the right to transfer this service to other parties who may be contracted with in order to provide overall maintenance of this item.

Method of Measurement

This item shall be measured as each CABINET, MODEL 334, installed, tested, accepted, complete, and fully operational.

Basis of Payment

CABINET, MODEL 334, measured as provided above, will be paid for at the contract unit price each, which price shall be payment in full for furnishing and installing the cabinet and all connections, testing, and for all labor, tools, equipment, transportation, and incidentals necessary to complete this item of work.

EQUIPMENT CABINET

Description. This work shall consist of all materials and labor required to install a pole mounted equipment cabinet.

Materials.

General

The Cabinet, Model 336 shall be a durable, weatherproof enclosure, constructed of 3/16 in. (4.75mm) thick aluminum or 1/8 inch (3.175 mm) thick aluminum lined with bullet resistant fiberglass panels that shall be UL listed and tested for UL752 Level 3 with a nominal thickness of ½ inch (12.7mm) maximum, and a nominal weight of 5.0 lbs. per square foot (24.5 kg per square meter) maximum. The cabinet shall be sized to adequately house all required components with extra space for arrangement and termination of wiring. The minimum size of the cabinet shall have a nominal outside dimension of 46 in. height x 24 inches wide X 24 inches deep. Cabinet, Model 336 shall consist of the following components: double door each equipped with a Corbin # 2 Brass lock or equal for front and rear cabinet entry, housing, mounting cage, power distribution assembly, service panel, thermostatically controlled fan, and all necessary mounting hardware and wiring, and other equipment, as shown on the Plans and specified in these special provisions.

All bolts, nuts, washers, screws, hinges, and hinge pins that are subject to corrosion shall be stainless steel unless otherwise specified. All equipment under this item shall be in accordance with Section 1074.03 of the Standard Specifications except as modified herein.

Ground and Neutral Bus Bars. A single copper ground and neutral bus bar, mounted on the equipment panel shall be provided. Ground and neutral conductors shall be separated on the bus bar. Compression lugs, plus 2 spare lugs, shall be sized to accommodate the cables with the heads of the connector screws painted green for ground connections and white for neutral connections.

Utility Services Connection. Where required; the Contractor shall notify the Utility Company marketing representative a minimum of 30 working days prior to the anticipated date of hook-up. This 30 day advance notification will begin only after the Utility Company marketing representative has received service charge payments from the Contractor. Prior to contacting the Utility Company marketing representative for service connection, the service installation controller cabinet and cable must be installed for inspection by the Utility Company.

Construction. The Contractor shall confirm the orientation of the installation and its door side with the engineer, prior to installation. All conduit entrances into the service installation shall be sealed with a pliable waterproof material.

The Contractor shall confirm the orientation of the Cabinet Model 336 installation and its front door side with the Engineer prior to installation. Stainless steel bolted connections shall be provided with lock-washers, locking nuts, or other approved means to prevent the connection nuts from backing off. Dissimilar materials shall be isolated from one another by stainless steel fittings.

The Contractor shall make all power connections to the cabinet in accordance with the Plans and as required. The neutral bus shall be isolated from the cabinet and equipment ground. It shall terminate at the neutral lug ultimately attached to the meter pedestal. All conductors used in cabinet wiring shall terminate with properly sized non-insulated (if used, for DC logic only) or clear insulated spring-spade type terminals except when soldered to a through-panel solder lug on the rear side of the terminal block or as specified otherwise. All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor. Cabling shall be routed to prevent conductors from being in contact with metal edges. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

All equipment in the cabinet, when required, shall be clearly and permanently labeled using marker strips. The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item that they are to identify and must be clearly visible with the items installed.

The equipment cabinet shall meet the testing, documentation, warranty requirements of the Cabinet, Model 334.

Basis of Payment. This work will be paid for at the contract unit price per each for EQUIPMENT CABINET which price shall be payment in full for furnishing and installing the cabinet and all connections, testing, and for all labor, tools, equipment, transportation, and incidentals necessary to complete this item of work.

FIBER OPTIC INNERDUCT (D-1)
Effective: April 1, 2005

1. Description.

This item shall consist of furnishing, installing, splicing, connecting and demonstrating continuity of fiber optic cable innerduct of sizes specified herein and as shown on the contract drawings. The innerduct shall be High Density Polyethylene.

2. Materials.

2.1 General:
The duct shall be a spiral ribbed 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 ribbed duct shall have internally designed longitudinal ribs for reduced pulling frictions and increased lubrication effectiveness.

The duct shall be made of high density polyethylene which shall meet the requirements of ASTM D 3035. The innerduct material shall be composed of high density polyethylene meeting the requirements of PE334470E/C as defined in ASTM D3350.

Submittal information shall demonstrate compliance with the details of these requirements.

2.2 Dimensions:
Duct dimensions shall conform to the standards listed in ASTM D3035, SDR-11. Submittal information shall demonstrate compliance with these requirements.

Nominal Size (diameter)	Inside Diameter (minimum)	Outside Diameter (Average)	Wall Thickness (Min.)	Bend Radius (minimum)	Pull Strength	Weight Average (lbs/100ft.)
1”	1.030”	1.315”	0.120”	14”	500	19
1.25”	1.313”	1.660”	0.151”	17”	750	31
1.5”	1.506”	1.900”	0.173”	19”	1000	40
2”	1.885”	2.375”	0.216”	24”	1600	60

2.3 Marking:
As specified in NEMA Standard Publication No. TC-7, the duct shall be clearly and durably marked at least every 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.

2.4 Color:
Innerduct shall be colored as follows or as directed by the Engineer.

Usage Designation	**Color**
Fiber Optic Trunk Cable (Ducts containing cables of 96 fibers)	Orange
Fiber Optic Distribution Cable (Ducts containing cables of 12, 6, or 4 fibers and 96 fiber ducts designated as distribution fibers)	Blue

3. Installation.

3.1 Pulling Tension.
Pulling tension of the duct shall be monitored throughout the pull and pulling tension shall not exceed those listed in the table or the specific manufacturer maximum pulling tensions as indicated in the catalog cut submittals. Failure to monitor the pulling tension will result is non-payment of that particular duct span and the span may be reinstalled with new duct at no additional cost to the State. Lubricants used shall be compatible with the duct.

3.2 Junction boxes.
Where duct passes through junction and/or pull boxes, the duct shall remain continuous unless a break is specifically indicated in the plans or as directed by the Engineer.

3.3 Handholes.

Where duct passes through handholes, the duct shall be looped uncut within the handhole unless otherwise indicated on the Plans or directed by the Engineer.

Bends.

Minimum bending radius shall be in accordance with the above table or the manufacturer's recommended radius, whichever is larger. Bends shall be made so that the duct will not be damaged and the internal diameter of the duct will not be effectively reduced. The degrees of bend in one duct run shall not exceed 360º between termination points.

3.4 In Trench

Where duct is installed in trench, it shall be placed in the bottom of the trench after all loose stones have been removed and all protruding stones have been removed or covered with backfill material as directed by the Engineer.

Where duct is shown to be installed in trench, it shall be installed at a depth not less than 30 inches unless otherwise indicated or specifically directed by the Engineer.

The inner duct may be plowed into place. Unless otherwise indicated or specifically approved by the Engineer, plowing of inner duct shall lay the duct in place and shall not pull the duct through the length of the cut behind a bullet-nose mandrel or similar apparatus. In all cases, plowing operations shall be non-injurious to the duct.

3.5 In Raceway

Where duct is installed in raceways, lubricating compounds shall be used where necessary to assure smooth installation.

3.6 Encased in Concrete

Concrete shall be class SI complying with Section 720 of the Standard Specifications.

Steel Reinforcement Bars. Steel reinforcement bars shall comply with Section 706.10 of the Standard Specifications.

Underground concrete-encased conduit shall be supported on interlocking plastic spacers specifically designed for the purpose spaced along the length of the run as recommended by the manufacturer. Spacing between raceways within a common duct dank shall be not less than 2 inches. The interlocking spacers shall be used at a minimum interval of 8 ft.

Concrete cover overall shall not be less than 3 inches all around the encased run. Space below the conduit and concrete fill shall be assured. Care shall be exercised during concrete placement to assure that there are no voids, so that spacers are undisturbed, and so that conduit joints stay secure and unbroken. Concrete shall be deflected during placement to minimize the possible damage to or movement of the conduits.

Conduit encased in concrete shall have steel reinforcing where installed below roadway or other paved vehicle areas (including shoulder) and the reinforcement shall extend not less than 5 feet additional from the edge of pavement unless otherwise indicated. Steel reinforcement shall not be less than No. 4 bars at corners and otherwise spaced on 12-inch centers, tied with No. 4 bars on 12-inch centers.

The Engineer shall examine all conduit joints for compliance with section 5 of this specification before concrete is poured.

3.7 Embedded

Conduit embedded in structure shall be supported on interlocking plastic spacers specifically designed for the purpose spaced along the length of the run as recommended by the manufacturer. Spacing between raceways within a common structure shall be not less than 2 inches. The interlocking spacers shall be used at a minimum interval of 8 ft.

Concrete cover overall shall not be less than 3 inches all around the embedded run. Space below the conduit and concrete fill shall be assured. Care shall be exercised during concrete placement to assure that there are no voids, so that spacers are undisturbed, and so that conduit joints stay secure and unbroken. Concrete shall be deflected during placement to minimize the possible damage to or movement of the conduits.

The Engineer shall examine all conduit joints for compliance with section 5 of this specification before concrete is poured.

4. Joints

4.1 All HDPE duct to HDPE duct joints shall be made with an approved duct fusion splicing device.

4.2 HDPE coilable non-metallic conduit to non-HDPE coilable non-metallic conduit joints shall be either made with an approved mechanical connector or with a chemical compound. Both methods must be specifically designed for joining HDPE coilable non-metallic conduit. Minimum pullout force for the chemical compound shall be as listed in the following table.

Nominal Size		**Pullout Force**	
mm	**in**	**N**	**Lbs**
31.75	**1.25**	**2400**	**540**
38.1	**1.50**	**2535**	**570**
50.8	**2.0**	**3335**	**750**
63.5	**2.5**	**4445**	**1000**
76.2	**3.0**	**6225**	**1400**
101.6	**4.0**	**8890**	**2000**

5. Measurement

The duct shall be measured for payment in linear feet in place as described herein. Measurements shall be made in straight lines between horizontal changes in direction between the centers of the terminating points (poles, cabinets, junction boxes). Vertical measurement of the duct shall be as follows:

For runs terminating at junction boxes and/or control cabinets, the vertical measurement shall be taken from the bottom of the trench, or horizontal raceway, to a point 18 inches beyond the center of the junction box or control cabinet.

For runs terminating at poles, the vertical measure shall be taken from the bottom of the trench, or horizontal raceway, to a point 18 inches beyond the center of the light pole handhole regardless of light pole mounting method

Innerduct installed in excess of the limits describes herein shall not be paid for.

6. Basis of Payment

This item will be paid for at the contract unit price per foot for FIBER OPTIC INNERDUCT, of the size of duct as indicated, which shall be payment in full for all material and work as specified herein.

RADAR VEHICLE DETECTION SYSTEM

General. This work shall consist of furnishing, installing, and placing into operation a temporary radar vehicle sensing device (RVSD) and appurtenant communications equipment and cabling on a temporary wood pole with an equipment cabinet. The RVSD must be compatible with the Department's existing ATMS software drivers.

RVSD

Sensor Detection. The RVSD shall be equivalent to the Image Sensing Solutions RTMS G4 or Wavetronix SmartSensor HD and shall provide volume average speed, occupancy, classification counts, 85th percentile speed, average headway, average gap, speed bin counts and direction counts for user-configurable time intervals for a minimum of 8 lanes of traffic.

- The RVSD shall provide up to 8 length-based classification bins.
- The RVSD shall provide up to 15 speed bins.
- The RVSD shall provide speed, length, class, lane assignment, and range data for each vehicle detection.
- The RVSD shall provide presence data for at least 8 lanes of traffic.

Detectable Area.

Detection Range. The RVSD shall be able to detect and report information in lanes located with the far boundary at a minimum of 200 ft. from the base of the pole on which the RVSD is mounted.

Barrier Performance. The RVSD shall detect vehicles with the specified accuracy in lanes that are adjacent to a barrier when 50% of a sedan is visible over the barrier from the point of view of the RVSD.

Performance.

Volume Accuracy. The volume data shall be within 5% of truth for a direction of travel during nominal conditions.

Speed Accuracy. Average speed data shall be accurate to within 3 mph (5 kph) for any direction of travel when there are more than 5 cars per lane in an interval. The RVSD shall measure speed using a dual-radar speed trap that calculates the time delay between two different radar beams.

Occupancy Accuracy. Occupancy data shall be within 10% of truth for any direction of travel on a roadway during nominal conditions.

Classification Accuracy. The RVSD shall correctly determine classification for 80% of detected vehicles when the classification bins are at least 10 ft. (3 m) wide and occupancy of all lanes is below 30%.

Performance Maintenance. The RVSD shall not require cleaning or adjustment to maintain performance.

The RVSD shall not rely on battery backup to store configuration information, thus eliminating any need for battery replacement.

Once the RVSD is calibrated, it shall not require recalibration to maintain performance unless the roadway configuration changes.

The designed mean time between failures (MTBF) of the RVSD, operating continuously, shall be 10 years or more.

Physical Properties. The RVSD shall not exceed 8 lbs in weight. The RVSD shall not exceed 14 in. by 12 in. by 6 in. (35.6cm x 30.5cm x 15.2cm) in its physical dimensions. All external parts of the RVSD shall be ultraviolet-resistant, corrosion-resistant, and protected from fungus growth and moisture deterioration.

Enclosure. The enclosure shall be classified "f1" outdoor weatherability in accordance with UL 746C. The RVSD shall be classified as watertight according to the NEMA 250 Standard. The RVSD enclosure shall conform to test criteria set forth in the NEMA 250 standard for type 4X enclosures. Test results shall be provided for each of the following type 4X criteria:

- External Icing (NEMA 250 clause 5.6)
- Hose-down (NEMA 250 clause 5.7)
- 4X Corrosion Protection (NEMA 250 clause 5.10)
- Gasket (NEMA 250 clause 5.14)

The RVSD enclosure shall include a connector that meets the MIL-C-26482 specification. The MIL-C-26482 connector shall provide contacts for all data and power connections.

Power Requirements. The RVSD shall consume less than 10 W. The RVSD shall operate with a DC input between 12 VDC and 28 VDC.

Communication Ports. The RVSD shall have an RS-485 port and an RS 232 port. The RVSD shall have contact closure pairs for each lane in order to communicate with existing locations. The RS-232 port shall be full-duplex and shall support true RTS/CTS hardware handshaking for interfacing with various communication devices. The RVSD shall support the upload of new firmware into the RVSD's non-volatile memory over either communication port. The communication ports shall support all of the following baud rates: 9600, 19200, 38400, 57600, and 115200 bps.

Data Protocols. The RVSD shall support 3 different data protocols for all lanes being monitored: interval (bin) data, event (per vehicle) data, and real-time true presence data. The interval (bin) data packet protocol shall support:

- Sensory ID
- A timestamp
- Total volumes
- Average speed values
- Occupancy in 0.1% increments
- Volume in up to 8 length-based user-defined vehicle classification bins
- Volume for both directions of traffic (bin by direction)
- 85th percentile speed in either mph or kph

The real-time true presence data packet protocol shall support:

- Sensor ID
- True presence information for each lane

Data Buffering. The RVSD shall store, in non-volatile memory, at least 9,000 interval data packets.

Radar Design. The RVSD shall employ a dual radar design that includes 2 receive channels. The RVSD shall not rely on temperatures compensation circuitry to maintain transmit frequency stability.

Antenna Design. The RVSD antennae shall be designed on printed circuit boards.

Resolution. The RVSD shall transmit a signal with a bandwidth of at least 240 MHz

RF Channels. The RVSD shall provide at least 4 RF channels so that multiple units can be mounted in the same vicinity without causing interference between them.

Configuration.

Auto-configuration. The RVSD shall have a method for automatically defining traffic lanes or detection zones without requiring user intervention.

Manual configuration. The auto-configuration method shall not prohibit the ability of the user to manually adjust the RVSD configuration. The RVSD shall support the configuring of lanes or detection zones in one-ft. (0.3-m) increments.

Windows Mobile–based Software. The RVSD shall include graphical user interface software that displays all configured lanes and the current traffic pattern, as well as, measured speed or length. The graphical interface shall operate on Windows Mobile Windows 2000, windows XP and Windows Vista in the .NET framework.

- Automatically find the correct baud rate
- Operate over a TCP/IP/NTCIP connection

Operating Conditions. The RVSD shall maintain accurate performance in all weather conditions. The RVSD shall be capable of continuous operation over an ambient temperature range of 40ºF to 165.2ºF (-40ºC to 74ºC). The RVSD shall be capable of continuous operation over a relative humidity range of 5% to 95% (non-condensing).

Testing.

FCC. Each RVSD shall be Federal Communication Commission (FCC) certified under CFR 47, Part 15, section 15.249 as an intentional radiator.

NEMA TS2-2003 Testing. The RVSD shall comply with the applicable standards stated in the NEMA TS2-2003 Standard.

Manufacturing. The internal electronics shall comply with the requirements set forth in IPC-A-610C Class 3, Acceptability of Electronic Assemblies.

Support. The RVSD manufacturer shall provide both training and technical support services.

Training. The manufacturer provided training shall be sufficient to fully train installers and operators in the installation, configuration, and use of the RVSD to ensure accurate RVSD performance. The training shall be conducted locally. The manufacturer provided training shall consist of comprehensive classroom labs and hands-on, in-the-field installation and configuration training. Presentations shall be followed by hands-on labs in which trainees shall practice using the equipment to calibrate and configure a virtual RVSD. The manufacturer-provided training shall include the following items:

- Knowledgeable trainer
- Presentation materials
- Computer files
- Laptop computers

Field training shall provide each trainee with the hands-on opportunity to install and configure the RVSD at roadside.

Technical Assistance. Manufacturer-provided technical support shall be available to assist with the physical installation, alignment, auto-configuration, troubleshooting, maintenance and replacement of each RVSD.

Documentation. RVSD documentation shall include a comprehensive user guide as well as an installer quick reference guide and a user quick-reference guide. The RVSD manufacturer shall supply the following documentation and test results at the time of the bid submittal:

- Volume accuracy data, including performance analyses for:
  - Free-flowing traffic
  - Traffic with a lane roughly 8 ft (2.4m) beyond a 4-ft. (1.2m) concrete barrier
  - 6-ft. (1.8-m) and 240-ft. (73.2m) lateral offset (simultaneous)
- Speed accuracy test data for both per-vehicle and average speed
- Occupancy accuracy test data
- Vehicle classification test data
- Auto-configuration documentation
- FCC CFR 47 certification
- NEMA 250 Standard for Type 4X Enclosure third-party test data
- NEMA TS2-2003 Standard third-party test data

The RVSD shall be warranted free from material and workmanship defects for a period of 2 years from date of shipment.

Terminal Server. If the RVSD does not have a direct Ethernet connection, then a new, rugged terminal server shall be provided with each RVSD at no additional cost to the Department. The terminal server shall be an IP addressable device that converts RS-232/RS-422/RS-485 serial communications protocols to 10/100 Base T/TX Ethernet protocol. The terminal server shall be fully compatible with the RVSD and shall meet the following requirements:

- Serial ports (minimum two ports)
  - Electronic Industries Association (EIA) 232/422/485, switch selectable.
  - Baud rates [50 bits per second (bps) to 230 kilobits per second (Kbps)]; parity (none, even, odd, mark, space); stop bits (1, 2) and full control of serial parameters including but not limited to:
    - Data Terminal Ready (DTR)
    - Data Carrier Detect (DCD)
    - Data Set Ready (DSR)
    - Clear to Send (CTS)
    - Request to Send (RTS)
  - RTS toggle for half-duplex emulation.

- One 10/100Base-TX Ethernet port that automatically negotiates speed and full-duplex or half-duplex operation.
- Input power must be 120 volts alternating current (VAC).
- Environmental requirements.
    - Operating temperature range: -31 degrees Fahrenheit (F) to 158 degrees F.
    - Operating humidity range of 0 to 95 percent non-condensing.
    - If a separate power adapter is provided, it must be certified by an independent testing company as meeting the above temperature and humidity requirements.
- Diagnostic light emitting diodes (LEDs) for power and Ethernet link status.
- Security.
    - Secure Shell (SSH) version 2.
    - Secure Socket Layer (SSL) version 3/Transport Layer Security (TLS) version 1 that supports Advanced Encryption Standard (AES) 256-bit strong encryption as defined in the Internet Engineering Task Force (IETF) Request for Comments (RFC) 3268 and the Federal Information Processing Standards (FIPS) 197.
- Remote monitoring, diagnostics, and configuration using simple network management protocol (SNMP).
- Ancillary equipment, including ower and communication cables, mounting hardware, and power adapter.

Cellular Modem. A rugged outdoor 3G/4G cellular modem shall be in provided for backhaul communications of outputs from radar vehicle sensing devices (RVSD).

Materials. The cellular modem shall have a small form factor and be manufactured for outdoor use and shall operate in harsh environments (operating temperature range of -22°F to +158°F). It shall be static IP addressable and include an Ethernet interface (10/100 Base-T, RJ45) and LED status indicators. The cellular modem shall support real-time 2-way communications for remote management and shall include management software by the modem manufacturer. The modem shall include an external antenna and cabling for optimum signal reception as recommended by the manufacturer. It shall be include a power supply from the manufacturer of the modem and shall include the manufacturer's installation and operations manuals and documentation of exact equipment model and serial numbers in hardcopy and PDF formats on CD-ROM. The modem shall be approved by Verizon Wireless for use on their network.

Construction Details. The cellular modem shall be mounted securely inside an enclosure as shown on the plans. It shall be placed to minimize the length of antenna cabling. External antenna and cabling shall be installed only if required to achieve reliably consistent signal communications quality. Antenna installation location shall be approved by the Engineer. Power supply and connections shall be installed in accordance with the manufacturer's recommendations. Three copies of the cellular modem product manuals shall be provided to the Department. One copy shall be stored on site inside the equipment cabinet.

Mounting and Installation.

Mounting Assembly. The RVSD shall be mounted directly onto a mounting assembly fastened to a pole or other solid structure as shown on the plans. The RVSD mounting assembly shall be constructed of weather-resistant materials and shall be able to support a 20-lb. (9.1 kg) load.

Mounting Location. The RVSD shall be mounted at a height that is within the manufacturer's recommended mounting heights based on lateral offset from the nearest lane to the mounting pole. Two RVSD units shall not be mounted so that they are pointed directly at each other. The detector bracket shall be attached to the pole with stainless steel straps. Silicon dielectric compound shall be applied to the detector unit base before attaching it to the mounting bracket. Before tightening the bracket is should be aligned to +/- 2 degrees of perpendicular to the roadway and aimed at the detection area. A connector cable is then attached to the unit.

A distance of 40 ft. (12.2 m) or more, along the direction of the roadway, shall separate the RVSDs if they are located on opposing sides of a roadway and the RVSDs shall be configured to operate on different RF channels. It is recommended that the manufacturer be consulted to verify final RVSD placement if the RVSD is to be mounted near large planar surfaces (sound barrier, building, parked vehicles, etc) that run parallel to the monitored roadway. The RVSD shall be located within sight of cabinet for set-up.

Cabling. The cable end connector shall meet the MIL-C-26482 specification. The cable shall be the Orion Wire Combo-2207-2002-PVC-GY or equivalent. The cable shall be terminated only on the two farthest ends of the cable. If 12 VDC is being supplied for the RVSD then the cable length shall not exceed 110 ft. (33.5 m). If 24 VDC is being supplied for the RVSD then the cable length shall not exceed 600 ft. (182.9 m). A 3.5 foot (1.1m) serial cable shall be installed in control cabinet. The connector cable should be strapped to the pole to prevent cable strain.

Lightning Surge Protection. The RVSD shall be installed using lightning surge protection on all communication and power lines. The surge protection devices shall meet or exceed the EN 61000-4-5 Class 4 Specification. The lightning surge protection unit shall be as recommended by the RVSD manufacturer. The lightning surge protection shall withstand 6KV and/or 10,000A.

Power Supply. The RVSD shall include the RVSD manufacturer's power supply for the provided detector unit.

Cabinet. The radar detector shall be connected to power and the communications equipment in the same cabinet that will house additional RVSD and the electronics for a CCTV camera. It shall be connected to a RVSD manufacturer-recommended surge suppression device. A RVSD manufacturer-supplied power supply shall be used for power conversion. A terminal server, if needed, shall be installed inside the cabinet. The radar detection system shall include all equipment and devices recommended by the manufacturer for proper operation.

Method of Measurement. This item shall be measured as each RADAR VEHICLE DETECTION SYSTEM installed, tested, operational and complete with components specified herein.

Basis of Payment. This work will be paid for at the contract unit price per each for RADAR VEHICLE DETECTION SYSTEM, completely installed, tested, and operational in accordance with the contract drawings and these special provisions. Price shall include all labor, materials, equipment, setup, testing and training.

ETHERNET SWITCH

Description. This work shall consist of providing a hardened Ethernet Switch in a cabinet as shown on the plans.

Materials.

General

The Ethernet switch shall be an environmentally hardened managed Ethernet switch compliant with IEEE 802.3 (10Mbps) and IEEE 802.3u (100Mbps) as manufactured by RuggedCom, Series RS900G or approved equal.

Operating Environment

The Ethernet switch shall be capable of operating properly over an ambient temperature range of -40C to +85C without the use of internal or external cooling fans in accordance with IEC 60068-2-1 and 60068-2-2. The Ethernet switch shall be capable of operating properly in relative humidity conditions of 95% non-condensing at 55C in accordance with IEC 60068-2-30. The Ethernet switch shall meet the environmental requirements of traffic control equipment in accordance with NEMA TS 2 (1998), Section 2: Environmental Requirements. Specifically NEMA TS 2 1998 (Section 2.2.8)

a. Vibration in each of the 3 mutually perpendicular planes.
b. Vibration frequency sweep of 5 to 30 Hz
c. Vibration strength = 0.5g
d. Duration = 3 hours, 1 hour at each plane

The manufacturer shall provide evidence of independent testing verifying performance. In general, the Ethernet switch shall comply with the environmental requirements outlined in Table 1. The Ethernet switch shall be capable of operating properly when exposed to radiated electric fields of up to 10V/m continuously and magnetic fields of up to 40A/m continuously. In general, the Ethernet switch shall comply with the EMI Immunity requirements given in IEC 61850-3 and IEEE1613. The Ethernet switch shall also pass the minimum EMC immunity requirements of EN61800-3. EN61800-3 A11 is the IEC standard for EMC emissions and immunity requirements for Adjustable Speed Power Drive Systems.

Port Requirements

The Ethernet switch shall have 8 10/100BaseTX ports 2 - 1000BaseX fiber optical ports. All fiber optic link ports shall be capable of Multimode or Single mode. The Ethernet switch shall have the option of both small form pluggable (SFP) optics and fixed (soldered on) optics. Single mode optics shall support distances up to 70km. The Ethernet switch shall support the following requirements and options:

10/100BaseTX ports:

- RJ45 connectors
- Cable type: Category 5, unshielded twisted pair (CAT 5 UTP)
- Segment Length: 100m
- Auto-negotiation support (10/100Mbps)
- Auto MDIX crossover capability
- TVS (Transient voltage suppression) between Line +/-, Line +/-ground, to protect the circuitry.
- Full Duplex operation (IEEE 802.3x)

1000BaseX fiber optical ports:

- SFP (small form pluggable)
- LC Connectors (multi-mode), LC or SC Connectors (single-mode)_
- Optical Characteristics: 850 nm multi-mode, 1310 nm single-mode,1550nm single-mode
- Supports Fiber Type: 62.5/125 um multi-mode fiber, 9/125 um single-mode fiber
- Segment Length: + 2 km with multi-mode fiber, Minimum Optical Budget 14 dB @ 850 nm
- Optical Budget single-mode fiber: minimum 17 dB @ 1310 nm
- Full Duplex operation (IEEE 802.3x)
- Optical power shall be sufficient to transport the signal back to the I55 Weigh Station video collection hut.

Networking Requirements

The Ethernet switch shall support automatic address learning of up to 8192 MAC addresses. The Ethernet switch shall support the following advanced layer 2 functions:

- IEEE 802.1Q VLAN, with support for up to 255 VLANs and 4096 VLAN ID's.
- IEEE 802.1p priority queuing
- IEEE 802.1w rapid spanning tree
- IEEE802.1Q-2005 MSTP (formerly 802.1s)
- IEEE 802.1Q-2005 standard GMRP
- IEEE 802.3x flow control
- IEEE.802.3ad-Link Aggregation
- IGMPv2 with 256 IGMP groups
- Port Rate Limiting
- Configuration via test file which can be modified through standard text editor
- Forwarding/filtering rate shall be 14,880 packets per second (PPS) for 10Mps, 148,800 for 100Mps, 1,488,000 for 1000Mps
- DHCP Option 82

Network Management Functionality Requirements

The Ethernet switch shall provide the following network management functions

- SNMPv2, SNMPv3
- RMON
- GVRP
- Port Mirroring
- 802.1x port security
- SSL – Secure Socket Layer
- SSH – Secure Shell
- TFTP
- Network Time Protocol (NTP),
- Simple Network Time Protocol (SNTP)
- Management via web or Telnet
- Built in Protocol Analyzer which enables traces to be run from within the Ethernet switch operating system. Must be able to forward traces to an IP address or UDP port. Traces for must include but not be limited to the following: STP, MAC, Link, IGMP, GVRP, PPP, Transport, DHCPRA, 802.1X, WEBS, SNMP, IP, TacPlus, Radius, FORW, IPASSIGN, TRANSPORT

Additionally, the Ethernet switch shall demonstrate to provide sub 15 ms failover per Ethernet switch hop in a ring topology.

Programmable Critical Failure Relay

The Ethernet switch shall provide a programmable critical failure out relay that may be configured to activate upon critical error detection such as loss of link or detection of critical system errors. This function shall be user enabled and programmable. The output contacts shall be available in a Form-C configuration with Max Current at 2A@250 VAC, .15A@125VDC, 2@20VDC.

Power Supply Requirements

The Ethernet switch shall be supplied with provisions for operation at the following power supply inputs, 85 to 264 Vac (50/60Hz). The power supply shall be internal to the Ethernet switch. Power supply shall have two stage isolation accomplished via two transformers which step down from primary AC/DC to VDC. A power cord of not less than 5 feet in length shall be supplied as well. The Ethernet switch shall require no more than 15W of power.

'Hipot' Testing in the Field The Ethernet switch shall allow for dielectric strength ('hipot') tests in the field, in accordance with IEC 60255-5, by trained personnel. It shall be capable of enduring a test voltage of at least 2kVrms on power supply inputs above 60V and 0.5kVrms on power supply inputs below 60V. A removable grounding wire shall be provided to allow disconnecting of any transient suppression circuitry at the power supply input to allow for 'hipot' testing without activating the transient suppression circuitry.

Mounting Requirements

The Ethernet switch shall provide options for DIN Rail mounting or panel mounting via brackets

Warranty

The Ethernet switch shall be warranted for defects in material and workmanship for five (5) years after shipment. The Warranty shall include software updates and 7x24 phone support for the 5 year warranty period.

Environmental Requirements

The Ethernet switch shall comply with the atmospheric, vibration, shock and bump requirements outlined in Table 1. This compliance shall be demonstrated by type withstands tests (i.e. 'type tests') as outlined in Table 1 and summarized in a Type Test Report per the test report requirements of each of the standards given in Table 1.

Table 1: Environmental Tests

Test	Description		Test Level	Severity
IEC 60068-2-1	Cold Temp	Test Ad	-40 deg. C, 16 hours	N/A
IEC 60068-2-2	Dry Heat	Test Bd	+85 deg. C, 16 hours	N/A
IEC 60068-2-30	Humidity	Test Db	95% (non-condensing), 55 deg. C, 6 cycles	N/A
IEC 60255-21-1	Vibration	Test Fc		Class 1
IEC 60255-21-2	Shock	Test Ea		Class 1
IEC 60255-21-2	Bump	Test Eb		Class 1

Safety Requirements / Agency Approvals

The Ethernet switch shall comply with the following electrical safety requirements or equivalents: UL60950 or CSA C22.2 No. 60950 (safety requirements for IT equipment). The Ethernet switch shall also have CE (Europe) qualification. The Ethernet switch shall also comply with FCC Part15 Class A for EMI emissions.

Construction. The Contractor shall securely mount the Ethernet Switch as shown on the plans. The switch shall be installed such that its status lights and ports are easily accessible for maintenance technicians. The switch shall be configured and tested to operate with optimized bandwidth and manage network traffic to enable remote monitoring and control of the field devices. The switch shall be configured to be fully interoperable with the existing network.

Method of Measurement. This items shall be measured ETHERNET SWITCH, installed each, tested, operational and complete.

Basis of Payment. This work shall consist of furnishing all labor, materials, equipment, setup and testing to supply and install an ETHERNET SWITCH, complete in accordance with the contract drawings and these special provisions. Miscellaneous connectors, cables and Ethernet cables shall be included in the unit price.

MODIFICATION OF EXISTING VIDEO DISTRIBUTION SYSTEM (D-1)
December 1, 2014

General. The CCTV (Closed Circuit Television) Distribution System is a fully integrated IP multicast system, comprised primarily of Cisco network hardware and software, providing multi-point Internet Protocol based video images and control over Ethernet to multiple monitoring center locations while minimizing bandwidth demand upon the system.

The system shall be generally configured to collect video images and connect control from field mounted cameras at distribution node locations and to produce video images and controls at designated distribution nodes and at two monitoring locations: District 1 Headquarters in Schaumburg, Traffic Systems Center in Oak Park.

The system shall utilize existing CCTV elements, and shall include all materials and equipment necessary to integrate the new cameras into the existing system. The work under this Special Provision includes the coordination with camera equipment provided under this contract, adjacent contract(s), and coordination with existing CCTV equipment as indicated, including adjustments of or supplements to the equipment as may be required.

Video Control Software. The existing control software is ICX's 360 Cameleon Enterprise camera control. Included in this item, the Contactor shall provide 10 ITS software license units. The Contractor shall configure the cameras within the video control software. This work shall be coordinated with the Electrical Maintenance Contractor.

HD IP Video Decoder. The HD video decoder shall be capable of decoding high definition and standard definition streams using H.264 or MPEG-4 compression technology. The HD video decoder shall provide one (1) DVI-I, one (1) HDMI, and one (1) DP monitor output with two outputs usable simultaneously. The HD video decoder shall be of the same manufacturer as the HD cameras provided on this project.

Video Distribution System (VDS) Control System Driver. The decoder and video output shall be controlled and configured through the VDS. Consequently a software driver for the VDS is required and included as a part of the decoder. The VDS control system is Cameleon ITS manufactured by 360 Surveillance, a division of FLIR. It is the Contractor's responsibility to determine if an existing software driver exists for the proposed decoder. If a driver does not exist for the proposed decoder, the work and cost of developing the driver shall be included in this item.

Provisioning of IP routing and switching equipment. The Contractor shall fully integrate all the equipment to be installed with the existing video distribution system as a part of this item and this coordination will require technical services of the existing system integrator, AT&T, a Cisco Systems Integrator (Contact: Jim Patterson, AT&T, 217.801.2329) and coordination with the State District 1 Electrical Maintenance Contractor. This work shall be included in the item and will not be paid for separately.

Method of Measurement. The modification of existing video distribution system shall be measured for payment as lump sum when furnished, installed, configured, warranted, made fully operational, and tested as detailed herein.

Basis of Payment. This work will be paid for at the contract lump sum price for MODIFICATION OF EXISTING VIDEO DISTRIBUTION SYSTEM which shall be for the work as specified herein.

CLOSED CIRCUIT TELEVISION CAMERA EQUIPMENT

Description. This item shall consist of furnishing and installing equipment for the control and distribution of CCTV video from the CCTV camera to a Video Collection Point (VCP). Transmission for the video and control signals shall be by fiber optic cable as specified elsewhere herein and as indicated in the plans.

Construction Requirements

General. The Contractor shall prepare and submit a shop drawing detailing the complete closed-circuit television cabinet equipment installation. The shop drawings shall identify the installation and specifications of all components to be supplied, for approval of the Engineer. Particular emphasis shall be given to the cabling and the interconnection of all of the components.

Appropriate connectors shall be furnished and installed to interface the in-cabinet components to the integrated dome camera assembly. The Contractor shall mount the in-cabinet components in the equipment cabinet and connect them to AC power, communications, and video feeds.

Testing. The Contractor shall test each installed CCTV Cabinet Equipment. The test shall be conducted from the field cabinet using the standard communication protocol and a laptop computer. The Contractor shall verify that the camera can be fully exercised and moved through the entire limits of Pan, Tilt, Zoom, Focus and Iris adjustments, using both the manual control and presets.

The Contractor shall repeat the test at the communications shelter associated with the CCTV camera.

The Contractor shall maintain a log of all testing and the corresponding results. A representative of the Contractor and a representative of the Engineer shall sign the log as witnessing the results. Records of all tests shall be submitted to the Engineer prior to accepting the installation.

Documentation. One copy of all operations and maintenance manuals for each CCTV component shall be delivered for each assembly installed. In addition, full documentation for all software and associated protocols shall be supplied to the Department on a CD-ROM. The Department reserves the right to provide this documentation to other parties who may be Contracted with in order to provide overall integration or maintenance of this item.

Warranty. The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. This warranty shall include repair and/or replacement of all failed components via a factory authorized depot repair service. All items sent to the depot for repair shall be returned within two weeks of the date of receipt at the facility. The depot location shall be in the United States. Repairs shall not require more than two weeks from date of receipt and the provider of the warranty shall be responsible for all return shipping costs.

The depot maintainer designated for each component shall be authorized by the original manufacturer to supply this service. A warranty certificate shall be supplied for each component from the designated depot repair site indicating the start and end dates of the warranty. The certificate shall be supplied at the conclusion of the system acceptance test and shall be for a minimum of two years after that point. The certificate shall name the Department as the recipient of the service. The Department shall have the right to transfer this service to other private parties who may be contracted to perform overall maintenance of the facility.

Materials.

Equipment Installation. The CCTV equipment shall be mounted in an enclosure provided and paid for separately. The installation and mounting of the CCTV equipment shall be fully coordinated with the enclosure or co-location.

Co-location of CCTV equipment. The CCTV equipment maybe co-located within another equipment controller cabinet as indicated.

The equipment shall be securely mounted on a mounting back panel or on a corrosion resistant DIN rail if equipment is configured as such.

Closed Circuit Television Camera Power Supply.
The Closed Circuit Television Camera Power Supply shall supply power to the camera dome assembly. The requirements include:

Input voltage	120 VAC ± 10%
Output voltage	24 VAC ± 10%
Operating Temperature Range:	-40ºC to +70ºC (minimum)
Storage Temperature Range:	-40ºC to +75ºC (minimum)

The power supply shall include an AC power indicator with power on/off switch. All outputs shall be fused. The power supply shall be sized for the dome units being supplied, considering pan/tilt, heating, and blower requirements, and shall not be less than 100 VA.

Over-voltage Protection. Over-voltage protection shall be provided on the power conductors, camera control conductors, and the video cables. The specific protection is based on the elements being protected.

Incoming Power Protection. The incoming power shall be protected with a filtering surge protector that absorbs power line noise and switching transients. The specified performance shall be as follows:

Peak current	20 kA (8x20 µs waveshape)
Life Test	5% change
Clamp voltage	280 V typical @ 20 kA
Response time	≤5 ns
Continuous service current	10 amps max. 120 VAC/60 Hz
Operating Temperature	-40ºC to +75ºC (minimum)
Nominal dimensions	7.15 inches by 3.13 inches by 2.3 inches

Camera Cable Surge Protection. The CAT5/5e/6 cable from the camera shall be protected with a lightning surge protector. The unit shall be fully compatible with the camera cabling and PoE and shall have shielded RJ45 jacks for EMI noise suppression. The unit shall provide high performance 3-stage protection:

1. Differential gas discharge tube
2. PTC resettable fuse
3. Low capacitance diode array

Specific requirements include:

Ethernet Connectors	(2) Shielded RJ45 Ports
Gas Tube Voltage	+/- 90 V
PTC Fuse Rating	+/- 1 A
Clamping Voltage	+/- 58 V
Operating Temperature	-40° C to +80° C
Nominal dimensions	6.3 x 3.2 x 2.2 (inches)

The protector shall protect a minimum of four conductors. [Transmit Data (2 wires) and Receiver Data (2 wires)]

Ethernet Switch. The Ethernet switch shall meet the requirements specified for the ETHERNET SWITCH and shall be paid for separately under that pay item.

Enclosure. The CCTV cabinet shall meet the requirements specified for the CLOSED CIRCUIT TELEVISION CABINET or CABINET, MODEL 334 and shall be paid for separately under those respective pay items.

Method of Measurement. CCTV equipment shall be counted, each installed, tested, operational and complete.

Basis Of Payment. This item shall be paid at the contract unit each for CLOSED CIRCUIT TELEVISION CAMERA EQUIPMENT for all labor, materials, equipment, setup and testing. Miscellaneous connectors and cables shall be included in the unit price.

ATMS SYSTEM INTEGRATION

Description.

This item includes integrating all remote vehicle sensing device (RVSD) units and all telemetry as shown in the plans into the IDOT Advanced Traffic Management System (ATMS). This item includes all software, programming, miscellaneous devices, and cables necessary to provide the successful expansion of the expressway traffic monitoring system to reflect changes in field sensors introduced by this project.

Integration.

The Contractor shall subcontract with the development and maintenance contractor for the ATMS to perform all ATMS software and hardware modifications. Contact information is:

Delcan, a PARSONS Company
c/o Scott Lee – project manager
650 E Algonquin Rd, Suite 104
Schaumburg, IL 60173

Phone: (847) 925-0120

The ATMS system shall be upgraded and expanded to add all RVSD units and all telemetry shown on the plans. The integration must be made to make this expansion a seamless transition, and function in an identical manner as the existing expressway surveillance. Work under this item includes but is not limited to the following:

(a) Integrate data from the additional RVSD units thru the NTCIP interface at a rate of once every 20 seconds.
(b) Create new Vehicle Detection Station (VDS) display, data table, description and control panel display, and travel time tables.
(c) Modify the existing graphic user interface, report generators, data bases, broadcast feeds (both subscriber and internal), data tables for the dynamic message sign control.
(d) Display on the Traffic Systems Center ATMS maps, and all user interfaces to the new VDS data including Volume, Occupancy, Speed, Vehicle Classification (length), and operational status.
(e) Create new segments and groupings used to display travel time and congestion data to the Dynamic Message Signs.
(f) Update the Lake Michigan Interstate Gateway Alliance (LMIGA) data feeds for presentation of the additional data to the web page and user interfaces.
(g) Develop an integration acceptance test plan and conduct said test to verify that all RVSD units and telemetry has been properly integrated according to the requirements. This acceptance plan shall conclude with a 30 day burn-in period. During the burn-in period, the subcontractor shall identify and resolve any problems identified with the integration.

Basis of Payment.

This item shall be paid for at the contract lump sum price for ATMS SYSTEM INTEGRATION, which price shall be payment in full for the work described. Acceptance shall be granted after integration, as described above, and after passing an acceptance test proposed by the Subcontractor, and agreed upon by the Engineer.

CLOSED CIRCUIT TELEVISION CAMERA, HD (D-1)
Effective: December 1, 2014

1. Description.

This item shall consist of furnishing and installing an integrated High Definition Closed-Circuit Television (CCTV) Dome Camera Assembly as described herein and as indicated in the Plans.

2. Materials.

2.1 General. The HD (High Definition) CCTV Dome Color Camera shall be a rugged, non-pressurized, outdoor surveillance domed camera system. The HD CCTV Dome Camera shall be designed to perform over a wide range of environmental and lighting conditions and automatically switches from color daytime to monochrome nighttime operation. The high definition camera shall be either a Bosch Autodome IP series 7000 HD, Pelco Spectra 1080P HD Series, or a Siqura HSD820H3-E series in compliance with the requirement herein.

Camera shall use a standard Web browser interface for remote administration and configuration of camera parameters. The browser interface shall provide PTZ control including preset and pattern and on-screen display (OSD) for access to camera programming.

All equipment and materials used shall be standard components that are regularly manufactured and utilized in the manufacturer's system.

The manufacturer shall be ISO 14001 Certified. The manufacturer's quality system shall be in compliance with the I.S./ISO 9001/EN 29001, QUALITY SYSTEM. The manufacturer shall provide a three year (3) warranty. The manufacturer shall pay inbound and outbound shipping charges during the warranty period for products returned as warranty claims. The manufacturer shall also provide an advance exchange program for warranty claims.

The warranty period shall begin on the date of final acceptance of the video distribution system. This warranty shall include repair or replacement of all failed components via a factory authorized repair facility. All items sent to the repair facility for repair shall be returned within two weeks of the date of receipt at the facility. The repair facility location shall be in the United States. Any extended warranty coverage required to comply with the specified warranty period shall be provided as a part of this pay item at no additional cost to the Department.

2.2 **Physical construction**. The CCTV Dome Camera shall be provided in a NEMA 4X or IP66 certified, rugged, weather-resistant package. The CCTV Dome Camera shall also comply with the following requirements:

Environmental	Requirement
IP Rating	IP 66
Weight (max.)	10 lbs
Overall Dimensions	10” dia. x 14”
Humidity	0 to 100%
Operating temperature	-40ºC to 50ºC
Mount	1 ½” NPT

The CCTV dome camera shall be equipped with a fan and heater controlled by a thermostat. The heater shall prevent internal fogging of the lower dome throughout the operating temperature range of the camera.

An optional rugged clear dome bubble shall be available from the CCTV camera manufacturer. The rugged dome shall be made from 3mm thick polycarbonate, designed to meet stringent strength standards without compromising optical clarity. The dome, by itself, shall withstand a 100 foot-pound impact. This energy is equivalent to that of a 10 lb sledgehammer being dropped from a height of 10 feet. The dome, when installed in the CCTV camera, shall exceed the UL 1598 horizontal impact standard for lighting fixtures, by a factor of 10. The submittal needs to indicate compliance with this requirement.

2.3 Power. The CCTV Dome Camera shall be designed to operate from a 120V power source. The appropriate power supply, if required for the CCTV Dome Camera to operate, shall be included as a part of this item. The power requirements for the camera shall comply with the following:

Item	**Requirement**	
Port	RJ-45 for 100Base-TX; Auto MDI/MDI-X;	
Cabling Type	CAT5 cable or better for 100Base-TX	
Input Voltage	18 to 32 VAC; 24 VAC nominal; 22 to 27 VDC; 24 VDC nominal	
Input Power		
	24 VAC nominal	25 VA nominal (without heater and blower);
		75 VA nominal (with heater and blower)
	24 VDC nominal	0.7 A nominal (without heater and blower); 3 A nominal (with heater and blower)
	PoE	IEEE802.3af (without heater and blower)

2.4 Camera. The camera shall provide a minimum of two simultaneous video streams with a 2.1 megapixel (MPx) 1920 x 1080 resolution, auto iris with 30X optical, and 12X digital zoom. The CCTV Dome Camera shall incorporate

Item	**Requirement**
Sensor Type	1/2.8-inch Type Exmor CMOS sensor
Optical Zoom	30X
Digital Zoom	12X
Maximum Resolution	1920 x 1080
Lens	f/1.6 - f/4.7, (4.3 mm - 129.0 mm optical)
Horizontal Angle of View	59° (wide) - 2° (tele)
Aspect Ratio	16:9
Light Sensitivity	Sensitivity in lux for 90% reflectance, f/1.6 (wide angle), 28 dB gain at 30 IRE (30% of signal level) with Sensitivity Boost OFF; 4X improvement to sensitivity with Sensitivity Boost ON
Color (33 ms)	0.65 lux
Color (250 ms)	0.07 lux
Mono (33 ms)	0.20 lux
Mono (250 ms)	0.015 lux
Day/Night Capabilities	Yes
IR Cut Filter	Yes
IR Trace	Curves 850 nm and 950 nm
Wide Dynamic Range	80dB
Iris Control	Auto iris with manual override
Backlight Compensation	Auto / Manual
Automatic Gain Control	Auto / Manual
Active Noise Filtering	Auto / Manual
Electronic Image Stabilization (EIS)	30X

2.5 Video

Item	Requirement
Video Encoding	H.264 in High, Main, or Base profiles and MJPEG
Video Streams	Up to 2 simultaneous streams, the second stream is variable based on the setup of the primary stream
Frame Rate	Up to 30, 25, 15, 12.5, 10, 8.333, 7.5, 6, 5,3, 2.5, 2, 1 (depending upon coding, resolution, and stream configuration)
Minimum Available Resolutions	1920 x 1080 1280 x 720 720 x 480
Supported Protocols	TCP/IP, UDP/IP (Unicast, Multicast IGMP), UPnP, DNS, DHCP, RTP, RTSP, NTP, IPv4, IPv6, SNMP v2c/v3, QoS, HTTP, HTTPS, LDAP (client), SSH, SSL, SMTP, FTP, and 802.1x (EAP)
Security Access	Password protected
Software Interface	Web browser view and setup

2.6 PTZ Mechanical

Item	Requirement
Pan Movement	360º continuous pan rotation
Pan Speed	Variable between 400° per second continuous pan to 5.0º per second
Vertical Tilt	Unobstructed tilt of +1º to –90º
Manual Control Speed	Pan speed of 0.1º to 80º per second; tilt operation shall range from 0.5º to 40º per second.
Automatic Preset Speed	Pan speed of 280º and a tilt speed of 160º per second
Presets	255 positions
Tours	2 tours
Preset Accuracy	± 0.2º
Proportional Pan/Tilt Speed	Speed decreases in proportion to the increasing depth of zoom
Motor	Continuous duty and variable speed, operating at 18 to 32 VAC, 24 VAC nominal
Window Blanking	16 blanked windows
Auto Flip	Rotates dome 180º at bottom of tilt travel
Power Consumption	Nominal 45 VA (without heater and blower running)
	Nominal 75 VA (with heater and blower running)

The camera shall provide a freeze frame feature that freezes a camera image as a preprogrammed preset is called, providing a live view once positioned. Selections for on/off shall be available through the embedded Web browser.

The camera shall provide image stabilization to compensate for vibration introduced into the camera.

The camera shall support IPv6 configurations in conjunction with IPv4.

3. **Still Picture Capture**. The camera shall be capable of capturing a still image in JPEG format and automatically transferring this image to an FTP site. The resolution of the image shall be user selectable. The frequency of captures shall be user settable and shall as a minimum range from 1 picture every 30 seconds to 1 picture every five minutes.

4. **Video Distribution System (VDS) Control System Driver**. The camera and video output shall be controller and configured through the VDS. Consequently a software driver for the VDS is required and included as a part of the CCTV camera. The VDS control system is Cameleon ITS manufactured by 360 Surveillance, a division of FLIR. It is the Contractor's responsibility to determine if an existing software driver exists for the propose camera manufacturer. If a driver does not exist for the proposed CCTV camera, the work and cost of developing the driver shall be included in this item.

5. **Testing**. The Contractor shall test each CCTV Dome Camera Assembly in the presence of the Engineer after the camera is installed. This test may be done locally at the camera support structure.

6. **Product Support**. The manufacturer shall provide technical support via email, fax and toll-free telephone. The above forms of support shall be provided Monday through Friday, 8:00am to 8:00pm EST.

7. **Installation**. The Contractor shall install the CCTV camera in accordance with manufacturer's instructions. The camera firmware shall be the latest stable release available at the time of installation.

8. **Documentation**. In addition to the initial submittal(s) prior to procurement, the Contractor shall provide installation and operation manuals, documentation of exact equipment model and serial numbers, software/firmware version numbers, in hardcopy and PDF formats on CD-ROM.

9. **Measurement**. Closed-Circuit Television (CCTV) Cameras, High Definition shall be counted as each upon successful completion of the testing described herein for payment.

10. **Basis of Payment**. This item will be paid for at the contract unit price each for CLOSED CIRCUIT TELEVISION CAMERA, which shall be payment in full for all material and work as specified herein.

CABINET HOUSING EQUIPMENT, TYPE IV

Description. This item shall consist of furnishing and installing cabinets of the type and size specified in place including anchor bolts, bases, pedestals, posts, fans, cable harnesses, ground rods, terminal boards, shelves, mounting hardware, and all miscellaneous items at locations as directed by the Engineer.

Materials. Cabinets shall be of fabricated aluminum supplied in sizes with minimum inside dimensions as listed below.

TYPE	HEIGHT	WIDTH	DEPTH	THICKNESS	OPENING
E.S.P. 1	22-1/2”	14-1/4”	9-3/4”	3/16”	18” x 11”
E.S.P. 2	36”	20”	15”	3/16”	28” x 17-1/2”
E.S.P. 3	49-1/2”	30”	17”	3/16”	38” x 27-11/2”
E.S.P. 4	55”	44”	26”	3/16”	2-1/2” x 41-1/2”

Cabinets shall be watertight. Doors shall be gasketed to provide a waterproof seal. Bases shall be caulked to obtain a moisture-proof bond. All cabinet types shall have a minimum of two (2) shelves for setting detectors and other equipment on, and Type 2 Corbin brass locks or equal.

E.S.P. Type 3 and Type 4 cabinets shall be fitted with a thermostatically controlled fan. It shall be mounted at the top of the cabinet for a forced air fan system that has a screened air exhaust opening under roof overhang and no opening in top of cabinetry. The fan shall be capable of operating at 130C.F.M. (3.68m³/min) at .160” (4.1mm) of water static pressure.

Where the E.S.P. Type 3 cabinet is used to house equipment controlling ramp metering signals, the E.S.P. Type 3 cabinet shall have a signal load relay installed. The signal load relay shall consist of two components, a base which is mounted on the E.S.P. Type 3 cabinet wall and a locking screw. The coil of this relay shall be connected to the mark output of the signal change tone receiver. The one set contacts of the load relay shall be used to change the ramp signals and one set of contacts shall be used to key the mark input to the signal change transmitter. This relay shall be incidental to the cost of the cabinet when used.

Materials shall conform to controller cabinets as listed in the Standard Specifications 1074.03 except that the door shall not have any outside designation nor shall the cabinet door be equipped with a police door or louvers. Post top mounted cabinets, shall have a ¼" (6.4mm) bottom of cabinet welded.

Each Induction loop shall have lightning protection. The Contractor shall furnish and install stud-mounted lightning protection devices. The device shall have three-terminals, two of which are connected across the loop input of the detector for differential mode protection and the third terminal grounded to protect against common mode damage. Differential mode surge shall be clamped by the semi-conductor array instantly and common mode surge shall be handled by three element gas discharge tube which fires at 400VDC and thereafter clamps the two loop leads to 30 volts in respect to ground. The device shall be installed in close proximity to the loop input. Extension of the factory leads of the device shall not be allowed.

Installation Details. Installation shall conform to applicable portions of Section 863 of the Standard Specifications. Cabinets, cabinet posts, and cabinet pedestals shall be primed and painted. The final coat color shall be specified by the Department at the time of the pre-construction meeting. Interior of all cabinets shall be painted high gloss white.

CMS/DMS Type 4 cabinets shall be serviced by 117 volts AC power with a 60 amp circuit breaker minimum.

All cabinets shall be serviced by 117 volts AC power and a telecommunication system. Each cabinet shall be equipped with a 10 ampere circuit breaker, ground rod, 115 VAC RFI filtering surge protector (ACD-340 surrestor), 130 volt, 70 joules, 10 amp varistor, lightning protection for each loop (SRA-6LC surrestor), data line protection for each leg of the four (4) wire telecommunication system (SRA 64C surrestor), a pull chain porcelain base light fixture with a 3 prong 110 volt outlet. The porcelain fixture shall be mounted on metal plate, that shall be mounted on the cabinet ceiling. No holes shall be drilled thru the cabinet exterior for internal equipment mounting.

Each wire entering a cabinet shall be trained in a workmanlike manner and lugged at each terminal strip or switch. If more than one wire has a common terminal on a terminal strip, the adjacent strip shall be used and an appropriate jumpered connection shall be made.

All cables and wiring entering a cabinet shall be dressed, harnessed, tied, laced, and clamped to produce a workmanlike wiring installation.

All cables (loop wires, power, phone) shall be labeled with a panduit type cable tag. The tag will identify the type of cable and the cable destination.

A copper grounding bus shall be mounted on the rear wall of the cabinets.

Each cabinet shall contain a wiring diagram of the installation in addition to the diagrams which are to be submitted to the Engineer.

Prior to the wiring of the cabinet, the contractor shall submit box print for approval before cabinet wiring shall begin.

The Contractor shall furnish three (3) diagrams of the internal and external connections of the equipment in each Traffic Systems Center cabinet. He shall also furnish the operating and maintenance instructions for all equipment supplied. One copy of the wiring diagrams for each cabinet shall be retained in each field cabinet. Wiring diagram shall be contained in a plastic pouch that shall be permanently mounted to the door of each cabinet. Contractor shall permanently mark the cabinet for each termination and each terminal connection as to loop, tone, closure, phone, and lane function of each termination in the cabinet.

Incidental to the cost of each cabinet, the Contractor shall construct 5” (127mm) P.C.C. sidewalk of a rectangular area 3’ x 4’ (1 meter by 1.2m) immediately adjacent to the cabinet foundation on the same side of the foundation as the cabinet door, with the 4’ (1.2m) dimension of the rectangle parallel to the cabinet door when closed. If the width of the required cabinet foundation is greater than the 3 feet (1 meter) width of the standard concrete foundation, Type D, the 4’ (1.2m) dimension of the sidewalk area shall be increased to equal the width of the foundation plus 1ft (30 cm) , the area to extend 6” (15cm) beyond each side of the foundation. This paragraph shall be applicable at all cabinet locations included in this Section. The only situations where this paragraph shall not apply are as follows: When the foundation is immediately adjacent to or within a paved sidewalk or shoulder area and no further surfacing is required. The Engineer shall be the sole judge as to the applicability of this paragraph in all questions arising therefrom.

No raceways shall be allowed to enter cabinet through the sides, top or back walls.

Anchor bolts shall be installed for pedestal and base mounted cabinets. These shall be considered as incidental to the cost of the cabinet.

Cable harnesses, terminal boards, and mounting hardware shall be installed as needed. These items shall be considered as incidental to the cost of the cabinet.

Terminal blocks provided in field cabinets shall be the heavy duty barrier type. The terminal block shall be a minimum of 2" (50.8mm) wide and 1-3/16" (30.2mm) deep. Center to center of the terminal screws or studs shall be a minimum of 21/32" (16 mm) with barriers in-between. Terminal blocks shall be rated at 45 amps 600 volts breakdown RMS line to line 11,000 V. and breakdown RMS line to ground 13,800 V. A marking strip shall be provided with each terminal block.

Method of Measurement. Cabinets will be accepted as concrete foundation mounted, pole mounted, pedestal mounted, or attached to structure. Each cabinet installed complete and in place will be counted as a single unit.

Basis of Payment. This work will be paid for at the contract price each for CABINET HOUSING EQUIPMENT, mounting and size specified, installed complete and in place.

CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, FOUNDATION, 80 FT. MOUNTING HEIGHT (D-1)
Effective: March 1, 2010

Description:

This item shall consist of the construction of a steel reinforced concrete foundation, of the dimensions indicated, complete with raceways. The foundation depth shall be as indicated in the Foundation Depth Table on the plans (where applicable) or as otherwise shown on the Contract Drawings or as directed by the Engineer.

The foundation shall include excavation, reinforcement, concrete, anchor bolts, nuts, washers and raceways as well as clean up and restoration of the location when such work is not provided under other paid items.

Materials:

Concrete shall be Class SI complying with Article 720 of the Standard Specifications and shall incorporate a Calcium Nitrite Corrosion Inhibitor as specified in Check Sheet #21 of the Supplemental Specifications and Recurring Special Provisions, Adopted February 1, 1995.

Reinforcement bars shall comply with Article 706.10 of the Standard Specifications.

Unless otherwise indicated, anchor bolts shall comply with the requirements of ASTM Designation A 687. Unless otherwise indicated, nuts shall be hexagon nuts in conformance with ASTM A 194 2H or ASTM a 563 DH, and washers shall be in conformance with ASTM F436.

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 A 153.

Unless otherwise indicated, conduit raceways shall be heavy wall rigid polyvinylchloride (PVC) conduit, (Schedule 40) UL listed and in conformance with NEMA TC2 and Federal Specification WC 1094A. Raceways shall be of the number and size as indicated.

Construction Requirements:

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 pentrometer and will establish foundation depth based upon the Foundation Depth Table shown on the plans, where applicable.

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 device 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 the foundation. Foundation top shall be chamfered 19.05 mm (3/4 inch) unless otherwise indicated.

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, except for specifically indicated locations, and where not otherwise indicated, foundation shall not protrude above grade more than 101.6 mm (4 inches) above a 1524.0 mm (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 and the incorrect foundation will not be measured for payment.

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 time of pouring of concrete mixture in place 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, after placement of the concrete, remain in a perfectly vertical position.

Method of Measurement:

The foundation shall be measured for payment in linear meters (feet) of the foundation in place, in accordance with the total length of concrete pier required, indicated as foundation depth, in the Foundation Depth Table on the Plans and as directed by the Engineer, i.e., extra foundation depth, beyond the directive of the Engineer, will not be measured for payment. Where extension above grade is required, this distance shall be measured for payment.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, FOUNDATION, 80 FT. MOUNTING HEIGHT, which shall be payment in full for the work as shown on the Drawings and described herein.

CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, GALVANIZED STEEL, 80 FT. MOUNTING HEIGHT

Description. This work shall consist of furnishing a CCTV camera structure complete with camera lowering device. The structure shall be a galvanized steel structure. The lowering device shall be configured to support a **high definition** camera with the appropriate power and Ethernet cable connections.

Definitions.

- CCTV Camera Structure: The complete camera structure and lowering device as one integral working system.
- Shaft: The camera structure shaft.
- Lowering Device: The components involved with the mounting, operation, and raising and lowering of the CCTV camera.
- Structure Height: The height of the structure shall be measured as indicated on the detail drawings

Materials.

Materials shall be as specified elsewhere herein.

Deflection.

The design of the structure shaft shall achieve a maximum, fully loaded deflection at the top of the structure, which is not greater than 1-inch

Submittals and Certifications.

The structure shall be designed in accordance with 2001 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals with Appendix C wind pressure for a 90 mph wind zone with a 1.3 gust factor. The pole shall be designed for use with a single arm camera lowering device with a total effective area of 2 square feet and total weight of 95 lbs. The structure shall not exceed 1" deflection in a 30 mph (non-gust) wind.

The camera structure shall be designed and constructed so no structural member or other component is applied in excess of the manufacturer's recommended rating (when applicable) or the published rating, whichever is lower

Shop drawings, product data and certifications shall be submitted. The submitted information shall be complete and shall include information relative to all specified requirements suitable for verification of compliance.

THE SUBMITTALS SHALL BE ARRANGED AND CROSS-REFERENCED TO THE SPECIAL PROVISIONS AND STANDARD SPECIFICATIONS. FAILURE TO CROSS-REFERENCE THE SUBMITTAL INFORMATION WITH THE SPECIAL PROVISIONS WILL RESULT IN THE SUBMITTAL BEING RETURNED WITHOUT REVIEW.

The submittal information shall be dated, current, project specific, identified as to the project, and shall also include the following calculations and certifications as applicable to the material utilized:

- Shaft design calculations, including Registered Engineer Certification.
- Certification of intent to provide domestic steel in accordance with Article 106.01 of the Standard Specifications.
- Welding details and procedures.
- Letter of intent to provide specified weld inspection reports.
- Confirmation of coordination between anchor rod supplier and the structure manufacturer for adequacy of anchor rod assembly.
- Manufacturer's recommended installation procedures.
- Letter of intent to provide manufacturer's representative during installation and to provide specified installation certification.

All certifications shall be notarized.

Shaft.

The pole shall be a maximum of three sections for field assembly. The pole shafts shall be a round cross section and meet the requirements of ASTM A595 grade A with a minimum yield strength of 55,000 psi. The bottom section shall have a minimum .3125 wall thickness and a minimum diameter of 23". The three shafts sections shall taper at a rate of .14" per foot and have an overall height of 80'. The pole base plate shall meet the requirements of ASTM A36 and be arranged to accommodate four (4) 1 ½" x 54" x 6" anchor bolts on a 27" bolt circle. Anchor bolts shall conform to ASTM F1554 gr. 55

The pole assembly shall be equipped with a 6" x 27" reinforced hand hole opening with a 3 gauge cover and shall be attached with four (4) ¼"-20 hex hd s.s. screws. The bottom of the hand hole shall be located up 14" from the bottom. The hand hole frame shall meet ASTM A529 grade 50and shall be made from ¾" x 3 ½" bar. There shall be a 3/8" diameter rod for wire tie off located at the top of the opening and 1 ¾" from the front of the hand hole frame and also a ½" tapped hole located 1 ¾" from the front of the frame at the bottom of the opening as shown on the drawing.

Six (6) 1" i.d. eye rings for power and communication cables are required as shown on the drawing. Two (2) shall be located 38" up from the bottom, two (2) located 6" below the top of the bottom shaft and two (2) 6" below the top of the center shaft.

There shall be a 3 ½" schedule 40 (4" od) pipe tenon 11 ¾" tall on a 3/8" thick plate welded to the top of the pole. The pipe tenon shall include a 1 ¾" x 5 ¼" slot and two (2) 5/8" holes as shown on the drawing to accommodate the Camera Lowering System arm assembly. A J-hook shall be included inside the top of the tenon assembly and shall include a removable cast aluminum pole top.

Camera Lowering Device

General

The camera lowering system shall be designed to support and lower a **high definition** closed circuit television camera, lens, housing, PTZ mechanism, cabling, connectors and other supporting field components without damage or causing degradation of camera operations. The camera lowering system device and the pole are interdependent; and thus, must be considered a single unit or system. The lowering system shall consist of a pole, suspension contact unit, divided support arm, and a pole adapter for attachment to a pole top tenon, pole top junction box, conduit mount adapter and camera connection box. The divided support arm and receiver brackets shall be designed to self-align the contact unit with the pole center line during installation and insure the contact unit cannot twist under high wind conditions. For maximum arm strength, round support arms are not acceptable.

The camera-lowering device shall withstand wind forces of 100mph with a 30 percent gust factor using a 1.65 safety factor. The lowering device manufacturer, upon request, shall furnish independent laboratory testing documents certifying adherence to the stated wind force criteria utilizing, as a minimum effective projected area, the actual effective projected area (EPA) or an EPA greater than that of the camera system to be attached. The camera-lowering device to be furnished shall be the product of manufacturers with a minimum of 3 years of experience in the successful manufacturing of camera lowering systems. The lowering device provider shall be able to identify a minimum of 3 previous projects where the purposed system has been installed successfully for over a one-year period of time each.

The lowering device manufacturer shall furnish a factory representative to assist the electrical contractor with the assembly and testing of the first lowering system onto the pole assembly. The manufacturer shall furnish the applicable DOT engineer documentation certifying that the electrical contractor has been instructed on the installation, operation and safety features of the lowering device. The contractor shall be responsible for providing applicable maintenance personnel “on site" operational instructions and providing three (3) copies of operations and maintenance manuals to the DOT engineer.

Suspension Contact Unit

The suspension contact unit shall have a load capacity 600 lbs. with a 4 to 1 safety factor. There shall be a locking mechanism between the fixed and moveable components of the lowering device. The movable assembly shall have a minimum of 2 latches. This latching mechanism shall securely hold the device and its mounted equipment. The latching mechanism shall operate by alternately raising and lowering the assembly using the winch and lowering cable. When latched, all weight shall be removed from the lowering cable and all electrical contacts shall be fully engaged. The fixed unit shall have a heavy duty cast tracking guide and means to allow latching in the same position each time. The contact unit housing shall be weatherproof with a gasket provided to seal the interior from dust and moisture.

The prefabricated components of the lift unit support system shall be designed to preclude the lifting cable from contacting the power or video/Ethernet cabling. The lowering device manufacturer shall provide a conduit mount adapter for housing the lowering cable. This adapter shall have an interface to allow the connection of a contractor provided 1.25 inch PVC conduit and be located just below the cable stop block at the back of the lowering device. The Contractor shall supply internal conduit in the pole as directed by the Lowering Device provider. The only cable permitted to move within the pole or lowering device during lowering or raising shall be the stainless steel lowering cable. All other cables must remain stable and secure during lowering and raising operations.

The female and male socket contact halves of the connector block shall be made of Hypalon. The female brass socket contacts and the male high conductivity brass pin contacts shall be permanently molded into the polymer body.

The current carrying male contacts shall be 1/8 inches in diameter. There shall be two male contacts that are longer than the rest which will make first and break last providing optimum grounding performance. The contacts shall be shall be fully coordinated with the **high definition** camera specified elsewhere herein.

The current carrying female contacts shall be 1/8 inches I.D. All of the contacts shall be recessed 0.125" from the face of the connector. Cored holes in the socket measuring 0.25" in diameter and 0.125" deep molded into the connector body are centered on each contact on the face of the connector to create rain-tight seals when mated with the male connector.

The wire leads from both the male and female contacts shall be permanently and integrally molded in the Hypalon body. The current carrying and signal wires molded to the connector body shall be constructed of #18/1 AWG Hypalon jacketed wire.

The contacts shall be self-wiping with a shoulder at the base of each male contact so that it will recess into the female block, thereby giving a rain-tight seal when mated. The facility manufacturing the electrical contact connector must comply with Mil Spec Q-9858 and Mil Spec I-45208.

Lowering Tool

The camera-lowering device shall be operated by use of a portable lowering tool. The tool shall consist of a lightweight metal frame and winch assembly with cable as described herein, a quick release cable connector, an adjustable safety clutch and a variable speed industrial duty electric drill motor. This tool shall be compatible with accessing the support cable through the hand hole of the pole. The lowering tool shall attach to the pole with one single bolt. The tool will support itself and the load assuring lowering operations and provide a means to prevent freewheeling when loaded. The lowering tool shall be delivered to the State upon project completion. The lowering tool shall have a reduction gear to reduce the manual effort required to operate the lifting handle to raise and lower a capacity load. The lowering tool shall be provided with an adapter for operating the lowering device by a portable drill using a clutch mechanism. The lowering tool shall be equipped with a positive breaking mechanism to secure the cable reel during raising and lowering operations and prevent freewheeling. The manufacturer shall provide a variable speed, heavy-duty reversible drill motor and a minimum of two complete lowering tools plus any additional tools required by plan notes. The lowering tool shall be made of durable and corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

Camera Junction Box

The camera junction box shall be of two piece clamshell design with one hinge side and one latch side to facilitate easy opening. The general shape of the box shall be cylindrical to minimize the EPA. The Camera Junction Box shall be cast aluminum with stabilizing weights on the outside of the box to increase room on the interior. The box shall be capable of having up to 40 pounds of stabilizing weights. The bottom of the Camera Junction Box shall be drilled and tapped with a 1-1/2" NPT thread to accept industry standard dome housings and be able to be modified to accept a wide variety of other camera mountings. The junction box shall be gasketed to prevent water intrusion. The bottom of the box shall incorporate a screened and vented hole to allow airflow and reduce internal condensation.

Materials

All pulleys for the camera lowering device and portable lowering tool shall have sealed, self lubricated bearings, oil tight bronze bearings, or sintered- oil impregnated, bronze bushings. The lowering cable shall be a minimum 1/8-inch diameter stainless steel aircraft cable with a minimum breaking strength of 1740 pounds with (7) strands of 19 wire each.

All electrical connections between the fixed and lowerable portion of the contact block shall be protected from exposure to the weather by a waterproof seal to prevent degradation of the electrical contacts. The electrical connections between the fixed and movable lowering device components shall be designed to conduct high frequency data bits as well as the power requirements for operation of dome environmental controls.

The interface and locking components shall be made of stainless steel and or aluminum. All external components of the lowering device shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

The Camera Manufacturer shall provide weights and /or counterweights as necessary to assure that the alignment of pins and connectors are proper for the camera support to be raised into position without binding. The lowering unit will have sufficient weight to disengage the camera and its control components in order that it can be lowered properly

Installation of the lowering device and camera shall be included as a part of this item and shall not be paid for separately.

Pole/Tower Installation.

The pole shall be set plumb on the foundation without the use of shims, grout or any other leveling devices under the pole base. The arm shall be set at right angles to the centerline of the pavement.

Poles shall not be installed until cameras are available for installation at the same time the poles are installed. Poles shall not be installed and left standing without a coordinated installation of arm and camera. Poles shall not be paid unless the coordinated assembly is complete.

Method of Measurement. CCTV camera structures shall be counted, each with all appurtenances installed.

Basis of Payment. This item shall be paid for at the contract unit price each for CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, GALVANIZED STEEL, of the mounting height specified.

FIBER OPTIC FUSION SPLICE

Description. This work shall consist of making all fiber optic fusion splices at a given site as shown on the plans. Fiber splicing consists of in-line fusion splices for all fibers described in the cable plan at the particular location. Splices shall be stored in rugged fiber optic splice closures in communications vaults or in splice trays of an above-ground fiber optic splice enclosure to secure and protect the fiber optic fusion splices.

Two splices are identified. A mainline splice includes fusion splicing all fibers in the cable sheath. In a lateral splice, the buffer tubes in the mainline cable are dressed out and designated buffer tubes and fiber strands are accessed and fusion spliced to lateral cable fiber strands or fiber pigtails as identified on the plans.

Materials. All equipment and ancillary materials needed to make fiber optic fusion splices shall be included in this work.

Splice Closures

Splice closures shall be designed for use under the most severe conditions such as moisture, vibration, impact, cable stress and flex temperature extremes as demonstrated by successfully passing the factory test procedures and minimum specifications listed below:

Physical Requirements. The closures shall provide ingress for up to four cables in a butt configuration. The closure shall prevent the intrusion of water without the use of encapsulates.

The closure shall be capable of accommodating splice organizer trays that accept mechanical or fusion splices. The splice closure shall have provisions for storing fiber splices in an orderly manner, mountings for splice organizer assemblies, and space for excess or unspliced fiber. Splice organizers shall be re-enterable. The splice case shall be UL rated.

Closure re-entry and subsequent reassembly shall not require specialized tools or equipment. Further, these operations shall not require the use of additional parts.

The splice closure shall have provisions for controlling the bend radius of individual fibers to a minimum of 1.5 in.

Compression Test. The closure shall not deform more than 10% in its largest cross-sectional dimension when subjected to a uniformly distributed load of 1335 N at temperatures of 0 and 100 degrees Fahrenheit. The test shall be performed after stabilizing at the required temperature for a minimum of two hours. It shall consist of placing an assembled closure between two flat parallel surfaces, with the longest closure dimension parallel to the surfaces. The weight shall be placed on the upper surface for a minimum of 15 minutes. The measurement shall then be taken with weight in place.

Impact Test. The assembled closure shall be capable of withstanding an impact of 28 N-M at temperatures of 0 and 100 degrees Fahrenheit. The test shall be performed after stabilizing the closure at the required temperature for a minimum of 2 hours. The test fixture shall consist of 20 lbs. cylindrical steel impacting head with a 2 in. spherical radius at the point where it contacts the closure. It shall be dropped from a height of 12 in. The closure shall not exhibit any cracks or fractures to the housing that would preclude it from passing the water immersion test. There shall be no permanent deformation to the original diameter or characteristic vertical dimension by more than 5%.

Cable gripping and sealing testing. The cable gripping and sealing hardware shall not cause an increase in fiber attenuation in excess of 0.05 dB/fiber @ 1550 nm when attached to the cables and the closure assembly. The test shall consist of measurements from six fibers, one from each buffer tube or channel, or randomly selected in the case of a single fiber bundle. The measurements shall be taken from the test fibers before and after assembly to determine the effects of the cable gripping and sealing hardware on the optical transmission of the fiber.

Vibration Test. The splice organizers shall securely hold the fiber splices and store the excess fiber. The fiber splice organizers and splice retaining hardware shall be tested per EIA Standard FOTP-II, Test Condition 1. The individual fibers shall not show an increase in attenuation in excess of 0.1 dB/fiber.

Water Immersion Test. The closure shall be capable of preventing a 10 ft. water head from intruding into the splice compartment for a period of 7 days. Testing of the splice closure is to be accomplished by the placing of the closure into a pressure vessel and filling the vessel with tap water to cover the closure. Apply continuous pressure to the vessel to maintain a hydrostatic head equivalent to 10 ft. on the closure and cable. This process shall be continued for 30 days. Remove the closure and open to check for the presence of water. Any intrusion of water in the compartment containing the splices constitutes a failure.

Certification. It is the responsibility of the Contractor to insure that either the manufacturer or an independent testing laboratory has performed all of the above tests, and the appropriate documentation has been submitted to the Department. Manufacturer certification is required for the model(s) of closure supplied. It is not necessary to subject each supplied closure to the actual tests described herein.

CONSTRUCTION REQUIREMENTS

Using a fusion splicer, the Contractor shall optimize the alignment of the fibers and fuse them together. The contractor shall recoat the fused fibers and install mechanical protection over them. All fiber splices shall be fusion spliced and secured inside a protective enclosure. 45 days prior to the start of the fiber optic cabling installation, the Contractor shall submit the proposed locations of the mainline splice points for review by the Department.

Upon completing all splicing operations for a cable span, the Contractor shall measure the mean bi-directional loss at each splice using an Optical Time Domain Reflectometer. Fusion splices must meet the acceptance testing requirements of the Fiber Optic Cable specifications. As directed by the Engineer, the Contractor at no additional cost to the Department shall replace any cable splice not satisfying the requirements.

The closure shall be installed according to the manufacturer's recommended guidelines. The Contractor shall prepare the cables and fibers in accordance with the closure and cable manufacturers' installation practices. A copy of these practices shall be provided to the Engineer 21 days prior to splicing operations.

After completing all fusion splices, the Contractor shall secure the splice closure to the side of the splice facility using cable support brackets. All cables shall be properly dressed and secured to rails or racks within the manhole. No cables or enclosures will be permitted to lie on the floor of the splice facility.

All work shall be neat and in a workmanlike manner. Particular care shall be taken as to not crush or kink the fiber optic cable. If in the opinion of the Engineer the cable has been crushed or kinked, the entire cable span shall be removed and replaced at no additional cost to the Department.

Method of Measurement. Fiber optic splices of the type specified will be measured as each for all the required splices shown on the plans at a given site completed, tested, and secured within protective enclosures.

Basis of Payment. This work will be paid for at the contract unit price per each for FIBER OPTIC SPLICE – LATERAL or FIBER OPTIC SPLICE – MAINLINE, which price shall be payment in full for all fusion splice work at a site location, complete as specified herein.

FIBER OPTIC CABLE, SINGLE MODE (D-1)
Effective: March 15, 2013

Description. The Contractor shall furnish and install loose-tube, single-mode, fiber optic cable of the number of fibers specified as shown in the plans and as directed by the Engineer.

Other ancillary components, required to complete the fiber optic cable plant, including but not limited to, moisture and water sealants, cable caps, fan-out kits, etc., shall be included in the cost of fiber optic cable and will not be paid for separately.

Materials. The single-mode, fiber optic cable shall incorporate a loose, buffer-tube design. The cable shall be an accepted product of the United States Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900 and meet the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-1999 for a single sheathed, non-armored cable, and shall be new, unused and of current design and manufacture.

Fibers

The cables shall use dispersion unshifted fibers. The optical and physical characteristics of the un-cabled fibers shall include:

The single-mode fiber shall meet EIA/TIA-492CAAA, "Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers," and ITU recommendation G.652.D, “Characteristics of a single-mode optical fiber cable.”

Physical Construction		
Requirement	**Units**	**Value**
Cladding Diameter	µm	12.50 ± 0.7
Core-to-Cladding Concentricity	µm	≤ 0.5
Cladding Non-Circularity	µm	≤ 0.7%
Mode Field Diameter (1310 nm)	µm	9.2 ± 0.4
Mode Field Diameter (1550 nm)	µm	10.4 ± 0.5
Coating Diameter	µm	245 ± 5
Colored Fiber Nominal Diameter	µm	253 – 259
Fiber Curl Radius of Curvature	m	> 4.0

Optical Characteristics				
Requirement			**Units**	**Value**
Cabled Fiber Attenuation		1310 nm	dB/km	≤ 0.4
		1550 nm		≤0.3
Point Discontinuity		1310 nm	dB	≤ 0.1
		1550 nm		≤ 0.1
Macrobend Attenuation	Turns	Mandrel OD	dB	
	1	32 ± 2 mm		< 0.05 at 1550 nm
	100	50 ± 2 mm		< 0.05 at 1310 nm
	100	50 ± 2 mm		< 0.10 at 1550 nm
	100	60 ± 2 mm		< 0.05 at 1550 nm
	100	60 ± 2 mm		< 0.05 at 1625 nm
Cable Cutoff Wavelength (Λ_{ccf})			nm	< 1260
Zero Dispersion Wavelength (Λ_0)			nm	$1302 \le \Lambda_0 \le 1322$
Zero Dispersion Slope (S_0)			ps/(nm^2-km)	≤ 0.089
Total Dispersion		1550 nm	ps/(nm-km)	≤ 3.5
		1285-1330 nm		≤ 17.5
		1625 nm		≤ 21.5
Cabled Polarization Mode Dispersion			(ps/km^2)	≤ 0.2
IEEE 802.3 GbE – 1300 nm Laser Distance			(m)	Up to 5000
Water Peak Attenuation: 1383 ± 3 nm			(dB/km)	≤ 0.4

Cable Construction

The number of fibers in each cable shall be as specified on the plans.

Optical fibers shall be placed inside a loose buffer tube. The nominal outer diameter of the buffer tube shall be 3.0 mm. Each buffer tube shall contain up to 12 fibers. The fibers shall not adhere to the inside of the buffer tube.

Each fiber shall be distinguishable by means of color coding in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding." The fibers shall be colored with ultraviolet (UV) curable inks.

Buffer tubes containing fibers shall be color coded with distinct and recognizable colors in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding." Buffer tube colored stripes shall be inlaid in the tube by means of co-extrusion when required. The nominal stripe width shall be 1 mm.

For cables containing more than 12 buffer tubes, standard colors are used for tubes 1 through 12 and stripes are used to denote tubes 13 through 24. The color sequence applies to tubes containing fibers only, and shall begin with the first tube. If fillers are required, they shall be placed in the inner layer of the cable. The tube color sequence shall start from the inside layer and progress outward.

In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and shall not be subject to fading or smearing onto each other. Colors shall not cause fibers to stick together.

The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of 7 CFR 1755.900.

Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed. Fillers shall be placed so that they do not interrupt the consecutive positioning of the buffer tubes. In dual layer cables, any fillers shall be placed in the inner layer. Fillers shall be nominally 2.5 mm or 3.0 mm in outer diameter.

The central member shall consist of a dielectric, glass reinforced plastic (GRP) rod (optional steel central member). The purpose of the central member is to provide tensile strength and prevent buckling. The central member shall be overcoated with a thermoplastic when required to achieve dimensional sizing to accommodate buffer tubes/fillers.

Each buffer tube shall contain a water-swellable yarn for water-blocking protection. The water-swellable yarn shall be non-nutritive to fungus, electrically non-conductive, and homogeneous. It shall also be free from dirt or foreign matter. This yarn will preclude the need for other water-blocking material; the buffer-tube shall be gel-free. The optical fibers shall not require cleaning before placement into a splice tray or fan-out kit.

Buffer tubes shall be stranded around the dielectric central member using the reverse oscillation, or "S-Z", stranding process.

Water swellable yarn(s) shall be applied longitudinally along the central member during stranding.

Two polyester yarn binders shall be applied contrahelically with sufficient tension to secure each buffer tube layer to the dielectric central member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking, and dielectric with low shrinkage.

For single layer cables, a water swellable tape shall be applied longitudinally around the outside of the stranded tubes/fillers. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter.

For dual layer cables, a second (outer) layer of buffer tubes shall be stranded over the original core to form a two layer core. A water swellable tape shall be applied longitudinally over both the inner and outer layer. The water swellable tape shall be non-nutritive to fungus, electrically non-conductive, and homogenous. It shall also be free from dirt and foreign matter.

The cables shall contain one ripcord under the sheath for easy sheath removal.

Tensile strength shall be provided by the central member, and additional dielectric yarns as required.

The dielectric yarns shall be helically stranded evenly around the cable core.

The cables shall be sheathed with medium density polyethylene (MDPE). The minimum nominal jacket thickness shall be 1.4 mm. Jacketing material shall be applied directly over the tensile strength members (as required) and water swellable tape. The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The MDPE jacket material shall be as defined by ASTM D1248, Type II, Class C, Category 4 and Grades J4, E7 and E8.

The jacket or sheath shall be free of holes, splits, and blisters.

The cable jacket shall contain no metal elements and shall be of a consistent thickness.

Cable jackets shall be marked with the manufacturer's name, month and year of manufacture, sequential meter or foot markings, a telecommunication handset symbol as required by Section 350G of the National Electrical Safety Code (NESC), fiber count, and fiber type. The actual length of the cable shall be within -0/+1% of the length markings. The print color shall be white, with the exception that cable jackets containing one or more co-extruded white stripes, which shall be printed in light blue. The height of the marking shall be approximately 2.5 mm.

The maximum pulling tension shall be 2700 N (608 lbf) during installation (short term) and 890 N (200 lbf) long term installed.

The shipping, storage, and operating temperature range of the cable shall be -40°C to +70°C. The installation temperature range of the cable shall be –30°C to +70°C.

General Cable Performance Specifications

The fiber optic cable manufacturer shall provide documentation and certify that the fiber optic cable complies with the following EIA-455-xxx Fiber Optic Test Procedures (FOTP):

When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components," the change in attenuation at extreme operational temperatures (-40°C and +70°C) shall not exceed 0.15 dB/km at 1550 nm for single-mode fiber and 0.3 dB/km at 1300 nm for multimode fiber.

When tested in accordance with FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable," a one meter length of unaged cable shall withstand a one meter static head or equivalent continuous pressure of water for one hour without leakage through the open cable end.

When tested in accordance with FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable," the cable shall exhibit no flow (drip or leak) of filling and/or flooding material at 70°C.

When tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables," the cable shall withstand a minimum compressive load of 220 N/cm (125 lbf/in) applied uniformly over the length of the sample. The 220 N/cm (125 lbf/in) load shall be applied at a rate of 2.5 mm (0.1 in) per minute. The load shall be maintained for a period of 1 minute. The load shall then be decreased to 110 N/cm (63 lbf/in). Alternatively, it is acceptable to remove the 220 N/cm (125 lbf/in) load entirely and apply the 110 N/cm (63 lbf/in) load within five minutes at a rate of 2.5 mm (0.1 in) per minute. The 110 N/cm (63 lbf/in) load shall be maintained for a period of 10 minutes. Attenuation measurements shall be performed before release of the 110 N/cm (63 lbf/in) load. The change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fibers and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test," the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," except that the number of cycles shall be two at three locations along a one meter cable length and the impact energy shall be atleast 4.4 Nm (in accordance with ICEA S-87-640)", the change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test," using a maximum mandrel and sheave diameter of 560 mm, the cable shall withstand a rated tensile load of 2670N (601 lbf) and residual load of 30% of the rated installation load. The axial fiber strain shall be ≤ 60% of the fiber proof level after completion of 60 minute conditioning and while the cable is under the rated installation load. The axial fiber strain shall be ≤ 20% of the fiber proof level after completion of 10 minute conditioning and while the cable is under the residual load. The change in attenuation at residual load and after load removal shall not exceed 0.15 dB at 1550 nm for single mode fiber and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-85, "Fiber Optic Cable Twist Test," a length of cable no greater than 2 meters shall withstand 10 cycles of mechanical twisting. The change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-37, "Low or High Temperature Bend Test for Fiber Optic Cable," the cable shall withstand four full turns around a mandrel of ≤ 20 times the cable diameter after conditioning for four hours at test temperatures of -30°C and +60°C. Neither the inner or outer surfaces of the jacket shall exhibit visible cracks, splits, tears, or other openings. The change in attenuation shall not exceed 0.30 dB at 1550 nm for single mode fiber and 0.50 dB at 1300 nm for multimode fiber.

Quality Assurance Provision

All cabled optical fibers > 1000 meters in length shall be 100% attenuation tested. The attenuation of each fiber shall be provided with each cable reel. The cable manufacturer shall be TL 9000 registered.

Packaging

Top and bottom ends of the cable shall be available for testing. Both ends of the cable shall be sealed to prevent the ingress of moisture. Each reel shall have a weather resistant reel tag attached identifying the reel and cable. The reel tag shall include the following information:

- Cable Number
- Gross Weight
- Shipped Cable Length in Meters
- Job Order Number
- Product Number
- Customer Order Number
- Date Cable was Tested
- Manufacturer Order Number
- Cable Length Markings
    - Top (inside end of cable)
    - Bottom (outside end of cable)

The reel (one flange) marking shall include:

- Manufacturer
- Country of origin
- An arrow indicating proper direction of roll when handling
- Fork lift-handling illustration
- Handling Warnings.

Each cable shall be accompanied by a cable data sheet. The cable data sheet shall include the following information:

- Manufacturer Cable Number
- Manufacturer Product Number
- Manufacturer Factory Order Number
- Customer Name
- Customer Cable Number
- Customer Purchase Order Number
- Mark for Information
- Ordered Length
- Maximum Billable Length
- Actual Shipped Length
- Measured Attenuation of Each Fiber

The cable shall be capable of withstanding a minimum-bending radius of 20 times its outer diameter during installation and 10 times its outer diameter during operation without changing the characteristics of the optical fibers.

The cable shall meet all of specified requirements under the following conditions:

- Shipping/storage temperature: -58° F to +158° F (-50° C to +70° C)
- Installation temperature: -22° F to +158° F (-30° C to +70° C)
- Operating temperature: -40° F to +158° F (-40° C to +70° C)
- Relative humidity from 0% to 95%, non-condensing

Optical Patch Cords and Pigtails

The optical patch cords and pigtails shall comply with the following:

- The optical patch cords shall consist of a section of single fiber, jacketed cable equipped with optical connectors at both ends.
- The factory installed connector furnished as part of the optical patch cords and pigtails shall meet or exceed the requirements for approved connectors specified herein.
- The fiber portion of each patch cord and pigtail shall be a single, jacketed fiber with optical properties identical to the optical cable furnished under this contract.
- The twelve fiber single-mode fiber optic cable shall be installed as a pigtail with factory installed ST compatible connectors.
- The patch cords shall comply with Telcordia GR-326-CORE

Connectors

The optical connectors shall comply with the following:

- All connectors shall be factory installed ST compatible connectors. Field installed connectors shall not be allowed.
- Maximum attenuation 0.4dB, typical 0.2dB.
- No more than 0.2dB increase in attenuation after 1000 insertions.
- Attenuation of all connectors will be checked and recorded at the time of installation with an insertion test minimum 5 times checked with an OTDR.
- All fibers shall be connectorized at each end.
- All fibers shall terminate at a fiber patch panel
- Unused fibers will be protected with a plastic cap to eliminate dust and moisture.
- Termination shall be facilitated by splicing factory OEM pigtails on the end of the bare fiber utilizing the fusion splicing method. Pigtails shall be one meter in length.

CONSTRUCTION REQUIREMENTS

Experience Requirements. Personnel involved in the installation, splicing and testing of the fiber optic cables shall meet the following requirements:

- A minimum of three (3) years experience in the installation of fiber optic cables, including fusion splicing, terminating and testing single mode fibers.
- Install two systems where fiber optic cables are outdoors in conduit and where the systems have been in continuous satisfactory operation for at least two years. The Contractor shall submit as proof, photographs or other supporting documents, and the names, addresses and telephone numbers of the operating personnel who can be contacted regarding the installed fiber optic systems.
- One fiber optic cable system (which may be one of the two in the preceding paragraph), which the Contractor can arrange for demonstration to the Department representatives and the Engineer.

Installers shall be familiar with the cable manufacturer's recommended procedures for installing the cable. This shall include knowledge of splicing procedures for the fusion splicer being used on this project and knowledge of all hardware such as breakout (furcation) kits and splice closures. The Contractor shall submit documented procedures to the Engineer for approval and to be used by Construction inspectors.

Personnel involved in testing shall have been trained by the manufacturer of the fiber optic cable test equipment to be used, in fiber optic cable testing procedures. Proof of this training shall be submitted to the Engineer for approval. In addition, the Contractor shall submit documentation of the testing procedures and a copy of the test equipment operation manual for approval by the Engineer.

Installation in Raceways. Prior to installation, the Contractor shall provide a cable-pulling plan. The plan shall include the following information:

- Identify where each cable will enter the underground system and the direction each pull.
- Identify locations where the cable is pulled out of a handhole, coiled in a figure eight, and pulled back into the hand hole.
- The plan shall address the physical protection of the cable during installation and during periods of downtime.
- Identify the location of slack storage locations
- Identify the locations of splices.
- Identify distances between fiber access points and crossings.

The cable-pulling plan shall be provided to the Engineer for approval a minimum of 15 working days prior to the start of installation. The Engineer's approval shall be for the operation on the freeway and does not include an endorsement of the proposed procedures. The Contractor is responsible for the technical adequacy of the proposed procedures.

During cable pulling operations, the Contractor shall ensure that the minimum bending of the cable is maintained during the unreeling and pulling operations. Unless specified otherwise by the fiber optic cable manufacturer, the outside bend radius of the cable during installation shall be no less than 20 times the outside diameter of the fiber optic cable. Entry guide chutes shall be used to guide the cable into the handhole conduit ports. Lubricating compound shall be used to minimize friction. Corner rollers (wheels), if used, shall not have radii less than the minimum installation-bending radius of the cable. A series array of smaller wheels can be used for accomplishing the bend if the cable manufacturers specifically approve the array.

If figure-eight techniques are used during cable installation, the cable shall be handled manually and stored on the ground. The cable shall be placed on tarps to prevent damage from gravel, rocks, or other abrasive surfaces. Tarps should also be used in muddy conditions to keep the cable clean. Enough area to accommodate the cable length to be stored and sufficient personnel to maintain the required minimum-bending diameter as well as avoid kinking or otherwise damaging the cable shall be provided. If the cable has been figure-eighted in preparation for a forward feed, the figure-eight must be flipped over to access the outside cable end. Provide sufficient personnel to avoid kinking the cable as the figure-eight is flipped over. When removing the cable from the figure-eight, use care to avoid kinking the cable and violating the minimum-bending diameter.

Power assisted or figure-eight eliminator equipment, which is used to eliminate manual figure-eight procedures, shall not be used unless specifically allowed by the cable manufacturer in writing.

The pulling tension shall be continuously measured and shall not be allowed to exceed the maximum tension specified by the manufacturer of the cable. A dynamometer or in-line tensiometer shall be used to monitor tension in the pull-line near the winch. This device must be visible to the winch operator or used to control the winch. The pulling system shall have an audible alarm that sounds whenever a pre-selected tension level is reached. Tension levels shall be recorded continuously and shall be given to the engineer as well as included in the record drawing package.

The use of a breakaway link (swivel) may be used to ensure that the maximum tension of the cable is not exceeded. Breakaway links react to tension at the pulling eye and shall not be used in lieu of tension measuring devices. All pulling equipment and hardware which will contact the cable during installation must maintain the cable's minimum bend radius. Equipment including sheaves, capstans, bending shoes, and quadrant blocks shall be designed for use with fiber optic cable.

The cable shall be pulled into the conduit as a single component, absorbing the pulling force in all tension elements. The central strength member and Aramid yarn shall be attached directly to the pulling eye during cable pulling. "Basket grip" type attachments, which only attach to the cable's outer jacket, shall not be permitted. A breakaway swivel, rated at 95% of the cable manufacturer's approved maximum tensile loading, shall be used on all pulls. When simultaneously pulling fiber optic cable with other cables, separate grooved rollers shall be used for each cable.

To minimize the exposure of the backbone cable and to facilitate the longer lengths of fiber optic cable, the Contractor shall use a "blown cable" (pneumatically assisted) technique to place the fiber optic cable. A Compressed air cooler shall be used when ambient air temperatures reach 90°F or more.

Where cable is to be pulled through existing conduit which contains existing cables, optical or other, the existing cables shall be removed and reinstalled with the fiber optic cable as indicated on the plans. The removal of the cable(s) shall be paid for separately. Reinstallation of the existing cables, if indicated on the plans, along with the fiber optic cable shall be included in this item for payment.

Tracer Wire. A tracer wire shall be installed with all fiber optic cable runs. One tracer wire shall be installed along with the fiber optic cable in each raceway. If a raceway has more than one fiber optic cable, only one tracer wire per raceway is required. If there are parallel raceways, a tracer wire is required in each raceway that contains a fiber optic cable. Tracer wire shall be installed in raceway segments which are metallic to provide a continuous tracer wire system.

The tracer wire shall be a direct burial rated, number 12 AWG (minimum) solid (.0808" diameter), steel core soft drawn high strength tracer wire. The wire shall have a minimum 380 pound average tensile break strength. The wire shall have a 30 mil high density yellow polyethylene (HDPE) jacket complying with ASTM-D-1248, and a 30 volt rating.
Connection devices used shall be as approved by the tracer wire manufacturer, except wire nuts of any type are not acceptable and shall not be used.

The cost of the tracer wire shall be included in the cost of the fiber optic cable and not paid for separately.

Aerial Fiber Optic Cable. Aerial fiber optic cable assemblies shall be of a self-supporting figure-8 design. The fiber optic cable shall be as described herein and shall be waterblocked utilizing water-swellable materials. The cable assembly shall be designed and manufactured to facilitate midspan access.

The submittal information must include a copy of the standard installation instructions for the proposed cable. Installed cable sag shall not exceed 1% of the span distance. The submittal information must also include catalog cuts for all hardware to be utilized in the installation.

Construction Documentation Requirements. The Contractor shall examine the proposed cable plant design. At least one month prior to starting installation of the fiber optic cable plant, the Contractor shall prepare and submit to the Engineer for review and approval, ten (10) copies of the Contractor's "Installation Practices for Outdoor Fiber Optic Cable Systems" manual. This manual shall address the Contractor's proposed practices covering all aspects of the fiber optic cable plant. This submittal shall include all proposed procedures, list of installation equipment, and splicing and test equipment. Test and quality control procedures shall be detailed as well as procedures for corrective action.

Operations and Maintenance Documentation. After the fiber optic cable plant has been installed, ten (10) complete sets of Operation and Maintenance Documentation shall be provided. The documentation shall, as a minimum, include the following:

- Complete and accurate as-built diagrams showing the entire fiber optic cable plant including locations of all splices.
- Final copies of all approved test procedures
- Complete performance data of the cable plant showing the losses at each splice location and each terminal connector.
- Complete parts list including names of vendors.

Testing Requirements. The Contractor shall submit detailed test procedures for approval by the Engineer. All fibers (terminated and un-terminated) shall be tested bi-directionally at both 1310 nm and 1550 nm with both an Optical Time Domain Reflectometer (OTDR) and a power meter with an optical source. For testing, intermediate breakout fibers may be concatenated and tested end-to-end. Any discrepancies between the measured results and these specifications will be resolved to the satisfaction of the Engineer.

Fibers which are not to be terminated shall be shall be tested with a temporary fusion spliced pigtail fiber. Mechanical splice or bare fiber adapters are not acceptable.

The Contractor shall provide the date, time and location of any tests required by this specification to the Engineer at least 5 working (7 calendar) days before performing the test. Included with the notification shall be a record drawing of the installed fiber optic cable system. The drawings shall indicate actual installed routing of the cable, the locations of splices, and locations of cable slack with slack quantities identified.

Upon completion of the cable installation, splicing, and termination, the Contractor shall test all fibers for continuity, events above 0.1 dB, and total attenuation of the cable. The test procedure shall be as follows:

A Certified Technician utilizing an Optical Time Domain Reflectometer (OTDR) and Optical Source/Power Meter shall conduct the installation test. The test equipment used shall have been calibrated within the last two years. Documentation shall be provided. The Technician is directed to conduct the test using the standard operating procedures defined by the manufacturer of the test equipment. All fibers installed shall be tested in both directions.

A fiber ring or fiber box shall be used to connect the OTDR to the fiber optic cable under test at both the launch and receive ends. The tests shall be conducted at 1310 and 1550 nm for all fibers.

All testing shall be witnessed by the IDOT Engineer and a copy of the test results (CD ROM or USB Drive) shall be submitted on the same day of the test. Hardcopies shall be submitted as described herein with copies on CD ROM.

At the completion of the test, the Contractor shall provide copies of the documentation of the test results to the Project Engineer. The test documentation shall be submitted as two bound copies and three CD ROM copies, and shall include the following:

Cable & Fiber Identification:

- Cable ID
- Operator Name
- Cable Location - beginning and end point
- Date & Time
- Fiber ID, including tube and fiber color
- Setup Parameters
- Wavelength
- Range (OTDR)
- Pulse width (OTDR)
- Scale (OTDR)
- Refractory index (OTDR)
- Setup Option chosen to pass OTDR “dead zone”

Test Results shall include:

- OTDR Test results
- Measured Length (Cable Marking)
- Total Fiber Trace
- Total Length (OTDR)
- Splice Loss/Gain
- Optical Source/Power Meter Total Attenuation (dB/km)
- Events > 0.10 dB

All work shall be neat and in a workmanlike manner. Particular care shall be taken as to not crush or kink the fiber optic cable. If in the opinion of the Engineer the cable has been crushed or kinked, the entire cable span shall be removed and replaced at no additional cost to the Department.

Sample Power Meter Tabulation:

Power Meter Measurements (dB)									
Location		Fiber No.	Cable Length (km)	A to B		B to A		Bidirectional Average	
A	B			1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm
		1							
		2							
Maximum Loss									
Minimum Loss									

The OTDR test results file format must be Bellcore/Telcordia compliant according to GR196-CORE Issue 2, OTDR Data Standard, GR 196, Revision 1.0, GR 196, Revision 1.1, GR 196, Revision 2.0 (SR-4731) in a ".SOR" file format. A copy of the test equipment manufacture's software to read the test files, OTDR and power, shall be provided to the Department. These results shall also be provided in tabular form, see sample below:

Sample OTDR Summary				
Cable Designation:	*TCF-IK-03*	**OTDR Location:**	*Pump Sta. 67*	**Date:** 0/0/00
Fiber Number	**Event Type**	**Event Location**	**Event Loss (dB)**	
1	*Splice*	*23,500 ft*	*0.082*	*0.078*
1	*Splice*	*29,000 ft*	*0.075*	*0.063*
2	*Splice*	*29,000 ft*	*0.091*	*0.082*
3	*Splice*	*26,000 ft*	*0.072*	*0.061*
3	*Bend*	*27,000 ft*	*0.010*	*0.009*

The following shall be the criteria for the acceptance of the cable:

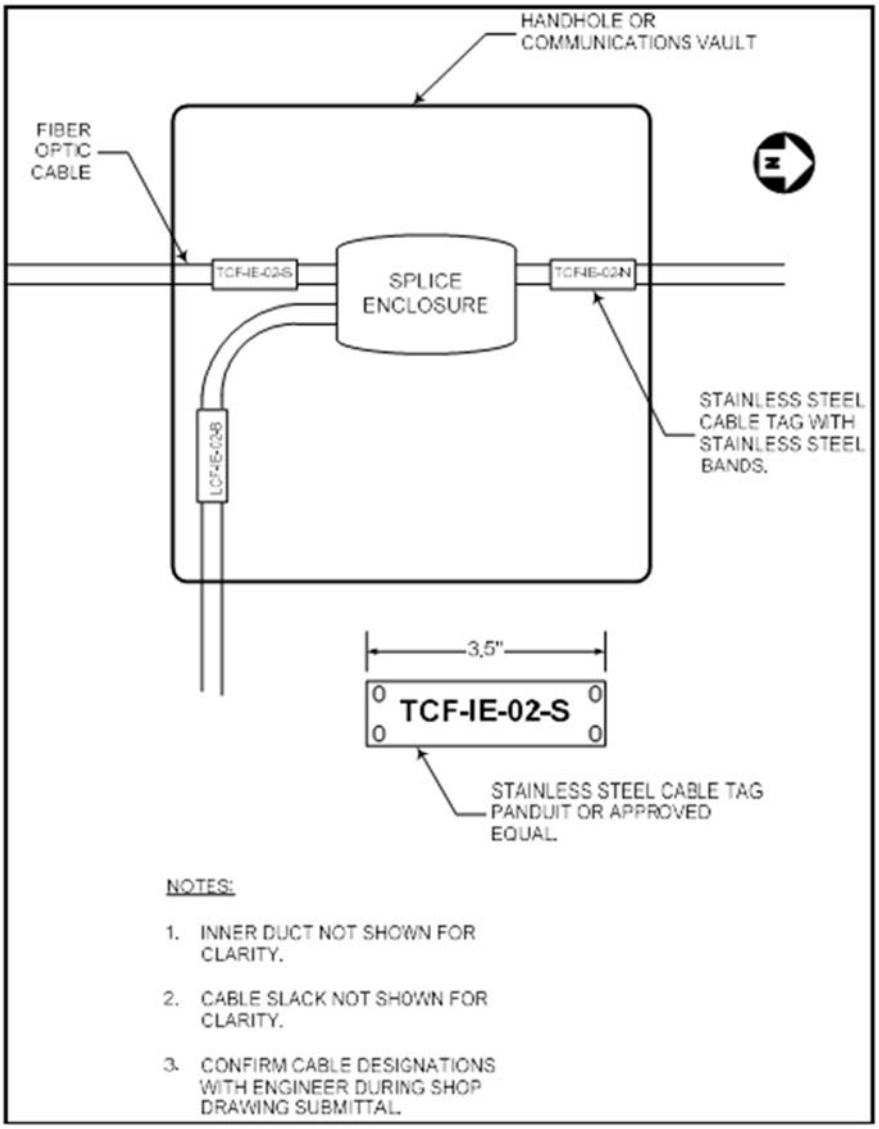
(a) Max cable attenuation @1310 nm ≤ 0.4 dB/km, @1550 nm ≤ 0.3 dB/km; events shall be ≤ 0.1 dB

(b) Contractor shall submit to the Engineer a loss budget which includes cable attenuation, events from splices, and connectors at each patch panel where the cable is terminated. This shall be done for each trunk, distribution and lateral cable installed on the project. The loss budget shall be submitted for review 30 days prior to the cable installation. Once approved by the Engineer, the fiber cable can be installed and the loss budget document shall be used to judge whether the installed cable, spliced and terminated, is acceptable by the Department.

Splicing Requirements. Splices shall be made at locations shown on the Plans. Any other splices shall be permitted only with the approval of the Engineer. Splices will be paid for separately. All splice locations must be identified in the Record Drawings. Cable runs which dead-end at a handhole, communications vault, interconnect cabinet, or any other type of enclosure, shall be dead ended in a splice enclosure.

Slack Storage of Fiber Optic Cables. Included as a part of this item, slack fiber shall be supplied as necessary to allow splicing the fiber optic cables in a controlled environment, such as a splicing van or tent. After splicing has been completed, the slack fiber shall be stored underground in handholes or in the raised base adapters of ground mounted cabinets in accordance with the fiber optic cable manufacturer's guidelines. Fiber optic cable slack shall be 100 feet for each cable at each splice location, above or below ground. Fiber optic cable slack shall be 50 feet for each cable at access points, above or below ground, where splicing is not involved. If the innerduct is cut, the ends of the innerduct should extend beyond the first vertical rack so they can be secured at that point. This slack shall be measured for payment.

Fiber optic cable shall be tagged inside handholes with yellow tape containing the text: "CAUTION - FIBER OPTIC CABLE." In addition, permanent tags, as approved by the engineer, shall be attached to all cable in a hand hole or other break-out environment. These tags shall be stainless steel, nominally 0.75" by 1.72", and permanently embossed. These tags shall be attached with stainless steel straps, and shall identify the cable number, the number of fibers, and the specific fiber count. Tags and straps shall be Panduit or approved equal. See figure below:


HANDHOLE OR
COMMUNICATIONS VAULT
FIBER
OPTIC
CABLE
TCF-IE-02-S
SPLICE
ENCLOSURE
TCF-IE-02-N
TCF-IE-02-S
STAINLESS STEEL
CABLE TAG WITH
STAINLESS STEEL
BANDS.
3.5"
TCF-IE-02-S
STAINLESS STEEL CABLE TAG
PANDUIT OR APPROVED
EQUAL.
NOTES:
1. INNER DUCT NOT SHOWN FOR CLARITY.
2. CABLE SLACK NOT SHOWN FOR CLARITY.
3. CONFIRM CABLE DESIGNATIONS WITH ENGINEER DURING SHOP DRAWING SUBMITTAL.

Label the destination of each trunk cable onto the cable in each handhole, vault or cable termination panel.

Method of Measurement. Fiber optic cable will be measured for payment in feet in place installed and tested. Fiber optic cable will be measured horizontally and vertically between the changes in direction, including slack cable. The entire lengths of cables installed in buildings will be measured for payment

Basis of Payment. This work will be paid for at the contract unit price per foot for FIBER OPTIC CABLE of the type, size, and number of fibers specified. Payment shall not be made until the cable is installed, spliced and tested in compliance with these special provisions.

FIBER OPTIC TERMINATION PANEL, 12F OR 24F (D-1)
Effective: Dec. 28, 2009

Description Work under this item shall consist of furnishing and installing a fiber optic termination panel, type and size as specified on the plans and described herein. This equipment will be used to link field equipment using single-mode fiber optic cable.

Materials The fiber optic termination panel shall comply with the following requirements:

(a) The fiber optic termination panel shall be rack mountable or wall mounted
(b) Rack mounted termination panels shall be installed in 19” racks inside of ITS or 334 Type Cabinets or Pump Houses w/19” racks
(c) The fiber patch panel shall terminate pigtail fibers as called out on the Plans.
(d) The fiber optic termination panel shall allow termination of a fiber patch cord to interconnect outside plant fibers to fiber optic communication equipment
(e) Shall be supplied with optical splice tray and holder
(f) Wall mounted termination panels shall be installed in Pump Station, Type III, Type IV, or Type V control Cabinets
(g) Wall-mounted termination panels shall be made out of solid steel construction, shall be powder coated, and feature top or bottom cable entry w/dust resistant grommets.
(h) Rack-mounted units shall be aluminum material per ATSMB 209, powder coated, and modular design.
(i) The approved type optical connectors on the end of each pigtail shall screw into a sleeve securely mounted to a patch panel within the controller cabinet. The maximum optical loss across the connection shall not exceed 0.25 dB.
(j) The fibers with the optical connectors on the pigtail cable shall be routed through and secured in the fiber optic termination panel as directed by and to the satisfaction of the Engineer.
(k) The bulkheads or single-mode adapter types shall be single-mode ST compatible, ceramic, unless a substitute is approved by the Engineer.

CONSTRUCTION REQUIREMENTS

The Fiber Optic Termination Panel shall be installed in the locations shown on the Plans. The panels shall come with cable strain relief hardware and pull out label for administrative documentation. All work shall be neat and in a workmanlike manner. Particular care shall be taken as to not crush or kink the fiber optic cable. If in the opinion of the engineer the cable has been crushed or kinked, the entire cable span shall be removed and replaced at the Contractor's expense.

The approved type of single-mode connectors on the end of each pigtail must screw into a sleeve securely mounted to the termination panel within the fiber termination panel enclosure. The panel must be provided with pre-connectorized and pre-wired port modules.

Basis of Payment FIBER OPTIC TERMINATION PANEL, 12F OR 24F will be paid for at the Contract unit price each. This price shall be payment for furnishing and installing the FIBER OPTIC TERMINATION PANEL 12F OR 24F along with any necessary fiber optic patch cords and any other materials, hardware, and labor necessary to complete the installation.

ELECTRICAL CABLE IN CONDUIT, 4C/NO. 18 SHIELDED LOOP LEAD-IN
Effective: March 1, 2010 Revised: April 5, 2017

Description.

This work shall consist of furnishing materials and labor for installation of shielded loop lead-in cables in conduit as specified herein and indicated by the Engineer, complete with all identification, terminating and testing.

Materials.

General:

Lead–in is the wire that extends from the core hole of the induction loop to the termination point.

The cable shall be an assembly of pairs of left hand lay twisted insulated conductors, with a core filled with a petroleum base flooding compound, overlapped conductive tape shield and a black high density polyethylene jacket overall. This cable shall meet the requirements of IEEE Standard 383.

The cable shall have an Aluminized Polyester Shield to protect against electromagnetic interference.

The cable interstices shall be filled with a water blocking compound. It shall prevent hosing, siphoning or capillary absorption of water.

The jacket of high density polyethylene shall be rated to 600 volts in accordance with UL 83 Section 36.

All cables shall be UL listed.

The cable shall be rated 90 degrees C dry and 75 degrees C wet and shall be suitable for installation in wet and dry locations, exposed to the weather, and shall be resistant to oils and chemicals.

It shall have an operating temperature range of -20C to +60C (minimum).

The UL listing mark, cable voltage, insulation type and ratings, as well as the cable size shall all be clearly printed on the cable in a color contrasting with the insulation color.

Conductors:

The lead–in cable shall be 4 conductors (2 pair) # 18 stranded (7X.0152”) un-coated copper, twisted at least 4 turns per foot and rated to 600 Volts. 1 pair is used for the loop while the other pair is a spare. Under no circumstances shall the spare pair be used to connect a second loop.

Conductors shall meet the requirements of ASTM Designation B-8 as applicable.

The conductors shall be coded as follows: black-red-white-green.

Insulation:

Cable insulation shall incorporate polyvinyl chloride (PVC) or Polypropylene, with a clear nylon covering overall as specified and the insulation shall meet or exceed the requirements of ICEA S-61-402, NEMA Standard Publication No. WC-5, UL Standard 83, as applicable.

Installation:

All cables shall be delivered to the site in full reels. Cable on the reels shall be protected from damage during shipment and handling by wood lagging or other means acceptable to the Engineer. Reels shall be tagged or otherwise identified to show the UL listing.

The loop lead-in shall be barrel sleeved, crimped, soldered and protected by heat shrinkable tubing to the loop #14 wire. Lead-ins shall be twisted in such a manner so as to prevent mechanical movement between the individual cables. Lead-ins shall be brought into the cabinet or handhole at the time the induction loop is placed in the pavement. Loops located over 1000 feet from cabinet require four (4) turns of No. 14 wire.

Lead-in cable will be installed where the lead-in length from point of interception to the point of termination exceeds 150 feet.

Where lead-in runs are less than 150 feet, the loop wire will be utilized as lead-in to the point of termination w/o splices, being twisted 5 turns per foot. The additional loop wire will not be paid for separately but shall be included in the Induction Loop Pay Item.

Loop lead-ins placed in handholes shall be coiled, taped, and hung from the side of the handhole to protect against water damage. Any other method of installation will require prior written approval of the Engineer. Each loop lead-in shall be color coded and tagged in each handhole through which it passes. The loop lead-in shall be color coded and tagged at the core hole, in each junction box it passes through and at the termination point in the cabinet.

TRAFFIC SYSTEMS CENTER LOOP SPLICING REQUIREMENT

MAINLINE LOOPS		METERING LOOPS			
Lane 1	Blue	Lane 4	Violet	Loop 1	Green
Lane 2	Brown	Exit	Black	Loop 2	Yellow
Lane 3	Orange	Entrance	White	Loop 3	Red

When 2 or 3 loops are installed on an exit or entrance ramp the loop color code shall conform to the mainline loop color code and shall be marked as entrance or exit ramp loops.

In addition to color codes each loop shall be identified with a written label attached to the loop wire, or lead-in wire. The tags shall be Panduit #MP250W175-C or equivalent. All wires and cables shall be identified in each handhole or cabinet the cable passes through, or terminates in. The labels shall be attached to the cable by use of two cable ties.

Testing.

After installation, the cable shall be tested as approved by the Engineer. Cable failing to pass the test shall be replaced with new cable at no additional cost.

Method of Measurement.

The cable shall be measured for payment in linear foot in place. Measurements shall be made in straight lines between changes in direction and to the centers of Equipment. All vertical cable and permissible cable slack shall be measured for payment. A total of six (6) feet of slack shall be allowed for the end of a run terminating at a panel and four (4) feet will similarly be allowed when terminating at a wall-mounted panel. Additional vertical distance for the height of conduit risers, etc., as applicable, will be measured for payment for equipment so mounted.

Basis of Payment.

This work shall be paid at the Contract unit price per linear foot, furnished and installed for

ELECTRICAL CABLE IN CONDUIT, LEAD IN, NO. 18 4/C, TWISTED SHIELDED

ELECTRIC SPLICE PEDESTAL

Description. The electric splice pedestal provides an above-ground enclosure for housing electrical cable splices. The electric splice pedestal accommodates temporary service during construction and permanent service after construction is completed.

Submittals. The Contractor shall submit for the approval of the Engineer, complete shop drawings for the pedestal, including internal termination panel diagram and directory and enclosure labels. The Contractor shall receive the Engineer's approval prior to purchase of materials or any assembly.

Materials. The foundation consists of a Type A traffic signal foundation with two (2") RGC conduit sleeves and (1") RGC conduit sleeve installed therein. A traffic signal post, 3.5 ft. tall, is mounted on the foundation. The cost of the traffic signal post is included in the cost of the pay item. The termination panel shall be mounted in a stainless steel NEMA 4X enclosure (30" x 16" x 8") or as required to contain the termination panel and spliced cable slack and provide at least the NEC minimum wiring troughs and adequate room to neatly route the conductors. The panel shall be side-hinged with a piano-type hinge with non-removable hinge pin, and shall have a stainless steel padlock hasp in addition to screw clamps to hold the door closed. All attachments and mountings used shall maintain the NEMA rating of the enclosure. An adapter plate of 1/4-inch stainless steel shall be welded to the bottom of the enclosure and shall have a slip-fit coupling attached to it for mounting the enclosure to the traffic signal post.

The internal terminal strip shall have copper neutral and ground buses with not less than 10 screws. Neutral bus screw heads shall be painted white, ground bus screws shall be painted green. The neutral and ground buses shall be bonded together.

The pedestal cabinet shall have a laminated diagram and directory mounted on the inside of the enclosure door. In addition, the load shall be identified by 1/8-inch thick melamine labels, black letters in white face, attached to the panel using zinc chromate plated machine screws. Adhesives shall not be used. The outside of the door of the enclosure shall also bear a melamine label of the same construction, attached with a minimum of 4 stainless steel screws, and shall bear the legend "ELECTRICAL SPLICE CAB. XXX", where XXX is the cabinet number as directed by the Engineer.

Ground Rod. A new ground rod shall be installed for the pedestal. The grounding electrode conductor shall be installed in rigid galvanized steel conduit from the ground bus to the ground rod. The connection to the ground rod shall be made with an exothermic weld. The ground rod, grounding electrode conductor, conduit, and the labor, tools, equipment necessary to install them are included in this pay item and will not be paid for separately.

CONSTRUCTION

The enclosure shall be manufactured by a UL listed panel shop and shall bear the UL label. The Contractor shall coordinate the installation of the pedestal with Commonwealth Edison. The Contractor shall notify the Engineer when the installation is complete, and the Contractor shall obtain the Engineers approval of the installed pedestal prior to energization.

METHOD OF MEASUREMENT. EQUIPMENT CABINET AND PEDESTAL MOUNTED BASE will be measured on an each basis for one installed, completed, tested and accepted EQUIPMENT CABINET AND PEDESTAL MOUNTED BASE.

BASIS OF PAYMENT. This work will be paid at the contract price each for EQUIPMENT CABINET AND PEDESTAL MOUNTED BASE which includes payment in full for all material, labor, tools and equipment required to construct a complete EQUIPMENT CABINET AND PEDESTAL MOUNTED BASE to the satisfaction of the Engineer. The electric cable shall be paid for separately.

CONCRETE FOUNDATIONS (SPECIAL)

Description. Concrete foundations shall be constructed to support ITS equipment cabinets at locations as indicated on the Plans. This work shall include installing any necessary hardware (entering conduits, bolts, anchor rods, grounding, etc.) as shown on the Plans. This work shall also include any topsoil, fertilizing, seeding, and mulching of the disturbed areas in accordance with Sections 211, 250, and 251 of the Standard Specifications.

Materials. Concrete foundations shall be according to materials defined in Article 836.02 of Section 836 of the Standard Specifications. All anchor bolts shall be in accordance with Section 1006.09 of the Standard Specifications except that all anchor bolts shall be hot dipped galvanized the full length of the anchor bolt including the hooks. Anchor bolts shall provide bolt spacing as shown in the Plans and as required by the cabinet manufacturer.

The Concrete foundations shall also be fabricated in accordance with Section 1070 of the Standard Specifications. These concrete foundations shall be fabricated from material new and unused in any previous application. The manufacturer shall provide a Certificate of Compliance that the materials are new and meet the specified requirements in accordance with the Standard Specifications and as shown on the Plans.

CONSTRUCTION REQUIREMENTS

The Engineer will determine the final placement of the Concrete foundations. Concrete foundation dimensions shall be in accordance with those dimensions shown in the Plans on the detail sheet “Cabinet, Model 334 Installation Detail”. The foundation shall be located as required in order to avoid existing and relocated utilities. The top of the foundation shall be finished level. Shimming of the appurtenance to be attached will not be permitted.

Prior to pouring the foundation, the Contractor shall check the Plans for the specific number, size, and direction of conduit entrances required at the given location. All conduit in the foundation shall be installed rigidly in place before concrete is deposited in the form. Bushings shall be provided at the ends of the conduit. Anchor rods and ground rod shall be set in place before the concrete is deposited by means of a template constructed to space the anchor rods according to the pattern of the bolt holes in the base of the appurtenance to be attached. The appurtenance shall not be erected on the foundation until the bases have cured for at least (7) days. The Concrete shall cure according to Article 1020.13 of the Standard Specifications.

Method of Measurement. Concrete foundations shall be measured for payment per each concrete foundation in-place installed in accordance with the total length of concrete foundation required for foundations as indicated on the Plans and as directed by the Engineer. Extra foundation depth, beyond the directive of the Engineer, will not be measured for payment.

Basis of Payment. Payment will be paid for at the contract unit price per each of CONCRETE FOUNDATIONS (SPECIAL).

INDUCTION LOOP
Effective: June 1, 1994 Revised: April 5, 2017

1. DESCRIPTION

This item shall consist of furnishing, installing and testing an induction loop, of the dimensions shown on the plans or of the dimension from Table 1, at the locations shown. The induction loop shall be installed in accordance with all details shown on the plans and applicable portions of Section.886 Standard Specifications for Road and Bridge Construction. All saw cutting, cable installation, joint sealing, lead-ins and testing necessary to complete the installation shall conform with the following requirements.

2. MATERIALS

The cable used for induction loop shall be #14-19 strand XHHW XLP-600V, encased in orange tubing as manufactured by Kris-Tech Wire Company, Inc., IMSA 51-7, or comparable. All loop wire shall be UL listed. The jacket, constructed of high density polyethylene, shall be rated to 600 volts in accordance with UL 83 Section 36.

Lead-ins shall be according to **ELECTRICAL CABLE IN CONDUIT, LEAD IN, NO. 18 4/C, TWISTED SHIELDED.**

Joint sealer shall have sufficient strength and resiliency to withstand stresses set up by vibrations and differences in expansion and contraction due to temperature changes. The joint sealer shall have a minimum tensile strength of 100 P.I.E. when tested by ASTM Method D638-58T. Adhesion to clean dry, oil-free Portland Cement concrete shall be at least equal to the tensile strength of the concrete. The joint sealer, with qualities described above, shall be capable of curing in a maximum time of 30 minutes at all temperatures above 50 degrees F (10 degrees C). Curing shall be defined as the capability of withstanding normal traffic loads without degradation. A hard asphalt-based filling and insulating compound having a high softening point and a high pouring temperature shall be used if the outside installation temperature is below 50 degrees F (10 degrees C). The filling compound shall have a softening point of not less than 235 degrees F (110 degrees C) and a summer pouring temperature of 375 degrees F (190 degrees C); winter pouring temperature of 425 degrees F (220 degrees C). Sealant for Detector Loop(s): The sealer shall meet or exceed the characteristics provided by OZ GEDNEY DOZSeal 230 filling compound.

3. INSTALLATION DETAILS

Slots in the pavement shall be cut with a concrete sawing machine in accordance with the applicable portions of Art. 420.05 of the Standard Specifications for Road and Bridge Construction. The slot must be clean, dry, and oil-free. Wire shall be inserted in the pavement slot with a blunt tool which will not damage the insulation. Loops shall not be dry cut. Loops should not be installed at an outside temperature below 50 degrees F (10 degrees C) unless directed by Engineer.

Plastic sleeving shall be used to insulate the wire where loop wire crosses cracks and joints in the pavement. The sleeving shall be properly sealed with electrical tape to prevent joint sealer from entering sleeves. Sleeving shall extend a minimum of 8 inch (20 cm) each side of joint.

Induction loops on exit and entrance ramps shall be square or rectangular with edges perpendicular or parallel to traffic flow. All mainline loops shall be round loops, 6 feet (1.8 m.) in diameter. Induction loops shall be centered on all ramps and in traffic lanes unless designated otherwise on the plans or by the Engineer. Traffic lanes shall be referred to by number and loop wire shall be color-coded and labeled accordingly. Lane one shall be the lane adjacent to the median, or that lane on the extreme left in the direction of the traffic flow; subsequent lanes are to be coded sequentially towards the outside shoulder. A chart which shows the coding for each installation shall be included in each cabinet. Core holes shall not be allowed at corner of loop. Saw cuts for all induction loops and lead-ins shall not be greater than 2.75 inches (7 cm) in depth.

All excess joint sealer shall be removed so that the level of the sealer in the saw cut is at the same level as the adjoining pavement.

All induction loops shall contain three (3) turns of No. 14 wire min. Each induction loop shall have its own Canoga 30003 or equal home run or lead-in to the cabinet when said induction loops is over 150 feet (45 m) from cabinet. Induction loops shall not be connected in series with other loops. This wire shall be free from kinks or any insulation abrasions. The loop lead-in shall be a Canoga 30003 cable. The loop lead-in shall be barrel sleeved, crimped, soldered and protected by heat shrinkable tubing to the loop #14 wire. Lead-ins shall be twisted in such a manner so as to prevent mechanical movement between the individual cables. Lead-ins shall be brought into a cabinet or handhole at the time the induction loop is placed in the pavement. Loops located over 1000 feet (300m) from cabinet require four (4) turns of No. 14 wire.

Where lead in runs are less than 150 feet (45 meters), the loop wire shall be utilized as lead-in from the Core Hole to the Cabinet, w/o splices, being twisted 5 turns per foot (16 turns per meter). The additional loop wire will not be paid for separately, but shall be considered part of this Pay Item.

Where duct is collapsed or damaged, making it impossible to pull loop lead-in, the affected area will need to be replaced. This will be paid for by the pay items CONDUIT IN TRENCH, HIGH DENSITY POLYETHYLENE COILABLE 1-1/4" and TRENCH AND BACKFILL FOR ELECTRICAL WORK.

Loop lead-ins placed in handholes shall be coiled, taped and hung from the side of the handhole to protect against water damage. Any other method of installation will require prior written approval of the Engineer. Each loop lead-in shall be color coded and tagged in each handhole thru which it passes. The loop lead-in shall be color coded and tagged at the core hole, in each junction box it passes thru, and at the termination point in the cabinet.
Contractor shall core drill all mainline round loops 6 feet (183 meters) in diameter x .25 inch (6 mm) in width x 2.75 inches (7 cm) in depth.

Loop lead-ins shall not be allowed in saw cuts in shoulders. The Engineer shall be contacted regarding proposed changes in loop locations necessitated by badly deteriorated pavement. The Engineer may relocate such loops. Loop Wire and lead-ins shall not be installed in the curb and gutter section or through the edge of pavement. A hole shall be drilled at least 12 inches (30 cm) in from the edge of pavement through which the P-duct, loop wire and lead-in shall be installed. Saw cuts through shoulders to core hole shall not be allowed.

W (M)	S (M)
13 ft (4.0 m)	9 ft (2.8 m)
14 ft (4.3 m)	10 ft (3.1 m)
15 ft (4.6 m)	11 ft (3.4 m)
16 ft (4.9 m)	12 ft (3.7 m)
17 ft (5.2 m)	13ft (4.0 m)
18 ft (5.5 m)	14ft (4.3 m)
19 ft (5.8 m)	15 ft (4.6 m)
20 ft (6.1 m)	16 ft (4.9 m)
21 ft (6.4 m)	17 ft(5.2 m)
22 ft (6.7 m)	18 ft (5.5 m)
23 ft (7.0 m)	19 ft (5.8 m)
24 ft (7.3 m)	20 ft (6.1 m)
25 ft (7.6 m)	21 ft (6.4 m)

Should the induction loop and/or core hole for the induction loop and loop lead-in cable be paved over by other construction operations, it shall be the contractor's responsibility for locating and finding the induction loop and/or the core hole for the repair of a bad loop or lead-in or for the installation of a new loop or loop lead-in. The locating of the core hole and the induction loop shall be incidental to the cost of the induction loop lead-in installation.

No extra compensation shall be allowed for finding and locating induction loops and/or core hole.

The loop shall be spliced to the lead-in wire with a barrel sleeve crimped and soldered. Epoxy filled heat shrink tubing shall be used to protect the splice. The soldered connection shall be made with a soldering iron or soldering gun. No other method will be acceptable, i.e. the use of a torch to solder will not be acceptable. The heat shrink tube shall be shrunk with a heat gun. Any other method will not be acceptable, i.e. the use of a torch will not be acceptable. No burrs shall be left on the wire when done soldering. Cold solder joints will not be acceptable. Refer to T.S.C. typical(s) TY-1TSC-418 #2 & #3 for proper loop to loop lead-in splice detail.

Where there are continuous count stations or multiple lane exits or entrance ramps the loop in the left most lane shall be wrapped clockwise, the adjacent lane loop wrapped counter-clockwise, etc, alternating wrapping the loops every other lane.

4.
TRAFFIC SYSTEMS CENTER LOOP SPLICING REQUIREMENT COLOR CODE

MAINLINE LOOPS				METERING LOOPS	
Lane 1	Blue	Lane 4	Violet	Loop 1	Green
Lane 2	Brown	Exit	Black	Loop 2	Yellow
Lane 3	Orange	Entrance	White	Loop 3	Red

When 2 or 3 loops are installed on an exit or entrance ramp the loop color code shall conform to the mainline loop color code and shall be marked as entrance or exit ramp loops.

In addition to color codes each loop shall be identified with a written label attached to the loop wire, or lead-in wire. The tags shall be Panduit #MP250W175-C or equivalent. All wires and cables shall be identified in each handhole or cabinet that the cable passes through, or terminates in. The labels shall be attached to the cable by use of two cable ties.

5. PROSECUTION OF SURVEILLANCE WORK

The work shall consist of replacement and/or repairs caused by the pavement repair, removal and resurfacing to all induction loops, loop lead-in, poly-duct, steel conduits, all interconnecting cables and all Surveillance appurtenances. The Contractor shall make modifications to existing installations to render the location functional. The Contractor shall also furnish and install new induction loops, loop lead-ins, poly-duct, steel conduits, all interconnecting cables, and all Surveillance appurtenances.

Should damage occur to any Traffic Systems Center cabinets, housing telemetry equipment and/or vehicle detection equipment, the Contractor shall install and replace all damaged equipment at his own expense. The Traffic Systems Center staff shall determine what equipment shall be reusable and what shall be replaced. Replaced equipment shall be of equal or better quality and type.

6. CONNECTIONS TO EXISTING INSTALLATIONS

Where new work connects to existing installations, the Contractor shall do all necessary cutting, fitting and foundation drilling to the existing installation. The Contractor shall remove all existing equipment, as required to make satisfactory connections, so as to leave the entire work in a finished and workmanlike manner, as approved by the Engineer. No raceways shall be allowed to enter cabinet through the sides or backwalls.

7. PROTECTION OF WORK

Electrical work, equipment and appurtenances shall be protected from damage during construction until final acceptance. Electrical raceway or duct openings, shall be capped or sealed from the entrance of water and dirt. Wiring shall be protected from mechanical injury.

8. STANDARDS OF INSTALLATION

Electrical work shall be installed in a neat and workmanlike manner in accordance with the best practices of the trade. Unless otherwise indicated, materials and equipment shall be new and installed in accordance with the manufacturer's recommendations.

Except as specified elsewhere herein, materials and equipment shall be in conformance with the requirements of Section 106 of the Standard Specifications.

9. TESTING

Before final acceptance, the induction loops shall be tested. Tests will not be made progressively, as parts of the work are completed. They shall be all made at one time. Items which fail to test satisfactorily shall be repaired or replaced.

An electronic test instrument capable of measuring large values of electrical resistance, such as major megger, shall be used to measure the resistance of the induction loop and its lead-in. The resistance of the loop and its lead-in shall be a minimum of 100 meg ohms above ground under any conditions of weather or moisture. The resistance tests and all electronic tests shall be performed in the presence of the Engineer any number of times specified by the Engineer. The loop and loop lead-in shall have an inductance between 100 micro henries and 700 micro henries. The continuity test of the loop and loop lead-in shall not have a resistance greater than two (2) ohms. The Contractor shall do all testing in the presence of the Engineer and all readings will be recorded by the Engineer. Testing shall be done with an approved loop tester.

10. FINAL ACCEPTANCE INSPECTION

When the work is complete, tested and fully operational, the Contractor shall schedule a Final Acceptance Inspection with the Engineer. Final acceptance will be made as a total system, not as parts.

The Contractor shall furnish the necessary manpower and equipment to make the Final Acceptance Inspection. The Engineer will designate the type of equipment required for the inspection tests.

11. METHOD OF MEASUREMENT

The induction loop measurement shall be the length of saw cut in the pavement which contains loop wire. The actual length of wire used in the saw cut shall not be considered in any measurement. The 1st 150 ft. of loop wire from core hole to cabinet will not be measured for Payment.

12. BASIS OF PAYMENT

This item will be paid at the contract unit price per lineal foot (meter) as **INDUCTION LOOP** for furnishing and installing all materials listed complete and operating in place. If loop is less than 150 ft. from cabinet, loop wire shall be used as lead-in and will not be paid separately. If loop is greater than 150 ft. from cabinet, loop wire shall be spliced in handhole to an **ELECTRIC CABLE IN CONDUIT, LEAD-IN NO. 18 4/C TWISTED SHIELDED (see ELECTRICAL CABLE IN CONDUIT, 4C NO. 18 SHIELDED LOOP DETECTOR WIRE SPECIAL PROVISION).**

REMOVE TEMPORARY INTERCONNECT

Description. This work shall consist of the removal of equipment installed as part of the Advance Work plans as described in this Special Provision. Work includes the following:

(a) Removal of type 336 cabinets from a wood pole, including mounting hardware.
(b) Removal of a RVDS from a wood pole, including mounting hardware.
(c) Securely packing RVDS and associated components, cabinets and internal equipment, and safely delivering all items to the Department (District 1 headquarters) or Electrical Maintenance Contractor as directed by the Engineer.
(d) Removal of wood poles used exclusively for temporary RVDS installations. The removal of wood poles for temporary lighting are pay for separately.
(e) Removal of span wire and attached fiber optic cables or power cables for temporary ITS systems.
(f) Removal of the Radar Vehicle Sensing System (RVSS) located in the westbound I-90 / I-190 diverge gore (installation in Contract 60X56).

Materials. None.

CONSTRUCTION REQUIREMENTS

General. No removal work will be permitted without approval from the Engineer. The Contractor shall set up a meeting with the State's Electrical Maintenance Contractor (EMC) and the Traffic Systems Center (TSC) Engineer. The EMC and TSC Engineer shall be notified at least 48 hours in advance of the meeting.

Each cabinet location shall be visited during the meeting to determine the condition of equipment. Any equipment that is to be salvaged that is damaged after this meeting shall be repaired or replaced at the contractor's expense, to the satisfaction of the Engineer. The equipment that is not salvaged shall be disposed of as directed by the Engineer and all debris removed beyond the right-of-way.

The condition of the equipment shall be documented and signed by representatives of the TSC, EMC and the Contractor. A copy shall be given to the Engineer.

If this meeting does not occur, then all of the equipment will be assumed to be in working condition. Any equipment that is not in working condition upon delivery shall be repaired or replaced at no additional cost to the Department.

Removal Details. The equipment shall be removed in accordance with the applicable sections of the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction:

(a) **Cabinet**: All cabinets shall be removed and salvaged as directed by the Engineer.
(b) **Cabinet Electronic Equipment**: Equipment housed in the cabinet shall be salvaged as directed by the Engineer.
(c) **RVDS**: The RVDS assembly shall be removed and salvaged as directed by the Engineer.
(d) **Wood Pole**: Wood Poles installed for temporary CCTV camera installations shall be removed and disposed of by the Contractor.
(e) **Span Wire**: Span wire shall be removed and disposed of by the Contractor.
(f) **Conduit**: Conduits installed for temporary connections that will not be used as part of the final ITS system shall be abandoned.
(g) **Cable**: Cables installed for temporary connections that will not be used as part of the final ITS system shall be removed and disposed of by the Contractor. This work shall be paid for under this pay item.
(h) **RVSS**: The RVSS shall be removed and salvaged as directed by the Engineer.

Coordination with Temporary Lighting Removal. Removal of temporary ITS equipment and infrastructure shall be coordinated with the temporary lighting removal. Wood poles no longer required for temporary lighting, but needed to support ITS fiber optic cables and power cables, shall remain in place until the temporary ITS system has been decommissioned.

Salvaging Details. Upon removal, equipment to be salvaged, as designated by the Engineer, shall be immediately packaged in suitable containers for protection and delivery. Each container shall clearly identify the contents, source location, and date of removal on the outside of the container. Containers shall become the property of IDOT upon delivery.

Salvaged equipment shall be delivered and unloaded at a facility of the Department or EMC, as designated by the Engineer. Packaging material required for proper shipping shall be included. The Contractor shall prepare a printed delivery receipt to be signed by a representative of the recipient. A copy of this signed receipt shall be provided to the Engineer.

Any damage resulting from the removal and/or transportation of equipment and associated hardware that are to be salvaged, shall be repaired or replaced in kind. The Engineer will determine the extent of damage and the suitability of repair and/or replacement.

Basis of Payment. This work will be paid for at the contract lump sum price for REMOVE TEMPORARY INTERCONNECT, which shall be payment in full for all labor, material removal, and transportation (to EMC or Department) necessary to complete the work as described above.

TRAFFIC CONTROL LED SIGNAL HEAD & PEDESTAL
Effective: Aug. 29, 1996 Revised: July 30, 2008

Description. This work shall consist of furnishing and installing one way traffic control LED signal head and pedestal at the locations shown on the plans, in accordance with the following requirements.

Materials. Signal Heads shall be polycarbonate.

Doors

Doors shall be of the same materials. They shall be suitably hinged and held securely to the casing by stainless steel locking devices. All other door parts such as hinge pins, lens clips, etc., shall be stainless steel also.

Gaskets

Neoprene gaskets or their equivalent shall be provided between the casing and the door and between the lens and the door to make the signal face weather proof.

Visors

Each signal lens shall have a visor of polycarbonate material. Visors for vehicular signal faces shall be of the tunnel type. Each visor shall be of standard length and designed to fit tightly against the door. Screws of stainless steel or equal material approved by the Engineer shall be used to attach the visors to the doors.

Optical Units

Each signal lens shall have an optical unit composed of the following parts:

(A) A signal lens conforming to the "Specifications for Traffic Signal Lenses," A.S.A. Designation D10.1, latest revision. The nominal sizes for vehicular signal lenses shall be 8 inches (203.2mm).

(B) An LED lamp designed especially for traffic signal service. This lamp shall be according to Section 880 & 1078 for an 8” Signal Head.

(C) A weatherproof lamp receptacle made of molded bakelite, designed to hold a traffic signal lamp with the light center at the focal point of the reflector. Each lamp receptacle shall be provided with two #18 (or larger) standard lead wires color coded of adequate length to be connected to the terminal block.

Post

(A) Base. The base shall be of cast iron conforming to the Specifications for Gray Iron Castings, A.S.T.M. Designation: A-48, Class 20, latest revision. Each base shall be octagonal in shape, unless a square base is specified. The octagonal bases shall be approximately 14” (355.06 mm) high and 16” (400 mm) across the flat sides at the bottom. The octagonal bases shall be true to pattern, with sharp clean-cut ornamentation and equipped with access doors for cable handling.

(B) Tubular Steel Post. The post shall be straight sided, having an outside diameter of not less than 4-1/2” (112mm) and a minimum thickness of 0.12” (3mm) and shall be of high-grade, open-hearth lap-welded steel. Neither the post nor the cap shall be galvanized.

(C) Anchor bolts. The anchor bolts shall be a minimum of 5/8” (16mm) in diameter and a minimum of 16” (400mm) long with an approximate 3” (75mm) bend at one end and threaded approximately 4” (100mm)at the other end. The anchor bolts shall conform to the specifications for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners, A.S.T.M. Designation: A307. The first 5 inches (127mm) at the threaded end of the anchor bolts, also the nuts and washers for use with the anchor bolts shall be galvanized by the hot-dip process or by electro-galvanizing.

(D) Ground Rod. Ground rod shall be 3/4" (19mm) in diameter and 8 ft (2.4 m) long, with one end pointed to facilitate driving and the other end chamfered to prevent mushrooming. It shall have a steel core with a heavy exterior layer of pure copper bonded to the core. A ground clamp capable of accommodating No. 6 wire shall be furnished with the rod.

(E) Barrier wall mounted. Where the signal is to be located on top of a barrier or retaining wall, a mounting plate will be provided in place of the iron base. This plate shall be 17" (425 mm) long, and 6" (150 mm) wide. It shall also extend 12" (300 mm) vertically down the wall. The plate will be constructed of 1" (25.4 mm) thick steel with a steel coupling welded in the center of the horizontal plate to accept the 4" (100 mm) steel post.

Installation Details. Each completely assembled traffic signal head shall normally be installed as follows:

A. Signal Head

1. The traffic control LED signal head shall consist of one signal face and each signal face shall consist of two signal sections. Each LED signal head shall be furnished with a terminal compartment and one terminal block.

2. The signal head shall normally be erected vertically on a signal post and the terminal compartment cover facing away from the road.

3. Each signal face shall be pointed in the direction of the approaching traffic it is to control. They shall be aimed as directed by the Engineer.

Each completely assembled traffic control signal post shall normally be installed as follows:

B. Signal Post

1. The metal post shall be screwed into an ornamental base, and the complete unit shall be erected vertically upon and securely bolted to a prepared foundation. Anchor bolts, nuts, and washers shall be furnished with each post.

C. Base Plate

1. The base plate mounted on the barrier wall shall be attached using self-tapping 5/8" x 5" (16 mm x 125 mm) galvanized hex-head anchor bolts. The signal head shall be at the same elevation as the signal on the opposite side of the ramp, normally 5' (1.5 m) above pavement.

PAINTING

All exposed metal surfaces shall be shop painted as follows:

1. Posts and bases shall have a minimum of two coats of durable paint, the final coat to be Federal Yellow in color.

2. The traffic signal visors are to be dull black in color.

3. Any steel or iron parts or fittings shall have one coat of approved primer and be finished with two coats of paint Federal Yellow in color.

Basis of Payment. This work shall be paid for at the contract unit price for SIGNAL HEAD, LED, RETROFIT, which price shall be payment in full for furnishing and installing the signal head, post, base, visor, doors, anchor bolts, nuts and washers complete. Any miscellaneous hardware will not be paid for separately, but shall be considered as incidental to the cost of this item.

REMOVE EXISTING RAMP METER SIGNAL HEAD AND POST

Description
This item shall consist of the removal of existing ramp meter signal heads and supports on freeway entrance ramps.

Removal of existing ramp meter signal heads and supports shall be in accordance with Article 895.05 of the Standard Specifications with the following additions:

The ramp meter 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 unless otherwise directed by the Engineer.

All equipment to be returned to the State shall be delivered by the Contractor to the State's Electrical 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 30 days of removing it from the installation site. The Contractor shall provide 5 copies of a list of equipment that is to remain the property of the State, including model and serial numbers, quantities, and type of equipment where applicable. 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 with these requirements, it will be rejected by the State's Electrical Maintenance Contractor. The Contractor shall be responsible for the condition of the signal equipment from the time Contractor takes maintenance until the acceptance of a receipt drawn by the State's Electrical Maintenance Contractor indicating the items have been returned in good condition.

Signal equipment which is lost or not returned to the Department for any reason shall be replaced with new equipment meeting the requirements of the Department specifications at no cost to the contract.

Materials. None, backfill and restoration shall be incidental to other construction.

Basis of Payment
This removal of the ramp meter signal head and post will be paid for at the contract unit price per each for REMOVE EXISTING SIGNAL HEAD AND POST.

RAMP GATE

Description
This item shall consist of the removal, relocation, and reinstallation of existing barrier ramp gate assembly on freeway entrance ramps.

CONSTRUCTION REQUIREMENTS

All existing ramp gate items shall be removed and relocated as shown on the plans. The reinstallation at the new location shall be done to meet the requirements of the original installation. Record plans and specifications for the original installation shall be obtained from the Department. Any damage done to the existing ramp gate or appurtenances shall be repaired or replaced by the Contractor at his/her own expense, as directed by the Engineer.

Relocation of the existing ramp gate shall consist of reusing the gate stand, gate arm, and anchor bollards. New concrete foundations for the anchor bollards and the gate stand shall be provided. Bolt patterns shall match the reused gate stand and anchor bollards. Contractor shall field verify the anchor bolt pattern matches the existing hardware prior to casting the concrete foundations. Minimum foundation depth shall be 48 inches; concrete pads shall be minimum 4 inches thick. Original installation requirements shall govern over these minimums.

Relocation of an existing ramp gate assembly shall include the removal and installation on a new concrete foundation with new anchor bolts, nuts, and washers.

The concrete foundation shall be removed to a level at least 3 feet below the adjacent grade, backfilled with approved material, and the surface reconstructed to match the adjoining area. Removed material shall be disposed of according to Article 202.03. The removal shall extend deeper where required to facilitate roadway construction at no additional cost to the Department. The foundation shall be disposed of outside the right-of-way. If the concrete foundation is located in the sidewalk area, the entire sidewalk square or squares where the concrete foundation is located shall be replaced with new sidewalk.

All removed equipment that is to be reused shall be stored off the job site at an approved location that secures the equipment until reinstallation occurs.

Method of Measurement
The removal and reinstallation of the existing ramp gate assembly will be measured for payment for each ramp gate assembly that is completely removed and installed complete in place.

Basis of Payment
This removal of the ramp gate assembly will be paid for at the contract unit price per each for REMOVE EXISTING GATE. The installation of the ramp gate assembly will be paid for at the contract unit price per each for DROP GATE.

LED FLASHING BEACON AND FLASHER CONTROLLER

Effective: June 1, 1994 Revised: July 30, 2008

Description

This item shall consist of furnishing and installing two one-section flashing beacon LED signal heads on a wood post or traffic signal post and a two-circuit flasher controller in the ramp metering control cabinet as indicated on the plans, or as directed by the Engineer, in accordance with the following requirements.

Materials and Equipment

This work shall conform to the requirements of applicable portions of Section 858, 880, & Article 1073.02 and Section 1078 for 8" heads of Standard Specifications for Road and Bridge Construction and Traffic Control Signal Head & Pedestal in these specifications.

Installation

This flashing beacon shall be installed on a wood post or traffic signal post as shown on the plans.

The flasher controller shall be solid state NEMA Type 3 and be according to NEMA Standards for Traffic Control Systems, TS 2. The flasher controller shall consist of two components; a base which is mounted on the ramp metering control cabinet wall and the flasher which plugs into and is secured to the base by a loading screw. A radio interference filter shall be supplied with the flasher controller. The flashing beacons shall flash alternately at the rate of not less than fifty nor more than sixty flashes per minute.

Basis of Payment

This work will be paid for at the contract unit price each for LED FLASHING BEACON (1 section, 1 face) AND FLASHER CONTROLLER, which price shall be payment in full for furnishing and installing LED FLASHING BEACON (1 section, 1 face) AND FLASHER CONTROLLER complete and operating in place. Conduit and fittings on the wooden post or light standard shall be incidental to the cost of the item and will not be paid for separately.

WOOD POST
Effective: June 1, 1994 Revised: July 30, 2008

Description

This item shall consist of furnishing, installing a 6" x 6" x 16'-0" (150 mm x 150 mm x 4.8 m) wood posts at ramp metering locations shown on the plans, or as directed by the Engineer.

Materials and Equipment

Each post shall be of southern pine conforming to Article 1007 of the Standard Specifications for Road and Bridge Construction. The preservative used in the treatment of the wood posts shall be a solution of pentachlorophenol meeting the requirement of Article 1007.12 of the Standard Specifications.

Installation

The posts shall be placed vertically in a vertical hole not exceeding 12 inches (30 cm) in diameter and not less than 5 feet (1.5 m) deep. The post shall be placed in the center of the hole and backfilled with stone screenings thoroughly tamped in 12-inch (30 cm) lifts. The stone screenings shall conform to Article 1004.01 (Gradation CA 6) of the Standard Specifications. The post shall be vertical after the tamping.

Under no circumstances will the sawing off of any part of a post be permitted after the preservative has been applied.

Basis of Payment

This work will be paid for at the contract unit price each for WOOD POST, of the length specified, which price shall be payment in full for furnishing and erecting the post, digging and backfilling the post hole.

REMOVE EXISTING FLASHING BEACON INSTALLATION COMPLETE

Description
This item consists of the removal of an existing ramp meter advance flashing beacon sign assembly on freeway entrance ramps as shown on the plans and as described herein. Work shall include removing the panel sign and post and disconnecting, removing, and salvaging of all existing flashing beacons complete, including all controllers, junction boxes, conduit, mounting brackets and appurtenances.

Disconnection and removal of the existing flashing beacon electric connection shall meet the requirements of Section 895 of the Standard Specifications and District Specifications for "Remove Existing Traffic Signal Equipment". This work shall consist of the complete removal of an existing flashing beacon sign assembly and the backfilling of the holes created by the removal of the poles and restoration of the surface to match the adjoining area.

Method of Measurement
Each existing flashing beacon installation that is disconnected, removed, and disposed of, including associated wiring, conduit, controller and junction boxes will be measured for payment.

Basis of Payment
This removal of the existing ramp meter advance flashing beacon sign assembly will be paid for at the contract unit price per each for REMOVE EXISTING FLASHING BEACON INSTALLATION COMPLETE.

CONDUIT RISER, GALVANIZED STEEL

Description

This item includes labor, material, and equipment necessary to install a 10-foot section of 2" diameter galvanized steel conduit riser at locations shown on the plans. The ends of the riser shall be threaded. The riser shall attach to underground conduit and the top of the riser shall include a weatherhead.

Method of Measurement

The method of measurement shall be EACH.

Basis of Payment

This work shall be paid for at the contract unit price each for CONDUIT RISER, GALVANIZED STEEL that shall be payment in full for the work complete, as specified herein and as directed by the Engineer.

REMOVE SIGN (SPECIAL)

Description. This work shall consist of removing a dynamic message sign (DMS) from an existing support structure and delivering it to the Illinois Tollway. Work includes the following:

(a) Removal of a DMS from a support structure, including mounting hardware associated with attaching the DMS to the support structure.

(b) Packing a DMS and associated components, including delivery costs.

Materials. None.

Construction. The Contractor shall provide and utilize equipment appropriate for removing the DMS from the structural support, without incurring damage to the structural support or the area surrounding the DMS. The Contractor shall provide temporary lane and shoulder closure in accordance with applicable Department Highway Standards.

The Contractor shall deliver the DMS, sign controller, cabinet, communications equipment, and appurtenances to the Tollway as directed by the Engineer. All DMS components which the Engineer designates as salvage shall be removed, boxed in containers, approved by the Engineer, and delivered and unloaded at a facility of the Tollway, as designated by the Engineer. Packaging material required for proper shipping shall be included. Materials that are not salvaged shall become the property of the Contractor and shall be disposed of according to Article 202.03. All work shall be coordinated with the Tollway.

Any damage resulting from the removal and/or transportation of the DMS and associated hardware that are to be salvaged, shall be repaired or replaced in kind. The Engineer will determine the extent of damage and the suitability of repair and/or replacement.

Basis of Payment.

This work will be paid for at the contract unit price per each for REMOVE SIGN (SPECIAL). Removal of the DMS support structure will be paid for under a separate pay item.

DMS WALK-IN ACCESS, FULL MATRIX, COLOR, NTCIP 1203 V3

1.0 General Requirements

This special provision shall govern the furnishing and installation of a Walk-In Access, Full matrix, Color, NTCIP 1203 V3 Dynamic Message Sign and associated equipment cabinets as shown in the plans and as detailed in this special provision. The high resolution, full color display shall be a full matrix configuration of 96 pixels high by 400 pixels wide. The size of the sign shall be as shown in the plans. All display elements and modules shall be solid state. No mechanical or electromechanical elements or shutters shall be used.

Equipment to be furnished at each dynamic message sign (DMS) field site shown in the plans shall include, but not be limited to the following: LED DMS, sign controller, cabling, sign enclosure, documentation, warranties, mounting hardware, latest vendor maintenance diagnostic software with 20 licenses to load software on Department/Department's maintenance forces laptops. Five (5) units of FLIR 360 Cameleon Client ITS site license for each installed DMS.

The Central Controller resides at the Traffic Systems Center. The DMS Central Software was developed by 360 Surveillance, Inc. The successful sign vendor shall perform an on-site working sample demonstration test to prove their product is compatible with the 360 Cameleon Client/Server Software. The Working Sample demonstration test criteria are outlined in Section 2.0 of this document.

Each DMS assembly shall consist of a LED DMS sign case including contents, mounting brackets, its associated sign controller unit (SCU), and communication unit, cabling between the DMS case and the sign controller unit, , optically coupled interface from controller to sign, and DMS walkway platforms with permanent safety and mounting brackets and hardware.

Each LED DMS shall be capable of displaying three lines of text. Each line shall consist of a string of 18 alphanumeric characters. Each character shall be composed from a luminous dot matrix system. The matrix system for a high resolution, full color display shall consist of 384 dots composed of 24 columns and 16 rows. A luminous pixel shall consist of a LED pixel array. All display elements and modules shall be solid state.

All characters, symbols, and digits shall be 18 inch nominal character size and shall be clearly visible and legible at a distance of 900 feet within a 30 degree cone of vision centered on the optical axis of the pixel.

The signs shall be capable of displaying the following:

- A static message
- A flashing message
- Two alternating messages, either flashing or static

The changing from one message to another shall be instantaneous.

The total weight added to the sign structure shall be no greater than 4000 pounds. The dimensions of the sign housing will not exceed 8'0" tall, 30'0" wide, and 4' deep and access to the electronics shall be achieved through the front display panels of the DMS. Larger signs may be submitted, but they will require additional review time to evaluate the structural adequacy of the Department's standard sign trusses.

The Contractor shall provide structure mounted service equipment to provide power to each sign. The cost of this shall be considered incidental to the unit price for the DMS. The Contractor shall be responsible to have a Licensed Structural Engineer in the State of Illinois design the sign attachment to the DMS sign truss and stamp the drawings. These drawings shall be submitted to the Engineer for approval before work can commence. These drawings will describe the mounting required to attach the DMS to the Structure. Shop drawings for the structures may be available upon request. The contractor shall supply all mounting hardware necessary to attach the DMS to the structure. The cost of this work shall be included in the contract bid price for the item. No additional compensation will be allowed for any modifications that maybe required to the structure.

All field equipment shall remain fully functional over an ambient temperature range of –40˚F to + 149˚F with relative humidity of up to 95%. All field equipment enclosures shall be designed to and shall withstand the effects of sand, dust, and hose-directed water. All connections shall be watertight.

2.0 Working Sample Demonstration (Dynamic Message Sign)

To ensure timely delivery for installation, it is imperative that the DMS manufacturer be regularly engaged in the manufacture of the specified equipment and capable of immediately demonstrating a sample DMS that is in clear compliance with the key portions of the specifications. Delay from the specified timeline, and failure to present the sample in a timely manner may result in termination of the contract, at the discretion of the Engineer.

The DMS manufacturer shall provide a satisfactory, approvable demonstration of a working sample DMS within 14 calendar days after contract execution. The sample shall be a complete mock-up of a working DMS based on the proposed equipment to be furnished under this contract and identified in the submittal material. The sample demonstration may utilize a portable sample at the IDOT Traffic Systems Center, or it may be at the manufacturer's production facility if located within District 1. A demonstration of an identical installed unit for some other contract will be acceptable.

The sample demonstration will be for purposes of review and approval by the engineer. The Engineer will issue review comments based on examination of the unit and its operation at the time of the demonstration, and the Engineer may require a subsequent revised sample demonstration if, in the Engineer's judgment, the comments warrant re-work of the sample unit.
Delay in presenting the specified demonstration or delay in attaining "Approved" or "Approved as Noted" status will result in the assessment of liquidated damages in the amount of $3,000 per calendar day until a satisfactory sample and demonstration are attained.

For a demonstration to be held at the IDOT Traffic Systems Center, the manufacturer shall coordinate the exact date, time, demonstration location, and power requirements with the Traffic Systems Center Engineer.

The sample unit shall be in substantial compliance with the contract requirements. The Engineer may elect to waive minor deviations for purposes of the demonstration, or may waive minor deviations completely if alternative provisions are judged superior to specified requirements, but deviations from key specified requirements will not be accepted.

3.0 Materials

All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion resistant and in strict accordance with the details shown in the plans and as detailed in this specification. All details and functionality listed in this specification will be thoroughly inspected and tested by the department. Failure to meet all details and functionality detailed in this specification shall be grounds for rejection of the equipment.

4.0 Terminology

Due to the varying definitions used in Dynamic Message Sign technology, this section defines specific terms as they apply to this specification.

Sign: The sign housing and its contents.

Sign Controller: Located in a ground cabinet or in the sign (as detailed in this specification), the sign controller specifies the message to be displayed. Messages can be selected either remotely from the central controller, locally from a laptop computer or from the front panel of the sign controller.

Central Controller: The MS Windows Server computer system and related software, which operates the system from a remote control site.

Workstation: This computer operates as a remote client to the central controller. A workstation operator may dial-in to the central controller and gain access to the functions of the central by using the appropriate access codes.

LED: Light Emitting Diode

Pixel: Any of the small discrete elements that, when arranged in a pixel matrix, create a character. A pixel contains a cluster of LEDs.

Pitch: Distance measured from center to center of adjacent pixels within a matrix. This distance is measured both horizontally and vertically.

Poll: The central controller and laptop computer are said to “poll” a sign when they request the sign’s status information. The term is derived from the periodic status polling, which a central can perform, but is loosely used to refer to any status request.

Message: Text; the information shown on the sign.

Display: The message seen by the motorist. A display may include more than one page of text (an alternating display). Any character or set of characters of a display may be flashed (a flashing display).

Neutral State: Sign is blank, or displaying a predefined message that is displayed regularly.

WYSIWYG: What You See IS What You Get. In this specification, this is the functionally of the LED DMS system where the central, workstation or laptop display mimics the actual message that is visibly displayed on the sign on an individual pixel basis.

5.0 DMS Manufacture Requirements

The company that designs and manufactures the LED DMS shall be currently ISO 9001 certified as of the bid date for this project and shall have received its ISO 9001 certification a minimum of three years prior to the bid date for this project. The scope of this company's ISO 9001 certification shall be for the Design, Manufacture, Installation, Maintenance and Sales of Dynamic Message Sign Systems. The facility where this company actually designs and manufactures the LED DMS shall be ISO 9001 certified. This company, this scope and the address of this facility shall all be listed on the ISO 9001 certificate. This ISO 9001 certificate shall be provided with the bid. The name, phone number and address of both the Authorized ISO 9001 Registrar that certified this company and the Authorized ISO 9001 Accreditation Body that accredited this Registrar shall be provided with the bid. Failure to fully comply with these requirements and to provide all this information will cause this company's equipment and software to be rejected. ISO 9002 and ISO 9003 certifications are not adequate and do not meet this requirement.

Experience Requirements:
The LED DMS Manufacturer shall submit a State Department of Transportation reference for a minimum of three (3) different states that have been successfully operating a highway **full color** LED dynamic message sign system and that completely meets these specifications, manufactured and supplied by this manufacturer for a period of no less than five (5) years.

The LED DMS Signs and System shall be fabricated by an established DMS manufacturer having the minimum of:

- 10 years experience, under the current corporate name, in the design and manufacturing of State Highway or Interstate Highway, permanently-mounted, overhead dynamic message signs and central control systems installed in freeway service. These 10 years of experience shall include the complete design and manufacturing of all aspects of the dynamic message signs, including the electronic hardware, software and sign housings.

- 100 State Highway or Interstate Highway, permanently-mounted, overhead dynamic message signs installed in freeway service, under the current corporate name.

- 50 State Highway or Interstate Highway, permanently-mounted, overhead LED dynamic message signs that completely meet this specification with three lines of 18-inch characters and Walk-In Access housings installed in freeway service, under the current corporate name.

- The manufacturer of the LED DMS Signs and System shall submit documentary evidence and reference data for the above requirements. Reference data shall include the name and address of the organization, and the name and telephone number of an individual from the organization who can be contacted to verify the above requirements. The name of the DMS manufacturer that meets these experience requirements shall have the same corporate name as the DMS manufacturer that meets the ISO 9001 requirements stated elsewhere in this specification. This information shall be provided prior to documentation submittal. Failure to furnish the above references will be sufficient reason for rejection of the supplier's equipment.

- The Contractor shall submit the information described in this section to the Engineer within 15 days of award of the contract. The Engineer will review the submitted information and provide comments and approval of the information to the Contractor within 15 calendar days after receipt. Review of the submittal information by the Engineer shall not relieve the Contractor of the contractor's obligation to furnish and install the work in accordance with the contract documents. No time extensions will be granted to the Contractor as a result of the need to resubmit various items to review.

- Shop drawings shall be submitted in accordance with Article 105.04 of the Standard Specifications and as specified in these special provisions.

- Prior to purchase or fabrication of any equipment or materials for use in this project, the Contractor shall submit, for review by the Engineer, appropriate catalog cuts sheets, and specifications for all standard, off-the-shelf items and shall submit shop drawings and other necessary data for all non-catalog or custom-made items.

- The Contractor shall furnish five sets of submittal data directly to the Engineer. Two copies of this information, with appropriate notations, will be returned to the Contractor after the review.

- If reprinted literature, such as catalog cut sheets, is used to satisfy the submittal data requirements, there shall be no statements on the literature which conflict with the requirements of the contract documents. Any such statements shall be crossed off and initialed by the Contractor. Explanation of how specifications shall be met pertaining to items changed from the literature shall be documented in writing and included with the submittal information.

- All items shall be submitted together.

- Each submittal shall contain sufficient information and details to permit full evaluation of each item, and its interrelationships among the various items shall be carefully addressed.

- The Contractor shall prepare and submit detailed shop drawings for each sign type indicating types of materials proposed for each component of each sign, parts lists, assembly techniques, layout of all display elements and wiring schematics. The shop drawings shall also illustrate in detail how the Contractor proposes to mount and connect the DMS sign case to the sign support structure (truss). The DMS sign case shall include any support mechanism necessary for the installation of the DMS sign case that is not included in the truss. These drawings shall be submitted to the Engineer for review and approval prior to fabrication of any sign. Parts lists shall include circuit and board designation, part type and class, power rating, component manufacturer and mechanical part manufacturer.

- As part of the submittals for the DMS assembly, the Contractor shall submit an engineering drawing illustrating the DMS character set including 26 upper case letters, 10 numerals, a dash, a plus sign (+), and slash. The Contractor shall also submit complete technical information, shop drawings, photographs, graphs, circuit diagrams, instruction manuals, security provisions, and any other necessary documents to fully describe the DMS assembly and associated equipment.

6.0 Product Testing

The DMS manufacturer shall provide documentation indicating that the DMS product has been tested to the following standards. It shall be acceptable for the testing to be performed on scale-sized versions of the actual DMS provided that the test unit is functionally and structurally equivalent to the full size DMS.

Failure to conform to these testing requirements shall be grounds for rejection. Rejected equipment may be offered for test or retest provided all non-compliant items have been corrected and tested or retested by the DMS manufacturer. Any corrections deemed necessary by the Engineer shall be made by the DMS manufacturer, at no additional cost to the Department.

6.1 Third Party Testing

Third party test reports shall be submitted for the following testing:

- NEMA Standards Publication TS 4, Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements – Section 2, Environmental Requirements. Test report shall detail results of mechanical vibration and shock, electrical noise and immunity, temperature, and humidity.

- Underwriters Laboratories (UL), UL 48 Standard for Electric Signs, UL 50 Enclosures for Electrical Equipment, and UL 1433 Standard for Control Centers for Changing Message Type Electric Signs. The UL report number(s) for all DMS and control equipment manufactured by the DMS manufacturer shall be submitted and the products shall bear the UL mark.

The supplier shall provide a record of each test performed including the results of each test. The report shall include a record of the 3rd party test laboratory and the test lab's representative that witnessed the tests, including the signature of the lab's representative. The test reports shall be provided to the Engineer for review as part of the technical submittal.

6.2 Self Certification

The DMS manufacturer shall provide self-certification, including a statement of conformance and copies of test reports, indicating that the following tests have been performed and passed.

Third party test reports shall be submitted for testing of the following National Transportation Communication for ITS Protocol (NTCIP) standards:

- NTCIP 1201:1996, NTCIP Global Object Definitions (including Amendment 1)
- NTCIP 1203:1997,Object Definitions for Dynamic Message Signs (including Amendment1)
- NTCIP 2101:2001, Point to Multi-Point Protocol Using RS-232 Subnetwork Profile.
- NTCIP 2103 (Draft v1.13), Point-to-Point Protocol over RS-232 Subnetwork Profile.
- NTCIP 2104 V01.11 Ethernet Subnetwork Profile

The NTCIP testing shall have been completed using industry accepted test tools such as the NTCIP Exerciser, Trevilon's NTester, Intelligent Devices' Device Tester, and/or Frontline's FTS for NTCIP. The NTCIP test report(s) shall include testing of sub-network communications functionality, all mandatory objects in all mandatory conformance groups, and a subset of the remaining objects.

7.0 Physical Construction

7.1 Wiring and Power Distribution

7.1.1 Power and Signal Entrances

Two threaded conduit hubs shall be located on the rear or side wall of the DMS housing. One hub shall be for incoming AC power and the other shall be for incoming DMS signal cabling or a communications line.

7.1.2 Panel Board

The DMS shall contain a power panel board and circuit breakers that meet the following minimum requirements:

- Service entrance-rated
- Minimum of 20 circuit breaker mounting positions
- Short circuit ratings of 22,000 amps and 10,000 amps for the main and branch circuits, respectively
- UL listed panel board and circuit breakers

7.1.3 Internal Wiring

Wiring for LED display module control, environmental control circuits and other internal DMS components shall be installed in the DMS housing in a neat and professional manner. Wiring shall not impede the removal of display modules, power supplies, environmental control equipment, and other sign components. Wires shall not make contact with or bend around sharp metal edges. All wiring shall conform to the National Electrical Code.

7.2 Earth Grounding

The DMS manufacturer shall provide one earth ground lug that is electrically bonded to the DMS housing. The lug shall be installed near the power entrance location on the DMS housing's rear wall. The DMS installation contractor shall provide the balance of materials and services needed to properly earth ground the DMS. All earth grounding shall conform to the National Electrical Code.

7.3 DMS Enclosure

The LED DMS shall enable the display of text, consisting of a string of alphanumeric and other characters. The size of the sign shall be as shown in the plans, and elsewhere in the specification. Each character shall be formed by a matrix of luminous pixels. The matrix of a standard character shall consist of 345 pixels over 15 columns and 23 rows.

The equipment design and construction shall utilize the latest available techniques with a minimum number of different parts, subassemblies, circuits, cards and modules to maximize standardization and commonality. The equipment shall be designed for ease of maintenance. All component parts shall be readily accessible for inspection and maintenance. Test points shall be provided for checking essential voltages.

The sign shall be designed for a minimum life of 20 years.

The sign shall be designed and constructed so as to present a clean and neat appearance. Poor workmanship shall be cause for rejection of the sign.

All cables shall be securely clamped or tied in the sign housing. No adhesive attachments will be allowed.

The dynamic message sign, including the sign housing and all modules and assemblies, shall be designed and manufactured in the USA.

The complete sign housing shall be designed and manufactured in-house by the LED DMS Sign Manufacturer.

A registered structural engineer in the State of Illinois shall analyze the DMS structure and certify that the DMS will withstand the temporary effects of being lifted by the provided eye bolts, will comply with the applicable requirements of AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals, Fourth Draft, 2001, and will support a front face ice load of 4 lbs. per square foot.

The equipment within the sign housing shall be protected from moisture, dust, dirt and corrosion. The sign shall be constructed of aluminum alloy 5052-H32 or 3003-H14 which shall not be less than 1/8” thick, unless otherwise specified in this document. Framing structural members shall be made of aluminum alloy 6061-T6 or 6063-T5.

All welding shall be by an inert gas process in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The LED DMS manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the 1997 ANSI/AWS D1.2-97 Structural Welding Code for Aluminum. Proof of certification of all the LED DMS manufacturer's welders and applicable welding procedures shall be supplied with the submittals. The name, phone number and address of the ANSI/AWS Certified Welding Inspector that certified the LED DMS manufacturer's welders and procedures shall also be provided with the submittals.

The DMS housing's right, left, and rear walls shall be vertical. The top and bottom sides shall be horizontal.

The sign housing shall be capable of withstanding a wind loading of 120 M.P.H. without permanent deformation or other damages.

All 120/240 VAC wiring located inside the sign housing shall be run in conduit pull-boxes, handy-boxes, power supply boxes, control cabinets, and circuit breaker boxes.

The performance of the sign shall not be impaired due to continuous vibration caused by wind, traffic or other factors. This includes the visibility and legibility of the display.
The presence of power transients or electromagnetic fields, including those created by any components of the system, shall have no deleterious effect on the performance of the system. The system shall not conduct or radiate signals which will adversely affect other electrical or electronic equipment including, but not limited to, other control systems, data processing equipment, audio, radio and industrial equipment.

All DMS structural hardware shall be stainless steel and appropriately sized for the application.

The DMS Manufacturer shall provide a signed and sealed copy of these certifications by the registered Structural Engineer as part of the catalog cut submittal.

7.3.1 Electronic Components

All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All workmanship shall comply with ANSI/IPC-1-610B Class 2 titled “Acceptability of Electronic Assemblies”, ANSI/IPC-7711 titled “Rework of Electronic Assemblies”, and ANSI/IPC-7721 titled “Rework and Modification of Printed Boards and Electronic Assemblies”.

All electronic components shall comply with Section Electronic Materials and Construction Methods, located in this document.

All Printed Circuit Boards (PCBs) shall be completely conformal coated with a 0.010 inch (10 MIL) minimum thickness silicone resin conformal coat. The LED mother boards shall be completely conformal coated, except at the pixels on the front of the PCB, with a 0.010 inch (10 MIL) minimum thickness silicone resin conformal coat. The material used to coat the PCBs shall meet the military specification: MIL-I-46058C Type SR.

7.3.2 Mechanical Components

All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used. All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. All materials used in construction shall be resistant to fungus growth and moisture deterioration. An inert dielectric material shall separate dissimilar metals.

7.3.3 Convenience Outlets

The DMS housing shall contain a utility outlet circuit consisting of a minimum of three (3) 15-A NEMA 15-R, 120 VAC duplex outlets, with ground-fault circuit interrupters. One outlet shall be located near each end of the DMS housing interior and the third outlet shall be located near the housing’s center.

If the sign controller and communication equipment is to be mounted in the sign, a second outlet circuit shall be included consisting of a minimum of two (2) 15-A NEMA 15-R, 120 VAC duplex outlets. These outlets shall be located near the controller and communication equipment mounting location.

7.4 Front Face Construction

The DMS front face shall be constructed with multiple rigid panels, each of which supports and protects a full-height section of the LED display matrix. The panels shall be fabricated using aluminum sheeting on the exterior and polycarbonate sheeting on the interior of the panel.

Front face panels shall provide a high-contrast background for the DMS display matrix. The aluminum mask of each panel shall be painted black and shall contain an opening for each pixel. Openings shall be large enough to not block any portion of the viewing cones of the LEDs.

Face panels shall be attached to each other using stainless steel hardware. Seams that separate adjacent panels shall be sealed. Panels shall not be welded or otherwise permanently mounted to the DMS housing.

Each panel shall have a single polycarbonate sheet attached securely to the inside of the aluminum panel. The polycarbonate sheet shall cover all of the pixel openings. The polycarbonate shall be sealed to prevent water and other elements from entering the DMS. The polycarbonate shall contain UV inhibitors that protect the LED display matrix from the effects of ultraviolet light exposure and prevent premature aging of the polycarbonate itself. The use of a plastic lens system will not meet the requirements and will be cause for rejection.

LED display modules shall mount to the inside of the DMS front face panels. No tools shall be needed for removal and replacement of LED display modules.

DMS front face borders (top, bottom, left side and right side) which surround the front face panels and LED display matrix, shall be painted black to maximize display contrast and legibility.

In the presence of wind, the DMS front face shall not distort in a manner that adversely affects LED message legibility.

7.4.1 Service Access

The DMS housing shall provide safe and convenient access to all modular assemblies, components, wiring and subsystems located within the DMS housing. All of those internal components shall be removable and replaceable by a single technician.

At least one (1) 80” vertically hinged door shall be located on each end (left, right or left and right side) of the DMS housing. Each access door shall be mounted to an integral doorframe. A vertical stainless steel hinge shall support each door and all doors shall open outward. In the closed position, each door shall latch to its frame with a three-point draw-roller mechanism. The latching mechanism shall include an internal handle and release lever. Door release levers shall be located so that a person with no key and no tools cannot become trapped inside the housing.

Access doors, when open at a 90-degree angle from the DMS housing end wall, shall not extend more than 38-inches (965 mm) from the housing. The bottom edge of each door shall be at least 3.5-inches (89 mm) from the bottom edge of the DMS housing. This will provide clearance for the doors to swing open over external access platform.

Doorframes shall be double flanged on all sides to shed water. Each door shall close around its flanged frame and compress against a closed-cell foam gasket, which adheres to the door. All doors shall contain a stop that retains the door in a 90-degree open position. When a door is open, the door and its stop shall not be damaged by a 40 mph (64 km/h) wind.

Each door shall be furnished with a lock that is keyed to a Corbin #2 lock.

The DMS must be equipped with an OSHA compliant safety rail assembly, which prevents service personnel from falling out of the DMS when closed across an open access door. A rail assembly must be provided for each door in the display. The safety rail shall consist of a top rail that extends 42-inches (1,067 mm) above the interior walkway and a mid-rail that extends 21-inches (533 mm) above the interior walkway. The rail assembly shall require no tools to open and close.

The DMS cabinet shall be equipped with an OSHA compliant anchor point at each entrance location for the connection of a personal fall arrest system. These anchorages integrated to the support structure must be strong enough to withstand a force of 5,000 pounds (22.2 kilo-newton(s)) as required by OSHA. The anchorages must be located such that they will not allow a person to free-fall more than 6 feet when a 6 foot lifeline is used. The anchorages must be located just inside each access door within easy reach from the outside.

Interior work area, minimum headroom of 72-inches (1,829 mm) shall be provided. This free space shall be maintained across the entire width of the DMS housing, with the exception of structural frame members. Structural members shall be designed not to obstruct the free movement of maintenance personnel throughout the DMS.

A level aluminum walkway shall be installed in the bottom of the DMS housing. The walkway shall be a minimum of 24-inches (610 mm) wide and it shall run the entire length of the housing, from one side to the other side. The walkway's top surface shall be non-slip and shall be free of obstructions that could trip service personnel. The walk-way shall support a load of 500 pounds (136 kg) per two (2) linear feet per AASHTO STA specifications for Highway Signs section 3.6 Live Loads and it shall be constructed of multiple aluminum removable panels.

7.4.2 Face Panels

Front face panels shall provide a high-contrast background for the DMS display matrix. The aluminum mask of each door panel shall be painted black and shall contain an opening for each pixel. Openings shall be large enough to not block any portion of the viewing cones of the LEDs.

Each panel shall have a single polycarbonate sheet attached securely to the inside of the aluminum panel. The polycarbonate sheet shall cover all of the pixel openings. The polycarbonate shall be sealed to prevent water and other elements from entering the DMS. The polycarbonate shall contain UV inhibitors that protect the LED display matrix from the effects of ultraviolet light exposure and prevent premature aging of the polycarbonate itself. Polycarbonate sheets shall have the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8", notched): 17 ft-lbs/inch of notch
- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270F and 66 PSI at 288F
- Coefficient of Thermal Expansion: 3.9X10-5 in/in/F
- Specific Heat: 0.30 BTU/lb/F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: Less than 5%

LED display modules shall mount to the inside of the DMS front face panels. Common hand tools shall be used for removal and replacement.

DMS front face borders (top, bottom, left side, and right side), which surround the front face panels and LED display matrix, shall be painted black to maximize display contrast and legibility.

In the presence of wind, the DMS front face shall not distort in a manner that adversely affects LED message legibility.

7.4.3 Exterior Finish

DMS front face panels and front face border pieces shall be coated with semi-gloss black Kynar 500 resin or an equivalent brand of oven-fired fluoropolymer coating, which has an expected outdoor service life of 20 years.

All other DMS housing surfaces, including the DMS mounting brackets, shall be natural mill-finish aluminum.

7.4.4 Heating

The lens panel shall use heated, forced air to prevent fogging and condensation. An eight watt-per-foot, self-regulating, heat tape shall be provided along the bottom of the message area, between the glazing and the display modules. The sign controller shall control the heat tape. All heat tape terminal blocks shall be covered for safety.

7.5 Humidity Control

A humidity sensor shall be provided and sensed by the sign controller from zero percent to 100 percent relative humidity in one percent or fewer increments. The sensor shall operate and survive from 0 percent to 100 percent relative humidity.

The sensor shall have an accuracy that is better than +/- five percent relative humidity.

The sign controller shall read the internal temperature sensors, external ambient temperature sensor and the humidity sensor. The sign controller shall use these readings in an algorithm that turns on the heat tape and/or the fans at the appropriate times to reduce both frost on the face of the sign and condensation on the display modules and other electronic circuitry.

7.6 Drain Holes

The bottom panel of the housing shall contain small drain holes. The drain holes shall be screened to prevent the entrance of insects and small animals and shall be replaceable.

7.7 Ventilation System

The DMS shall contain systems for cabinet ventilation and safe over-temperature shutdown.

The DMS shall contain a electronically controlled ventilation system and a failsafe thermostat designed to keep the internal DMS air temperature lower than +140°F (+60°C), when the outdoor ambient temperature is +115°F (+46°C) or less.

The ventilation system shall consist of two or more air intake ports. Intake ports shall be located near the bottom of the DMS rear wall. Each intake port shall be covered with a filter that removes airborne particles measuring 500 microns in diameter and larger. One or more ball bearing-type fans shall be mounted at each intake port. These fans shall positively pressure the DMS cabinet.

Fans and air filters shall be removable and replaceable from inside the DMS housing.

Each ventilation fan shall contain a sensor to monitor its rotational speed, measured in revolutions per minute. The fan speed shall be reported to the sign controller upon request.

The ventilation system shall move air across the rear of the LED modules in a manner such that heat is dissipated from the LED's. The airflow shall move from the bottom of the cabinet towards the top to work with natural convection to move heat away from the modules.

Each exhaust port shall be located near the top of the rear DMS wall. One exhaust port shall be provided for each air intake port. All exhaust port openings shall be screened to prevent the entrance of insects and small animals.

An aluminum hood attached to the rear wall of the DMS shall cover each air intake and exhaust port. All intakes and exhaust hoods shall be thoroughly sealed to prevent water from entering the DMS.

The DMS shall automatically shut down the LED modules to prevent damaging the LEDs if the measured internal cabinet air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140°F (+60°C). The factory default setting shall be overridden if the selected message priority is set above 200 or is selected as an emergency message.

Alternate sign ventilation systems can be submitted to the Engineer for approval. Extra time and additional demonstration testing and documentation of the proposed alternate system may be needed to secure the necessary approval from the Engineer. No extra compensation shall be awarded to the Contractor for the alternate design but if the alternate design is rejected, liquidated damages may apply.

8.0 LED Display Modules

The DMS shall contain LED display modules that include an LED pixel array, LED driver circuitry, and mounting hardware. These modules shall be mounted adjacently in a two-dimensional array to form a continuous LED pixel matrix. Each LED display module shall be constructed as follows:

- Each LED display module may consist of one or two circuit boards. If two boards are used, they shall be mounted physically to each other using durable corrosion resistant hardware. They shall be electrically connected via one or more header-type connectors. The header connectors shall be keyed such that the boards cannot be connected incorrectly.

- All LED modules shall be manufactured using laminated fiberglass printed circuit boards.

- Each LED display module shall be mounted to the rear of the display's front face panels using durable corrosion resistant hardware. No tools shall be required for module removal and replacement. The modules shall be mounted such that the LEDs emit light through the face panel's pixel holes and such that the face panel does not block any part of the viewing cone of any of the LEDs in any pixels.

- LED display module power and signal connections shall be a quick-disconnect locking connector type. Removal of a display module from the DMS, or a pixel board or driver circuit board from its display module, shall not require a soldering operation.

- All exposed metal on both sides of each printed circuit board, except connector contacts, shall be protected from water and humidity exposure by a thorough application of conformal coating. Bench level repair of individual components, including discrete LED replacement and conformal coating repair, shall be possible.

- Individual addressing of the each LED display module shall be configured via the communication wiring harness and connector. No on-board addressing jumpers or switches shall be allowed.

- Removal or failure of any LED module shall not affect the operation of any other LED module or sign component. Removal of one or more LED modules shall not affect the structural integrity of any part of the sign.

- It shall not be possible to mount an LED display module upside-down or in an otherwise incorrect position within the DMS display matrix.

- All LED display modules, as well as the LED pixel boards and driver circuit boards, shall be identical and interchangeable throughout the DMS.

8.1 LED Pixels

Each LED module shall contain a printed circuit board to which LED pixels are soldered. The LED pixel matrix shall conform to the following specifications:

- Each LED module shall contain a minimum of 256 LED pixels configured in a two dimensional array. The pixel array shall be a minimum of sixteen (16) pixels high by sixteen (16) pixels wide.

- The distance from the center of one pixel to the center of all adjacent pixels, both horizontally and vertically, shall be 0.81-inches (20.6mm).

- Each pixel shall consist of a minimum of one (1) independent string of discrete LEDs for each color. All pixels shall contain an equal quantity of LED strings.

- The failure of an LED string or pixel shall not cause the failure of any other LED string or pixel in the DMS.

- Each pixel shall contain the quantity of discrete LEDs needed to output white colored light at a minimum luminous intensity of 12,400 candelas per square meter when operated within the forward current limits defined in these specifications.

- Each pixel shall also be capable of displaying amber colored light with a minimum luminous intensity of 7,440 candelas per square meter when operated within the forward current limits defined in these specifications.

- Each LED pixel shall not consume more than 1.5 watts.

- The circular base of the discrete LEDs shall be soldered so that they are flush and parallel to the surface of the printed circuit board. The longitudinal axis of the LEDs shall be perpendicular to the circuit board.

8.2 Discrete LEDs

DMS pixels shall be constructed with discrete LEDs manufactured by Avago Technologies (formerly Agilent Technologies), Toshiba Corporation, Nichia Corporation, OSRAM, or equivalent. Discrete LEDs shall conform to the following specifications:

- All LEDs shall have a nominal viewing cone of 30 degrees with a half-power angle of 15 degrees measured from the longitudinal axis of the LED. Viewing cone tolerances shall be as specified in the LED manufacturer's product specifications and shall not exceed +/- 3 degrees.

- Red LEDs shall utilize AlInGaP semiconductor technology and shall emit red light that has a peak wavelength of 615 – 650 nm.

- Green LEDs shall utilize InGaN semiconductor technology and shall emit green light that has a peak wavelength of 525 – 535 nm.

- Blue LEDs shall utilize InGaN semiconductor technology and shall emit blue light that has a peak wavelength of 464 – 470 nm.

- The LED lenses shall be fabricated from UV light resistant epoxy.

- The LED manufacturer shall perform color sorting of the bins. Each color of LEDs shall be obtained from no more than two (2) consecutive color "bins" as defined by the LED manufacturer.

- The LED manufacturer shall perform intensity sorting of the bins. LEDs shall be obtained from no more than two (2) consecutive luminous intensity "bins" as defined by the LED manufacturer.

- The various LED color and intensity bins shall be distributed evenly throughout the sign and shall be consistent from pixel to pixel. Random distribution of the LED bins shall not be accepted.

- LED package style shall be either through-hole flush-mount or surface-mount. Through-hole LEDs with standoffs will not be accepted.

- All LEDs used in all DMS provided for this contract shall be from the same manufacturer and of the same part number, except for the variations in the part number due to the intensity and color bins.

- The LEDs shall be rated by the LED manufacturer to have a minimum lifetime of 100,000 hours of continuous operation while maintaining a minimum of 70% of the original brightness.

8.3 Pixel Drive Circuitry

One (1) electronic driver circuit board shall be provided for each LED pixel module and shall individually control all pixels on that module. The driver circuit boards shall conform to the following specifications:

- Each LED driver board shall be microprocessor-controlled and shall communicate with the sign controller on a wire or fiber optic communication network using an addressable network protocol. The microprocessor shall process commands from the sign controller to display data, perform diagnostic tests, and report pixel and diagnostic status.

- Constant current LED driver ICs shall be used to prevent LED forward current from exceeding the LED manufacturer's recommended forward current whenever a forward voltage is applied. To maximize LED service life, LED drive currents will not be allowed that exceed the manufacturer's recommendations for the 100,000-hour lifetime requirement.

- The LED pixels shall be directly driven using pulse width modulation (PWM) of the drive current to control the display intensity. This LED driver circuitry shall vary the current pulse width to achieve the proper display intensity levels for all ambient light conditions. The drive current pulse shall be modulated at a frequency high enough to provide flicker-free operation and a minimum of 200 brightness levels.

- The LED driver circuitry shall receive updated display data at a minimum rate of ten (10) frames per second from the sign controller.

- Each LED driver circuit shall be powered by 24 VDC from external regulated DC power supplies. Each driver circuit shall receive power from a minimum of two (2) independent power supplies. Indicator LEDs shall be provided to indicate the status of each power source.

- Each LED driver circuit shall contain a microprocessor-controlled power regulation circuit that controls the voltage applied to the LED strings. The power circuit shall automatically adjust the voltage supplied to the LEDs to optimize power consumption efficiency as the temperature changes.

- The voltage of each power input shall be measured to the nearest tenth of a volt and reported to the sign controller upon request. Each driver circuit shall also contain one status LED for each power source that indicates if the power source is present or not.

- The LED driver circuitry shall be able to detect that individual LED strings or pixels are stuck off and shall report the pixel status to the sign controller upon request.

- The LED driver board shall contain a seven segment numeric LED display that indicates the functional status of the driver and pixel boards. At a minimum, it shall indicate error states of the LED pixels and communication network. The indicator shall be positioned such that a maintenance technician can easily view the status code for diagnostic purposes. The status codes shall also be reported to the sign controller upon request.

8.4 Characters Displayed

The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line.
The display area shall be 96 pixels high by 400 pixels wide.

The sign shall normally display 18-inch characters using triple-stroke (23 x 15) characters with four-column spacing between characters. The operator shall be able to change the default spacing between characters. The spacing options shall be one, two or three pixel columns. Font access privileges shall be assigned by the system supervisor.

The full matrix display shall be capable of displaying other sized character, graphics/symbols, and other number of lines depending on the height of the character utilized.

The separation between the last column of one module and the first column of the next shall be equal to the horizontal distance between the columns of a single display module. The separation between the last row of one module and the first row of the next shall be equal to the horizontal distance between the rows of a single display module.

18-inch characters shall be legible under all light conditions at a distance of 900 feet within a 30 degree cone of vision centered on the optical axis of the pixel. The cone perimeter shall be defined by its 50% intensity points.

The sign shall be the proper brightness in all lighting conditions for optimum legibility. It shall be bright enough to have a good target value, but not be the point where the pixels bloom, especially in low ambient light level conditions.

The brightness and color of each pixel shall be uniform over the entire face of the sign within the 30 degree cone of vision from 900 feet to 200 feet in all lighting conditions. Non-uniformity of brightness or color over the face of the sign under these conditions shall be cause for rejection of the sign.

8.5 Display of Graphic Images

The DMS control software shall support the inclusion of graphics in messages. If the NTCIP 1203 v3 standard has not reached a “recommended” or “approved” state by the time of contract award, the vendor shall support graphics using manufacturer-specific objects and MULTI tags.

If a manufacturer-specific means of supporting graphics is used, the vendor shall commit to provide NTCIP 1203 v3 firmware updates at no cost to the customer. These updates will include all current requirements of these specifications and also standard graphics support. The vendor shall install the updates no later than six months after the NTCIP 1203 v3 standard reaches the “approved” state.

9.0 Regulated DC Power Supplies

The LED pixel display modules shall be powered with auto-ranging regulated switching power supplies that convert the incoming AC to DC at a nominal voltage of 24 volts DC. Power supplies shall be wired in a redundant parallel configuration that uses multiple supplies for the DMS display matrix.

Power supplies shall be redundant and rated such that if one supply fails, the remaining supply(s) shall be able to operate 100% of the pixels in that display region at 100% brightness when the internal DMS air temperature is +140°F (60°C) or less.

Each power supply shall receive 120VAC power from separate circuits on separate circuit breakers, such that a single tripped breaker will not disconnect power from more than one supply.

The power supplies shall be sufficient to maintain the appropriate LED display intensity throughout the entire operating input voltage range.

The output of each power supply shall be connected to multiple circuits that provide power to the LED modules. Each output circuit shall not exceed 15 amperes and shall be fused.

Each power supply shall be monitored by a microprocessor-controlled circuit. This circuit shall monitor the voltage of each power supply. The power supply voltages shall be reported to the sign controller upon request. The power supplies used to power the LED pixel modules shall be identical and interchangeable throughout the DMS.

Regulated DC power supplies shall conform to the following specifications:

- Nominal output voltage of 24 VDC +/- 10%
- Nominal maximum output power rating of 1000 watts
- Operating input voltage range shall be a minimum of 90 to 260 VAC
- Operating temperature range shall be a minimum of –30ºF to +165ºF (-34ºC to +74ºC)
- Maximum output power rating shall be maintained over a minimum temperature range of –30ºF to +140ºF (-34ºC to +60ºC)
- Power supply efficiency shall be a minimum of 80%
- Power factor rating shall be a minimum of 0.95
- Power supply input circuit shall be fused
- Automatic output shut down and restart if the power supply overheats or one of the following output faults occurs: over-voltage, short circuit, or over-current
- Power supplies shall be UL listed
- Printed circuit boards shall be protected by an acrylic conformal coating

9.1 Photoelectric Sensor Devices

Three (3) photocells shall be installed on the sign. These devices shall permit automatic light intensity measurement of light conditions at each sign location.

These photocells shall be mounted in a manner to measure front, rear and ambient light conditions.

9.2 Brightness Control

Automatic adjustment of the LED brightness shall occur in small enough increments so that the brightness of the sign changes smoothly, with no perceivable brightness change between adjacent levels. Provision shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

Pixel brightness shall be controlled by pulse width modulation of the DC current. The pixel current waveform shall have a frequency of 100 +/-5 Hertz at nighttime brightness levels and 2400 $\pm$ 120 Hertz at daytime brightness levels with an adjustable duty cycle of 0.03 to 99.9% in 0.5% or finer increments. Brightness shall be manually settable from the front panel of the controller and remotely from the central computer in 1% increments. Brightness control shall be able to be returned to automatic from the sign controller front panel and the central computer.

9.3 Pixel Status Feedback

Two separate types of pixel status feedback shall be provided to the central controller from the local sign controller. These include a pixel test and a pixel read:

Pixel Test: The pixel test shall be performed from the central controller on command and automatically once a day. During a pixel test, the full operational status of each string of LEDs in each pixel shall be tested and then transmitted to the central controller or laptop computer. This pixel status test shall distinguish the difference between half out, full out, half stuck-on and fully stuck-on pixels. A list of defective pixels shall be provided, listing pixel status, line number, module number, column number and row number for each defective pixel. The pixel test may briefly disturb the displayed message for less than 0.5 seconds.

Pixel Read: The pixel read shall be performed during both message downloads and during every sign poll from the central controller or laptop computer. The pixel read shall perform a real-time read of the displayed message and shall return the state of each pixel to the central controller as it is currently displayed to the motorist, including any errors. This shall allow the central controller operator to see what is visibly displayed to the motorist on an individual pixel basis. During a pixel read, the state of each pixel (full-on, half-on or off) in the sign shall be read by the sign controller to allow the central controller or laptop computer to show the actual message, including static flashing and alternating messages, that is visibly displayed on the sign in a WYSIWYG format. This pixel reading shall take place while a message is displayed on the sign without disturbing the message in any way. Any flashing, flickering, blinking, dimming, or other disturbance of the message during this pixel read shall be cause for rejection of the sign.

The pixel read shall be an actual real-time read of the current flowing through each string of LEDs at the time of the associated sign poll or message download and shall not be accomplished by simulating errors based on the last pixel test.

10.0 Environmental Operating Parameters

All DMS components shall be capable of operating without any decrease in performance over a temperature range of –40°C (-40°F) to + 70°C (+158°F) with a relative humidity of up to 95% non-condensing, unless otherwise noted in this specification.

11.0. Sign Controller

11.1 General Requirements

Each DMS shall be controlled and monitored by its own sign controller. The sign controller shall be a stand-alone microprocessor-based system, which does not require continuous communication with DMS control software in order to perform most DMS control functions.

The sign controller shall meet the following operational requirements:

- Communicate using the NTCIP protocol
- Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation
- Include a front panel user interface with LCD and keypad for direct operation and diagnostics as described herein
- Contain a minimum of three (3) NTCIP-compliant RS232 communication ports
- Contain a minimum of one (1) NTCIP-compliant Ethernet port with RJ45 connector
- Contain DMS-specific control firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface NTCIP shall be natively supported in the DMS controller. External protocol converter or translator devices shall not be allowed.

11.2 Controller Location

The sign controller and associated communication equipment shall be installed inside the DMS housing.

11.3 Environmental

The sign controller shall meet the following environmental requirements defined in NEMA Standards Publication TS 4, Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements.

11.4 Mechanical and Electrical

The sign controller shall meet the following electrical and mechanical requirements:

- Mount in a standard EIA 19-inch (480 mm) equipment rack with a maximum 4U space requirement
- Weigh no more than 10 pounds, including its enclosure
- Consume no more than 30 watts of power
- Powered by an internal regulated DC power supply capable of operating on 120VAC or 240VAC at both 50Hz and 60Hz
- All printed circuit boards shall be sealed with an acrylic conformal coating

11.5 Operational Requirements

Front Panel User Interface

The sign controller's front panel shall include a menu driven, 16 button keypad and a 280x472 graphical LCD. These devices shall be used to perform the following functions with the sign controller and DMS:

- Monitor the current status of the sign controller, including the status of all sensors and a RGB what-you-see-is-what-you-get (WYSIWYG) representation of the message visible on the display face
- Perform diagnostics testing of various system components, including pixels, power systems, sensors, and more
- Activate, create, preview and delete messages stored in memory
- Blank the sign.
- Start and stop the schedule.
- Configure display parameters, including display size and color technology
- Configure date and time.
- Configure communications port settings and NTCIP options
- Configure level of password protection per user.
- Select automatic or manual brightness mode of operation.

The front panel interface shall also include:

- Power switch to turn the controller on and off
- LED power "on" indicator
- Local/remote selection from LCD interfaces.
- LED to indicate when any of the NTCIP communication channels are active

11.6 Memory

The sign controller shall have non-volatile electronically changeable memory. This memory shall be formed by flash or battery-backed static RAM integrated circuits that retain the data in memory for a minimum of 30 days following a power loss. This changeable memory shall be used to store messages and schedules. The controller memory shall be capable of storing a minimum of 500 changeable text based messages in non-volatile RAM. There shall be a minimum of 2 GB RAM and 8 GB of storage.

11.7 Internal Clock

The DMS sign controller shall contain a computer-readable clock that has a battery backup circuit. The battery shall keep the clock operating properly for at least 5 years without external power, and the clock shall automatically adjust for daylight savings time and leap year using hardware, software, or a combination of both. The clock shall be set electronically by the sign controller microprocessor and shall be accurate to within one (1) minute per month.

11.8 Communications

All remote communication ports shall be NTCIP-compatible as defined in the "Requirements for NTCIP Compatibility" section of these specifications.

11.9 Communication Modes

The DMS sign controller shall be able to receive instructions from and provide information to a computer containing DMS control software using the following communication modes:

- Remotely via direct or dial-up communications with a remotely located computer. The system communications backbone, as well as all field modems or signal converters, shall provide the DMS sign controller with an RS232 signal.

- Locally via direct connection with a laptop computer that is connected directly to the sign controller using an RS232 null modem connection.

11.10 Serial Communication Ports

The DMS sign controller shall contain a minimum of three (3) NTCIP-compatible RS232 communication ports. These ports shall support multiple communication interfaces, including, but not limited to, direct null-modem (for local laptop control), dial-up and leased-line modems, radio systems, cellular modems, and fiber optic modems. The RS232 ports shall all have standard DB9M connectors.

The baud rate, connection type, and NTCIP communication protocol shall be configurable. Each port must support all typical serial baud rates ranging from 1200 to 115,200 baud. All three ports shall be capable of supporting either of the following sub network profiles: NTCIP 2101 (PMPP) or NTCIP 2103 (PPP). They shall also be capable of supporting either NTCIP 2201 (Null) or NTCIP 2202 (Internet) transport profiles. Only one each of the transport and sub network profiles shall be active at any time on each port.

11.11 Ethernet Port

The DMS sign controller shall contain a minimum of one (1) 10/100Base-T Ethernet communication port. This port shall be available for use for communicating from the central control system to the DMS sign controller when an Ethernet network is available. The Ethernet port shall have a standard RJ45 connector.

Communications on the Ethernet port shall be NTCIP-compatible using the NTCIP 2202 Internet transport profile and the NTCIP 2104 Ethernet sub network profile. This shall permit the controller to be operated on any typical Ethernet network using the TCP/IP and UDP/IP protocols.

11.13 Controller Addressing

The DMS sign controller shall use whatever addressing scheme is appropriate for the NTCIP network types used for communications. The controller addressing shall be configurable through the front panel user interface.

NTCIP 2101 (PMPP) networks shall be configured with an address in the range 1 to 255 with a default address of 1. NTCIP 2104 (Ethernet) networks shall use a static IP address. Both the IP address and subnet shall be configurable. NTCIP 2103 (PPP) networks shall not require network addressing.

12.0 Transient Protection

The DMS and sign controller signal and power inputs shall be protected from electrical spikes and transients as follows:

12.1 Sign AC Power

The AC power feed for all equipment in the sign cabinet shall be protected at the panel board by a parallel-connection surge suppresser rated for a minimum surge of 50 kA. This device shall conform to the following requirements:

- Withstand a peak 100,000-ampere surge current, 50kA L-N, 50kA L-G
- Designed, manufactured, & tested consistent with: ANSI/IEEE C62.41.1-2002, C62.42.2-2002, C62.45-2002, NEMA LS-1, NEC 285 and IEC 61643, CE
- Less than 1 nanosecond response time
- Temperature range of -15ºF to +140°F (-26ºC to +60ºC)
- Approximate dimensions of 3-inches (76 mm) wide by 8-inches (203 mm) long by 3-inches (76 mm) high
- High Energy Parallel Design for Category C3 & C-High Application
- UL listed to: UL 1449 Third Edition 200kA & 100kA SCCR

12.2 Control Equipment AC Power

- Withstand a peak 100,000-ampere surge current, 50kA L-N, 50kA L-G
- Designed, manufactured, & tested consistent with: ANSI/IEEE C62.41.1-2002, C62.42.2-2002, C62.45-2002, NEMA LS-1, NEC 285 and IEC 61643, CE
- Less than 1 nanosecond response time
- Temperature range of -15ºF to +140°F (-26ºC to +60ºC)
- Approximate dimensions of 3-inches (76 mm) wide by 8-inches (203 mm) long by 3-inches (76 mm) high
- High Energy Parallel Design for Category C3 & C-High Application
- UL listed to: UL 1449 Third Edition 200kA & 100kA SCCR

12.3 Communication Signals

Transient voltage surge suppressors shall protect all communication signals connecting to the control equipment from off-site sources using copper cables. Transient voltage surge suppressors shall protect all copper communication lines used to pass data between the sign controller and sign.

12.4 Protection

A series/parallel two-stage suppression device shall protect the modem communication port from over-voltage and over-current conditions. This surge protection shall be integrated internally within the controller.

13.0 Local User Auxiliary Interface;
When DMS sign Controller is located inside of DMS sign Enclosure

13.1 Auxiliary Control Panel

The DMS shall include an auxiliary control panel that will provide a secondary user interface panel for DMS control, configuration, and maintenance. The auxiliary control panel shall meet the same electrical, mechanical, and environmental specifications as the DMS controller. It shall be powered independently from a 120 VAC outlet. There also shall be a 120 VAC convenience outlet for maintenance personnel lap top computers and a hinged shelf which folds from inside the cabinet and is suitable for the laptop computer to rest on.

13.2 Interface Panel

The auxiliary control panel shall have an LCD panel and keypad identical to those found on the DMS controller. It shall also contain a local/remote control switch; reset switch, status LEDs, and one NTCIP compatible RS232 communication port that meet the same specifications as the DMS controller.

13.3 DMS Control Interface

The auxiliary control panel shall include an identical menu system to the DMS controller with all of its features and functionality.

13.4 Location

The Auxiliary Control Panel shall be installed at grade level in a location that is safe and easy for maintenance personnel to access.

13.5 Controller Signal Interface

The auxiliary control panel shall interface to the DMS controller using outdoor-rated Category 5 copper cable. It shall be capable of operating up to 4000 feet from the DMS controller.

14.0 Sign Controller Functions

The sign controller shall be capable of being controlled from the central controller or the laptop computer.

The controller software shall be capable of performing the following functions:

Display a message, including:

1. Static messages
2. Flashing messages
3. Alternating messages

Messages shall be capable of displaying text, graphics or a combination of both. The graphics area shall be downloaded from the central controller with each message.

It shall be possible to separately vary the flashing and alternating frequencies.

Flashing messages shall have the following adjustable timing:

1. Message time on from 0.5 to 5.0 seconds in 0.1 second increments.
2. Message time off from 0.5 to 5.0 seconds in 0.1 second increments

It shall be possible to flash any character or set of characters in a static message.

Alternating messages shall have the following adjustable timing:

1. Primary message time on from 0.5 to 5.0 seconds in 0.1 second increments.
2. Primary message time off from 0 to 5.0 seconds in 0.1 second increments.
3. Alternative message time on from 0.5 to 5.0 seconds in 0.1 second increments.
4. Alternate message time off from 0 to 5.0 seconds in 0.1 second increments.

It shall be possible to flash any character or set of characters in an alternating message at the adjustable frequencies listed above for flashing messages. The flashing period shall be a sub-multiple of the alternating on-time it is associated with.

Report errors and failures, including:

1. Power failure
2. Power recovery
3. Pixel string failure
4. Fan failure
5. Over a user selectable critical temperature
6. Power supply failure
7. Data transmission error
8. Receipt of invalid data
9. Communication failure recovery

Message and status monitoring:
The sign controller shall respond to the central controller whenever it receives a request for status (a poll). The return message shall be capable of providing the following information:

1. Actual message that is visibly displayed on the sign on an individual pixel basis (full-on, half-on or off)
2. Current sign illumination level
3. Local Control Panel switch position (central, local or local override mode)
4. Error and failure reports
5. Temperature readings
6. LED power supply voltage levels
7. Origin of display message transmission (laptop, manual or central)
8. Heater status
9. Address of sign controller
10. Uninterruptible power supply status
11. AC Surge protection status
12. Communication line protection status
13. Operational status of the following sensors
    - Each temperature sensor
    - Each photocell
    - Each airflow sensor
    - Humidity sensor
    - Each power supply sensor
    - Severe error condition response

Each time the sign controller is polled by the DMS Master Controller or laptop computer, the sign controller shall test the operation status of the sensors listed below and return this information to the DMS Master Controller. This operational status test shall determine if each of the following sensors are functioning properly.

1. Each temperature sensor
2. Each photocell
3. Humidity sensor
4. Each LED power supply

The sign controller shall provide a library with a minimum of 50 permanent messages, consisting of 30 or less characters per line, stored in PROM. The sign controller shall also be able to accept a downloaded library from the central or laptop computer of a minimum of 25 changeable messages stored in non-volatile RAM. These messages may be called for display on the sign from the keypad on the front panel of the DMS Controller.

The sign controller shall also be capable of displaying messages on the sign that are downloaded from the central controller or laptop computer, but are not located in the library stored in non-volatile memory of the sign controller.

The sign shall normally display triple stroke (23 x 15) characters with four-column spacing between characters. The sign shall also be able to display single stroke (5 X 7), expanded (6 X 7) or double-stroke (7 X 7) nominal character fonts or change the default spacing between characters. The spacing options shall be one, two or three pixel columns. Each font may be edited and downloaded to the sign controller from the central controller or laptop computer at any time without any software or hardware modifications.

The full matrix display shall also be capable of displaying other sized characters, graphics/ symbols, and other number of lines depending on the height of the character utilized. The interline spacing shall be variable.

The sign controller shall monitor the photo cell circuits in the sign and convert the measured light intensity into the desired pixel brightness. The photo circuit readings shall be correlated with a brightness table in the sign controller. The brightness table shall have a minimum of 255 brightness levels. Automatic adjustment of the LED driving waveform duty cycle shall occur in small enough increments so that brightness of the sign changes smoothly, with no perceivable brightness change between adjacent levels. The brightness table in each individual sign controller shall be adjustable from the central controller and can be customized according to the requirements of the installation site. Each sign shall have its own, independent brightness table.

Brightness shall be manually settable from the front panel of the controller and remotely from the central computer in one percent increments from one to 99%.

There shall be a means to adjust how rapidly the sign responds to changes in ambient light as measured by the photocells. This can be used, for example, to prevent the sign from changing its brightness due to a vehicle's headlight momentarily hitting the sign. The adjustment shall be made from the central controller or laptop computer and shall have two different settings, one for daytime control and one for nighttime control, with the day/night ambient light threshold also being an adjustable value. In addition, there shall be a means to specify different weighting factors for each photocell, to specify how prominently each photocell figures in the calculation of nighttime ambient light.
In the event of a power failure, the sign controller shall activate a programmable default message (which shall be a blank message) and shall report the AC power failure to the central controller.

The operational status of each pixel in the sign shall be automatically tested once a day and tested when a pixel test is requested from the central controller or laptop computer. A list of defective pixels shall then be transmitted to the central controller or laptop computer, listing pixel status test shall distinguish the difference between half-out, full-out, half-stuck on and fully stuck-on pixels. This test shall not affect the displayed message for more that 0.5 seconds.

When the sign controller is polled and when messages are downloaded from the central controller or laptop computer, each pixel in the sign shall be read and its current state (full-on, half-on or off), for the currently displayed message, shall be returned to the central controller. This will allow the central controller or laptop computer to show the actual message that is visibly displayed on the sign on an individual pixel basis in a WYSIWYG format. (This is different from the pixel test listed above.) This pixel status read shall not affect the displayed message in any way. The pixel read shall be an actual real-time read of the current flowing through each string of LEDs at the time of the associated sign poll or message download and shall not be accomplished by simulating errors based on the last pixel test.

The operational status of the fans shall be automatically tested once a day and tested on command from the central controller or laptop computer. Any failure will cause an error message to be sent to the central controller or laptop when the sign controller is polled by the central controller or laptop computer.

The sign controller shall read the internal temperature sensors, external ambient temperature sensor and the humidity sensor. The sign controller shall use these readings in an algorithm that turns on the heat tape and/or the fans at the appropriate times to reduce both frost on the face of the sign and condensation on the display modules and other electronic circuitry.

Temperature sensors shall be continuously measured and monitored by the sign controller. A temperature greater than a user selectable critical temperature shall cause the sign message to go to blank and the sign controller shall report this error message to the central controller. This user selectable critical temperature shall be capable of being changed by the central controller or laptop computer. The central controller and laptop computers shall have the ability to read all measurements from the sign controller.

All LED module power supply voltages shall be continuously measured by the sign controller. The sign controller shall provide these voltage readings to the central controller or laptop computer when the sign controller is polled by the central controller or laptop computer.

There shall be no perceivable blinking, flickering or ghosting of the pixels at any time, except during a pixel test as described above. The displayed message will not be affected in any way at any time for the pixel status read as described above.

In the event the central controller fails to communicate with the sign controller within a programmable time limit, the sign shall activate a programmable default message (which shall be a blank). This function shall apply only when the sign controller is in central control mode.

Failure of any sign shall not affect the operation of any other sign in the system.

The sign controller shall perform a consistency check of messages downloaded from the central controller or laptop computer to ensure that the message will fit in the display area of the sign. If any part of the message fails this check, the downloaded message shall not be displayed and an error message shall be displayed on the operator's GUI.

The sign controller internal time clock shall ensure that a message is taken down at the correct time, even in the event of a communications loss.

The sign controller shall allow a moving arrow to be displayed by the central controller or laptop computer. The moving arrow shall be on one line with a standard message on the other lines. The moving arrows shall be from the left or right and shall start from one end or in the middle of the sign and continue to the end of the sign.

The sign controller shall blank the sign in the event of a communication failure or power failure. The controller shall blank the sign if failure lasts greater than 5 minutes. Communication failures are either on the field transmit, field receive, or both.

The sign controller shall have a special function output to control an auxiliary blank-out sign. This shall be a contact closure to ground capable of sinking at least 10 mA. It shall be controlled from the central controller.

The sign controller shall be capable of being remotely reset from the central controller.

The system power shall be protected by two stages of transient voltage suppression devices as required in the AC Power Section of this specification. Tripping of each stage (or both if tripped simultaneously) of the surge protection shall cause the sign controller to call central and report the error condition (for dial-up operation) or report the error condition to central on the next poll (for multi-drop operation). There shall be an option that is either enabled or disabled and is selected and downloaded from the central controller to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

Communication lines shall be protected by two stages of transient voltage suppression devices as required in the Sign Controller Communication Interface Section of this specification. Tripping of each stage (or both if tripped simultaneously) of the surge protection shall cause the sign controller to call central and report the error condition (for dial-up operation) or report the error condition to central on the next poll (for multi-drop operation). There shall be an option that is either enabled or disabled and is selected and downloaded from the central controller to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall disconnect the communication lines until the surge protection has been replaced. When this option is enabled, tripping of the second stage of surge protection shall disconnect the communication lines until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

14.1 Modes of Operation

The mode of operation determines which level of control governs the DMS message selection. The three modes of operation are:

Central Mode: The local control panel switch is off and the central controller controls and monitors the sign

Local Mode: The local control panel switch is on and the laptop computer is used to locally control the sign. The central controller only monitors the sign (i.e. status poll).

Local Override: The local mode has been overridden by the central to allow the central to control the sign in case the local control panel switch was unintentionally left in local mode.

14.2 AC Power

The sign and its sign controller shall be capable of operating with 120/240 VAC, 50 amp per leg, 60 hertz, single-phase power.

The sign shall have a 50 amp per leg, 120/240 VAC, two-pole load center with 16 circuit capability. Each circuit in the sign shall be powered from a separate circuit breaker.

The system shall be protected by two stages of transient voltage suppression devices including MOVS and spark gap arrestor. If enabled by the central controller, tripping of the second stage shall prevent power from reaching any components of the sign until the surge protection has been replaced. Tripping of each stage of the surge protection shall cause the sign controller to call central and report the error condition (for dial-up operation) or report the error condition to central on the next poll (for multi-drop operation).

14.3 Transient Test Requirements

The sign housing electronics and the control cabinet shall be separately capable of withstanding a high-energy transient having the following characteristics repeatedly applied to the AC input terminals:

A ten microfarad oil filled capacitor charged to 1000 VDC $\pm$ 5% shall be discharged into the power input terminals a minimum of three times for each polarity. Immediately following this test the unit under test shall perform all of its defined functions upon the restoration of normal AC power.

15.0 Electronic Materials and Construction Methods

15.1 Printed Circuit Boards

Printed Circuit Boards (PCB) design shall be such that components may be removed and replaced without damage to boards, traces or tracks.

Only FR-4 0.062 inch material shall be used. Inter-component wiring shall be copper clad track having a minimum weight of 2 ounces per square foot with adequate cross section for current to be carried. Jumper wires will not be permitted, except from plated-through holes to component. The maximum number of jumper wires allowed per circuit board is two.

All PCBs shall be finished with a solder mask and a component identifier silk screen.

15.2 Components

All components shall be of such design, fabrication, nomenclature, or other identification so as to be purchased from a wholesale electronics distributor, or from the component manufacturer, except for printed circuit board assemblies:

Circuit design shall be such that all components of the same generic type, regardless of manufacturer, shall function equally in accordance with the specifications.

All discrete components, such as resistors, capacitors, diodes, transistors, and integrated circuits shall be individually replaceable. Components shall be arranged so they are easily accessible for testing and replacement.

16.0 Technical Assistance

The DMS manufacturer's technical representative shall provide on-site technical assistance in following areas:

1. Sign to structure installation
2. Sign controller cabinet installation
3. Sign to controller cabling

The initial powering up of the sign(s) shall not be executed without the permission of the DMS manufacturer's technical representative.

17.0 Testing Requirements

The equipment covered by this specification shall be subjected to design approval tests (DAT), factory demonstration tests (FDT), stand-alone tests, systems tests and 72 hour and 90 day test periods to determine conformance with all the specification requirements. The Engineer may accept certification by an independent testing lab in lieu of the design approval tests to verify that the design approval tests have previously been satisfactorily completed. The DMS vendor shall arrange for and conduct the tests in accordance with the testing requirements stated herein. Unless otherwise specified, the DMS vendor is responsible for satisfying all inspection requirements prior to submission for the Engineer's inspection and acceptance. The contract periods will not be extended for time lost or delays caused by testing prior to final Department approval of any items. The Engineer reserves the right to have his representative witness any and all tests. The results of each test shall be compared with the requirements specified herein. Failure to conform to the requirements of any test shall be counted as a defect, and the equipment shall be subject to rejection by the Engineer. Rejected equipment may be offered again for a retest provided that all non-compliances have been corrected and retest by the DMS vendor and evidence thereof submitted to the Engineer.

Final inspection and acceptance of equipment shall be made after installation at the designated location as shown on the plans, unless otherwise specified herein.

17.1 Test Procedures

The DMS vendor shall provide five (5) copies of all design approval, factory demonstration, stand-alone and system test procedures and data forms for the Engineer's approval at least sixty (60) days prior to the day the tests are to begin. The test procedures shall include the sequence in which the tests will be conducted. The test procedures shall have the Engineer's approval prior to submission of equipment for tests.

The DMS vendor shall furnish data forms containing all of the data taken, as well as quantitative results for all tests. The data forms shall be signed by an authorized representative (company official) of the equipment manufacturer. At least one copy of the data forms shall be sent to the Engineer.

The DMS vendor shall be responsible for providing the test fixtures and test instruments for all of the tests.

17.2 Design Approval Tests

Design approval tests shall be conducted by the DMS vendor on one or more samples of equipment of each type, as approved by the Engineer, to determine if the design of the equipment meets the requirements of this Specification. The test shall be conducted in accordance with the approved test procedures as described in section 19.0.

If the design approval tests have not previously been satisfactorily completed by an independent testing lab and accepted by the Engineer, the Engineer shall be notified a minimum of thirty (30) calendar days in advance of the time these tests are to be conducted.

The design approval tests shall cover the following:

17.2.1 Temperature and Condensation

The DMS sign system equipment shall successfully perform all the functionality requirements listed in this specification under the following conditions in the order specified below:

1. The equipment shall be stabilized at -40°F (-40°C). After stabilization at this temperature, the equipment shall be operated without degradation for two (2) hours.
2. Moisture shall be caused to condense on the equipment by allowing it to warm up to room temperature in an atmosphere having relative humidity of at least 40% and the equipment shall be satisfactorily operated for two (2) hours while wet.
3. The equipment shall be stabilized at 149°F (65°C). After stabilization, the equipment shall be satisfactorily operated for two (2) hours without degradation or failure.

17.2.2 Primary Power Variation

The equipment shall meet the specified performance requirements when the nominal input voltage is 115 V ± 15 V. The equipment shall be operated at the extreme limits for at least 15 minutes during which the operational test of the FDT shall be successfully performed.

17.2.3 Power Service Transients

The equipment shall meet the performance requirements, specified in the parent specification, when subjected to the power service transient specified in 2.1.6 “Transient, Power Service”, of the NEMA standard TS1. The equipment shall meet the performance requirements specified in the parent specification.

17.2.4 Relative Humidity

The equipment shall meet its performance requirements when subjected to a temperature of (149°F 65°C) and a relative humidity of 90%. The equipment shall be maintained at the above condition for 48 hours. At the conclusion of the 48 hour soak, the equipment shall meet the requirements of the operational test of the FDT within 30 minutes of beginning the test.

17.2.5 Vibration

The equipment (excluding cabinets) shall show no degradation of mechanical structure, soldered components, or plug-in components and shall operate in accordance with the manufacturer’s equipment specifications after being subjected to the vibration tests as described in Section 2.2.5, “Vibration Test”, of the NEMA standard TS1.

17.2.6 Consequences of Design Approval Test Failure

If the unit fails the design approval test, the design fault shall be corrected and the entire design approval test shall be repeated. All deliverable units shall be modified without additional costs to the Department, to include design changes required to pass the design approval tests.

18.0 DMS Controller Uninterruptible Power Supply

A UPS shall be provided to allow the sign controller to notify the central controller when an improper power condition at the DMS persists for longer than 30 seconds.
The UPS shall meet the following minimum specifications:

1. Line Transient Protection: Passes ANSI/IEEE C62.41 Category A testing
2. Safety Compliance: UL listed to UA1778
3. EMC Compliance: FCC Class B
4. Efficiency:>95% on line
5. Capacity VA/Watts @ 0.67P.F. : 425VA/285W
6. Voltage Nominal: 120 VAC
7. Voltage Range: 100-142 VAC
8. Typical run time (minutes): Full load: 3 minutes. Typical load: 5 minutes
9. Transfer time: 4 ms typical
10. Battery: Sealed, maintenance-free, valve regulated, UL 924 recognized.
11. Battery recharge time (to 95% of capacity): 8 hours with output fully loaded
12. Over current protection (on line): circuit breaker
13. Input fault current (maximum): 15A
14. Operating temperature: Range minimum -10°F -140°F (-23°C to 60°C)
15. Humidity: 5% - 95% RH (non-condensing)

19.0 Factory Demonstration Tests

The DMS vendor shall be responsible for conducting Factory Demonstration Tests on an all units at the DMS Vendor's Manufacturing Facility. These tests shall be performed on each unit supplied. The Engineer shall be notified a minimum of sixty (60) calendar days before the start of tests. The DMS Vendor shall pay for all travel expenses, including airfare, rental car, hotel, meals, etc., for up to three (3) department personnel or designated representatives for the Engineer to witness the Factory Demonstration Tests on the first unit at the vendor's manufacturing facility. All tests shall be conducted in accordance with the approved test procedures of Section 17.0. All equipment shall pass the following individual tests:
Examination Tests:
All equipment shall be examined carefully to verify that the materials, design, construction, markings and workmanship comply with the requirements of the Specification.
Continuity Tests:
The wiring shall be checked to determine that it meets the requirements of the appropriate paragraphs in the Specifications.

19.1 Operational Test

All equipment shall be operated long enough to permit equipment temperature stabilization, and to check and record an adequate number of performance characteristics to ensure compliance with the requirements of this Specification.

19.2 Consequences of Factory Test Failure

If any unit fails to pass its demonstration test, the unit shall be corrected and another unit substituted in its place and the test successfully repeated.

If a unit has been modified as a result of a demonstration test failure, a report shall be prepared and delivered to the Engineer prior to shipment of the unit. The report shall describe the nature of the failure and the corrective action taken.

If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or extension of the contract period.

20.0 Stand-Alone Tests

The DMS vendor shall conduct an approved stand-alone test of the equipment installation at the field site. The test shall, as a minimum, exercise all stand-alone (non-network) functional operations of the field equipment with all of the equipment installed as per the plans, or as directed by the Engineer.

Approved data forms shall be completed and turned over to the Engineer as the basis for review and rejection or acceptance. At least thirty (30) working days' notice shall be given prior to all tests to permit the Engineer or his representative to observe each test.

20.1 Consequences of Stand-Alone Test Failure

If any unit fails to pass its stand-alone test, the unit shall be corrected or another unit substituted in its place and the test successfully repeated.

If a unit has been modified as a result of a stand-alone test failure, a report shall be prepared and delivered to the Engineer prior to the re-testing of the unit. The report shall describe the nature of the failure and the corrective action taken.

If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or extension of the contract period.

21.0 System Test

The DMS vendor shall conduct approved DMS system tests on the field equipment with the central equipment. The tests shall, as a minimum, exercise all remote control functions and display the return status codes from the controller.

Approved data forms shall be completed and turned over to the Engineer as the basis for review and for rejection or acceptance.

21.1 Consequence of System Test Failure

If system tests fail because of any components(s) in the subsystem, the particular components(s) shall be corrected or substituted with other components(s) and the tests shall be repeated. If a component has been modified as a result of the system test failure, a report shall be prepared and delivered to the Engineer prior to retest.

22.0 72 Hours and 90 Days Test Failure

After the installation of the DMS system is completed and the successful completion of the System Test, the DMS vendor shall conduct one continuous 72-hour full operating test prior to conducting a 90-day test period. The type of test to be conducted shall be approved by the Engineer, and shall consist primarily of exercising all control, monitor and communications functions of the field equipment by the central equipment.

The 90-day test period shall commence on the first day after the successful completion of the approved 72-hour continuous full operating test period.

During the 90-day test period, downtime, due to mechanical, electrical and/or other malfunctions, shall not exceed five (5) working days. The Engineer may extend the 90-day test period by a number of days equal to the downtime in excess of five (5) working days.

The Engineer will furnish the DMS vendor with a letter of approval stating the first day of the 90-day test period.

23.0 Final System Acceptance

Final system acceptance shall be defined as when all work and materials provided for in this item have been furnished and completely installed, and all parts of the work have been approved and accepted by the Engineer and the Dynamic Message Sign System has been operated continuously and successfully for ninety (90) calendar days with no more than five (5) working days downtime due to mechanical, electrical and/or other malfunctions.

24.0 Warranty

Equipment furnished under this Specification shall be guaranteed to perform according to these specifications and to the manufacturer's published specifications. Equipment shall be warranted for a minimum of **five years** return to factory against defects and/or failure in design, materials and workmanship. Unless otherwise specified in the invitation for bids, warranty coverage shall become effective on the date of final acceptance of the system by the Department. The Contractor shall assign to the Department all manufacturer's normal warranties or guarantees, on all such electronic, electrical and mechanical equipment, materials, technical data, and products furnished for and installed on the project. Defective equipment shall be repaired or replaced, at the manufacturer's option, during the warranty period at no cost to the Department. The Contractor shall provide a written document on DMS Vendor letterhead, signed by the DMS Principle, documenting said warranties or guarantees and shall be submitted to the Engineer before project acceptance.

25.0 Center to Field Communications NTCIP Requirements

This section describes the minimum specifications for the NTCIP communication capabilities of the DMS controller and DMS control software. The contractor shall provide all the software, firmware, and services necessary to operate a dynamic message sign (DMS) system that fully complies with the NTCIP functional requirements specified herein, including incidental items that may have been inadvertently omitted.

References

These specifications reference standards through their NTCIP designated names. The following list provides the current versions of each of these standards.

Each NTCIP device covered by these project specifications shall implement the version of the standard that is specified in the following table. Refer to the NTCIP library at www.ntcip.org for information on the current status of NTCIP standards.

Document Number and Version	Document Title	Document Status
NTCIP 1101:1996 and Amendment 1	Simple Transportation Management Framework (STMF)	Approved Standard with Amendment
NTCIP 1102:2004	Octet Encoding Rules (OER) Base Protocol	Approved Standard
NTCIP 1103 v1.26a	Transportation Management Protocols	Recommended Standard
NTCIP 1201:1996 and Amendment 1	Global Object (GO) Definitions	Approved Standard
NTCIP 1203:1997 and Amendment 1	Object Definitions for Dynamic Message Signs	Approved Standard with Amendment
NTCIP 2001:1996 and Amendment 1	Class B Profile	Approved Standard
NTCIP 2101:2001	Point to Multi Point Protocol (PMPP) Using RS-232 Subnetwork Profile	Approved Standard
NTCIP 2103:2003	Point-to-Point Protocol Over RS-232 Subnetwork Profile	Approved Standard
NTCIP 2104:2003	Ethernet Subnetwork Profile	Approved Standard
NTCIP 2201:2003	Transportation Transport Profile	Approved Standard
NTCIP 2202:2001	Internet (TCP/IP and UDP/IP) Transport Profile	Approved Standard
NTCIP 2301:2001	Simple Transportation Management Framework (STMF) Application Profile	Approved Standard

Table 1: NTCIP Document References

25.1 Subnetwork Profiles

Each serial or modem port on each NTCIP device shall be configurable to support both NTCIP 2101 and NTCIP 2103. Only one of these profiles shall be active at any given time. Serial ports shall support external dial-up modems.

Each Ethernet port on the NTCIP device shall comply with NTCIP 2104.

The NTCIP device(s) may support additional Subnet Profiles at the manufacturer's option. At any one time, only one subnet profile shall be active on a given port of the NTCIP device. All response datagram packets shall use the same transport profile used in the request. The NTCIP device shall be configurable to allow a field technician to activate the desired subnet profile and shall provide a visual indication of the currently selected subnet profile.

25.2 Transport Profiles

Each serial or modem port on each NTCIP device shall be configurable to support both NTCIP 2201 and NTCIP 2202.

Each Ethernet port on the NTCIP device shall comply with NTCIP 2202.

The NTCIP device(s) may support additional transport profiles at the manufacturer's option. Response datagrams shall use the same transport profile used in the request. Each NTCIP device shall support the receipt of datagrams conforming to any of the supported transport profiles at any time.

25.3 Application Profiles

Each NTCIP device shall comply with NTCIP 2301 and shall meet the requirements for Conformance Level 1.

An NTCIP device may support additional application profiles at the manufacturer's option. Responses shall use the same application profile used by the request. Each NTCIP device shall support the receipt of application data packets at any time allowed by the subject standards.

25.4 Object Support

Each NTCIP device shall support all mandatory objects of all mandatory conformance groups as defined in NTCIP 1201 and NTCIP 1203.

Each NTCIP device shall support all mandatory objects in all optional conformance groups required herein. All optional objects listed in these specifications shall be supported.

The NTCIP device(s) shall are required to support the following optional conformance groups.

Conformance Group	Reference
Time Management	NTCIP 1201
Timebase Event Schedule	NTCIP 1201
Report	NTCIP 1201
PMPP	NTCIP 1201
Font Configuration	NTCIP 1203
DMS Configuration	NTCIP 1203
MULTI Configuration	NTCIP 1203
MULTI Error Configuration	NTCIP 1203
Illumination/Brightness Control	NTCIP 1203
Scheduling	NTCIP 1203
Sign Status	NTCIP 1203
Status Error	NTCIP 1203
Pixel Error Status	NTCIP 1203

Table 2: Required Optional Conformance Groups

The following table indicates objects that are considered optional in the NTCIP standards, but are required by this specification. It also indicates modified object value ranges for certain objects. Each NTCIP device shall provide the full, standardized object range support (FSORS) of all objects required by these specifications unless otherwise indicated below.

Object	Reference	Project Requirement
moduleTable	NTCIP 1201 Clause 2.2.3	Shall contain at least one row with moduleType equal to 3 (software).
maxTimeBaseScheduleEntries	NTCIP 1201 Clause 2.4.3.1	Shall be at least 28
maxDayPlans	NTCIP 1201 Clause 2.4.4.1	Shall be at least 20
maxDayPlanEvents	NTCIP 1201 Clause 2.4.4.2	Shall be at least 12
maxEventLogConfig	NTCIP 1201 Clause 2.5.1	Shall be at least 50
eventConfigMode	NTCIP 1201 Clause 2.4.3.1	The NTCIP Component shall Support the following Event Configuration: onChange, greaterThanValue, smallerThanValue
eventConfigLogOID	NTCIP 1201 Clause 2.5.2.7	FSORS
eventConfigAction	NTCIP 1201 Clause 2.5.2.8	FSORS
maxEventLogSize	NTCIP 1201 Clause 2.5.3	Shall be at least 200
maxEventClasses	NTCIP 1201 Clause 2.5.5	Shall be at least 16
eventClassDescription	NTCIP 1201 Clause 2.5.6.4	FSORS
maxGroupAddresses	NTCIP 1201 Clause 2.7.1	Shall be at least 1
communityNamesMax	NTCIP 1201 Clause 2.8.2	Shall be at least 3
numFonts	NTCIP 1203 Clause 2.4.1.1.1.1	Shall be at least 12
maxFontCharacters	NTCIP 1203 Clause 2.4.1.1.3	Shall be at least 255
defaultFlashOn	NTCIP 1203 Clause 2.5.1.1.1.3	The DMS shall support flash “on” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOff	NTCIP 1203 Clause 2.5.1.1.1.4	The DMS shall support flash “off” times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultBackgroundColor	NTCIP 1203 Clause 2.5.1.1.1.1	The DMS shall support the black background color

defaultForegroundColor	NTCIP 1203 Clause 2.5.1.1.2	The DMS shall support the amber foreground color
defaultJustificationLine	NTCIP 1203 Clause 2.5.1.1.1.6	The DMS shall support the following forms of line justification: left, center, and right
defaultJustificationPage	NTCIP 1203 Clause 2.5.1.1.1.7	The DMS shall support the following forms of page justification: top, middle, and bottom
defaultPageOnTime	NTCIP 1203 Clause 2.5.1.1.1.8	The DMS shall support page “on” times ranging from 0.1 to 25.5 seconds in 0.1 second increments
defaultPageOffTime	NTCIP 1203 Clause 2.5.1.1.1.9	The DMS shall support page “off” times ranging from 0.1 to 25.5 seconds in 0.1 second increments
defaultCharacterSet	NTCIP 1203 Clause 2.5.1.1.1.10	The DMS shall support the eight bit character set
dmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.4	Shall be at least 100.
dmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS shall support any valid MULTI string containing any subset of those MULTI tags listed in Table 3 (below)
dmsControlMode	NTCIP 1203 Clause 2.7.1.1.1.1	Shall support at least the following modes: local, central, and centralOverride
dmsSWReset	NTCIP 1203 Clause 2.7.1.1.1.2	FSORS
dmsMessageTimeRemaining	NTCIP 1203 Clause 2.7.1.1.1.4	FSORS
dmsShortPowerRecoveryMessage	NTCIP 1203 Clause 2.7.1.1.1.8	FSORS
dmsLongPowerRecoveryMessage	NTCIP 1203 Clause 2.7.1.1.1.19	FSORS
dmsShortPowerLossTime	NTCIP 1203 Clause 2.7.1.1.1.10	FSORS

dmsResetMessage	NTCIP 1203 Clause 2.7.1.1.1.12	FSORS
dmsCommunicationsLossMessage	NTCIP 1203 Clause 2.7.1.1.1.12	FSORS
dmsTimeCommLoss	NTCIP 1203 Clause 2.7.1.1.1.12	FSORS
dmsEndDurationMessage	NTCIP 1203 Clause 2.7.1.1.1.15	FSORS
dmsMemoryMgmt	NTCIP 1203 Clause 2.7.1.1.1.16	The DMS shall support the following Memory management Modes: normal and clearChangeableMessages
dmsMultiOtherErrorDescription	NTCIP 1203 Clause 2.4.1.1.1.20	If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error
dmsIllumControl	NTCIP 1203 Clause 2.8.1.1.1.1	The DMS shall support the following illumination control modes: Photocell, and Manual
dmsIllumNumBrightLevels	NTCIP 1203 Clause 2.8.1.1.1.4	Shall be at least 100
dmsIllumLightOutputStatus	NTCIP 1203 Clause 2.8.1.1.1.9	FSORS
numActionTableEntries	NTCIP 1203 Clause 2.9.1.1.1	Shall be at least 200
watcdogFailureCount	NTCIP 1203 Clause 2.11.1.1.1.5	FSORS
dmsStatDoorOpen	NTCIP 1203 Clause 2.11.1.1.1.6	FSORS
fanFailures	NTCIP 1203 Clause 2.11.2.1.1.8	FSORS
fanTestActivation	NTCIP 1203 Clause 2.11.2.1.1.9	FSORS

tempMinCtrlCabinet	NTCIP 1203 Clause 2.11.4.1.1.1	FSORS
tempMaxCtrlCabinet	NTCIP 1203 Clause 2.11.4.1.1.2	FSORS
tempMinSignHousing	NTCIP 1203 Clause 2.11.4.1.1.5	FSORS
tempMaxSignHousing	NTCIP 1203 Clause 2.11.4.1.1.6	FSORS

Table 3: Modified Object Ranges and Required Optional Objects

25.5 Multi Tags

Each NTCIP device shall support the following message formatting MULTI tags. The manufacturer may choose to support additional standard or manufacturer-specific MULTI tags.

MULTI Tag	DESCRIPTION
f1	Field 1-time (12 hr)
f2	Field 1-time (24 hr)
f8	Field 8- day of month
f9	Field 9-month
f10	Field 10-2 digit year
f11	Field 11-4 digit year
fl (and /fl)	Flashing text on a line-by-line basis with flash rates controllable in 0.1-second increments.
Fo	Font
jl2	Justification- line-left
jl3	Justification- line-center
jl4	Justification- line- right
jp2	Justification- page- top
jp3	Justification- page- middle
jp4	Justification- page- bottom
mv	Moving text
nl	New line
np	New page up to 5 instances in a message (i.e. up to 6 pages/frame in a message counting first page)

MULTI Tag	DESCRIPTION
pt	Page times controllable in 0.1-second increments

Table 4: Required MULTI Tags

25.6 Documentation

NTCIP documentation shall be provided on a CD-ROM and will contain ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB modules referenced by the device functionality.

- If the device does not support the full range of any given object within a standard MIB Module, a manufacturer specific version of the official standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module except that it will have the extension “man”.
- A MIB module in ASN.1 format containing any and all manufacturer specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.

- A MIB containing any other objects supported by the device

25.7 Acceptance Testing

The vendor will provide certification of NTCIP-compliance as part of the vendor's pre-build submittal documentation. This certification shall be in the form of a comprehensive test plan and completed test report as performed by either the vendor or a third-party testing agency. The testing shall have been completed using industry accepted test tools such as the NTCIP Exerciser, Trevilon's NTester, Intelligent Devices' Device Tester, and/or Frontline's FTS for NTCIP. Data capture files from the FTS software during the performance of the above testing shall be furnished upon request of the Engineer.

The Engineer can elect to perform additional NTCIP testing if desired. This testing shall be conducted on a production DMS in the vendor's facility during the factory acceptance test. The vendor shall provide a written NTCIP test procedure to the Engineer a minimum of 30 days prior to the NTCIP testing.

25.8 Interpretation Resolution

If the Engineer or DMS manufacturer discovers an ambiguous statement in the standards referenced by this procurement specification, the issue shall be submitted to the NTCIP DMS Working Group for resolution. If the Working Group fails to respond within 90 days, the engineer shall provide an interpretation of the specification for use on the project.

26.0 As-Built Documentation

The Contractor shall provide to the Engineer the following documentation of the complete installed equipment prior to testing. Sufficient documentation shall be provided to reflect "as-built" conditions and to facilitate operation, maintenance, modification and expansion of the system or any of its individual components. Manufacturer supplied documentation which covers the intent of this requirement may be used, subject to the approval of the Engineer.

A. Operator's Manuals: A manual containing a general description and detailed operating and installation instructions shall be provided for each different type or model of equipment. Five copies of the manual shall include the following information:

1. A general description of the equipment including all information necessary to describe the basic use or function of the system components. This shall include a general block diagram presentation of the equipment. Where auxiliary equipment is required, tabular charts shall be included, list such equipment. These charts shall include the nomenclature physical and electrical characteristics and functions of the auxiliary equipment, unless such information is contained elsewhere in an associated manual. In the latter case, a reference shall be made to the location of the information pertaining to the auxiliary equipment.

2. The theory of operation of the system components in a clear, concise manner supported by simplified schematics, logic, data flow diagrams, one-function diagrams, etc. Timing and waveform diagrams and voltage levels shall be shown as required. A logical development shall be used starting with a system block level and proceeding to a circuit analysis. Circuit analysis shall be detailed whenever circuits are not normally found in standard text books. This application of new theoretical concepts shall be fully described. Where the design allows operation in a number of different modes, an operational description of each mode shall be included.
3. In simple, clear language, the routine of operation, from necessary preparations for placing the equipment into operation, to securing the equipment after operation. This section shall contain appropriate illustrations, with the sequence of operations presented in tabular form wherever feasible.
4. The manufacturer's recommended procedures and checks necessary for preventive maintenance. This shall be specified for pre-operation, weekly, monthly, quarterly, semi-annual, annual and "as required" checks as necessary to assure reliable equipment operation. Specification, including tolerances, for all electrical, mechanical, and other applicable measurement, adjustments, or both, shall be listed.
5. Data necessary for isolation and repair of failure or malfunctions, assuming the maintenance technicians to be capable of analytical reasoning using the information provided in the submittal information. Accuracies, limits, and tolerances for all electrical, physical or other applicable measurements shall be described. General instructions shall be included for disassembly, overhaul and reassembly, including shop specifications or performance requirements.
6. Detailed instructions shall be given only where failure to follow special procedures would result in damage to the equipment, improper operation, danger to operating or maintenance personnel. Consumption of excessive person hours, etc. Such instructions and specifications shall be included only for such maintenance as maybe accomplished by specialized technicians and engineers in a modern electromechanical shop. The instructions shall describe special test set-up, components fabrication, the use of special tools, jigs and test equipment.
7. A detailed physical description of size, weight, special mounting requirements, electrical connections, and all other pertinent information necessary for proper installation and use of the equipment shall be provided.
8. The parts list shall contain all information required to describe the characteristics of the individual parts, as required for identification. It shall include a list of all equipment within a group and list all assemblies, sub-assemblies and replacement parts of units. The tabular arrangement shall be an alphanumerical order of the schematic reference symbols and shall give the associated description, manufacturer's name and part number. A table of contents or some other convenient means shall be provided for the purpose of identifying major components, assemblies, etc.

Schematic diagrams shall be complete and accurate as required to supplement the text material and to allow the books to be a self-contained technical information source. Maximum size of these diagrams shall be limited to allow their use in close proximity to the equipment, in the class room, etc., part reference symbols, test voltages, waveforms and other aids to understanding of the circuits function shall be included on the diagrams. Test voltages, waveforms and other aids to understanding of the circuits function may be shown on either simplified schematics or other drawings (as required in the above sections) on theory of operation or maintenance or on the schematic diagrams required for this section. The overall scope of information shall not be less, however, than that stated for the schematic diagrams.

B. Software Manuals

The DMS vendor shall provide manuals and data for the computer software system and components thereof. These shall include the following:

1. Computer programmer's manuals and computer user's manuals (5 copies each). Include manuals for any CPU language used by the Contractor for this project. Include instructions for performing a back-up of all software and message libraries.
2. Two original copies of the computer's operating system manual and compiler and assembly language manuals and an instruction manual for translating source to object code.
3. Manufacturer's documentation (including schematics) for all plug in circuit cards used in the microcomputer chassis.
4. Computer program logic in flow chart form (5 copies).
5. Narrative descriptions of programs and input output formats (5 copies).
6. Two copies of source programs, for master and sign controller software, shall be provided on CD-ROM. An unrestricted license for software use by the Department shall be provided to the Engineer.
7. DMS vendor shall provide the communication protocol used between the DMS master controller and the DMS sign controller for use by the Department without any restrictions.

C. Final Documentation

Final documentation shall reflect all field changes and software modifications and shall be provided before installation. Final documentation shall be approved prior to final system acceptance has begun. This document shall include drawings of conduit layouts, cable diagrams, wiring lists, cabinet layouts, wiring diagrams and schematics for all elements of the communications system. This shall also include detailed drawings identifying by cable type, color-coded function, the routing of all conductors (pairs) in the communications system. Upon completion of the installation, the Contractor shall submit these plans, maps, and/or drawings to reflect an as built condition, incorporating all changes made during installation, such as in pair identification and routing.

27.0 Spare Parts Requirements

The Contractor shall provide additional parts to create two (2) additional character matrixes, two (2) load modules to drive a character module, one (1) LED power supply, and one complete sign controller unit. The cost of additional parts/equipment shall be considered incidental to the price for each DMS.

28.0 DMS Training

Operational and maintenance training for the entire system shall be provided to designated personnel during installation, testing and debugging. This training shall be provided through practical demonstrations and other related technical procedures. Training shall be limited to a maximum of 15 people and shall be provided at a time and location approved by the Engineer. The training shall include, but not be limited to, the following:

1. **Hands-on operation of all sign control hardware**
2. **Explanation of all system commands, their function and usage.**
3. **Insertion of data**
4. **Required preventative maintenance**
5. **Servicing procedures**
6. **System trouble-shooting or problem identification procedures**

A minimum of 24 hours of instruction shall be provided for the operational and maintenance procedures for the system. The DMS vendor shall submit an agenda for the training and one complete set of training materials along with the qualification of proposed instructors to the Engineer for approval at least 30 days before the training is to begin. The Engineer will review material and approve or request changes. After approval, the vendor shall provide a minimum of 5 copies of the training material that will become the property of the Department after training period is over.

The DMS vendor shall record the entire training on DVDs and shall provide the recordings to the Engineer for later use. The training shall be conducted at District One Traffic Systems Center building, after the completion of all system integration tests. The schedule of training sessions shall be established by the DMS vendor, with the approval of the Engineer.

29.0 Warranty

The equipment and parts furnished for the DMS and DMS control system shall be new, of the latest model, fabricated under high quality standards.

Equipment and parts furnished for the DMS shall be warranted by the manufacturer to be free of defects in assembly or fabrication and materials for a minimum of five years from the date of acceptance and shall be warranted for quality of work for twelve months from the date of final acceptance. If component manufacturer's warranties are for a longer period, they shall apply. Any parts or equipment found to be defective during the warranty period shall, upon the concurrence of the defect by the manufacturer, be replaced free of charge.

The Engineer shall be furnished with a certification stating that the equipment, parts and material furnished for the DMS and DMS control system complies with all the provisions of this special provision. If there are any items which do not comply with this special provision, then a list of those exceptions shall be detailed on the certification.

All manufacturer's warranties and guarantees for the dynamic message sign system shall be transferred to the Department on the date of final acceptance.

30.0 Method of Measurement

The DMS Walk-In Access, Full matrix, Color, NTCIP 1203 V3 shall be paid for at the contract unit price as each which cost shall include the cost of furnishing all labor, materials, documentation, warranties, tools and equipment to install, test, and make the location operational with the specified DMS in this pay item.

31.0 Basis of Payment

This work shall be paid for at the contract unit price each for TRUSS MOUNTED LED DYNAMIC MESSAGE SIGN which price shall include furnishing and installing the DMS sign, documentation, warranties, spare parts, training, and diagnostic software as directed by the engineer.

REMOVE AND RELOCATE EXISTING ELECTRICAL SERVICE

Description. This special provision describes the relocation of an existing ComEd power service from an existing street lighting controller to the same street light controller relocated for temporary lighting. (Note the relocation of the existing street light controller is covered under a separate special provision.)

Materials. All materials are to be provided by ComEd. ComEd shall install new conduit as necessary to route service entrance conductors to the new controller location. New termination lugs shall be installed at the end of the service entrance conductors. The existing service entrance conductors may be re-used or replaced at ComEd's discretion.

Installation. Utility coordination shall be according to Article 804.03 of Standard Specifications for Road and Bridge construction, adopted January 1, 2012.**Basis of Payment.** This work will be paid for at the contract lump sum price for REMOVE AND RELOCATE EXISTING ELECTRICAL SERVICE and according to Article 109.05 of Standard Specifications for Road and Bridge Construction, adopted January 1, 2012.

REMOVAL OF UNDERPASS LIGHTING UNIT, NO SALVAGE

Description. This special provision describes the removal of existing underpass lighting units no salvage.

Materials. Not applicable.

Installation. Removal shall be according to Article 842 of Standard Specifications for Road and Bridge Construction, adopted January 1, 2012, as modified for underpass lighting units as follows: removal shall include lamps, luminaires, mounting rings, conduits, and all associated hardware and appurtenances.

Basis of Payment. This work will be paid for according to the contract unit price each for REMOVAL OF UNDERPASS LIGHTING UNIT, NO SALVAGE at the locations indicated on plan and details.

LUMINAIRE, LED
Effective: February 1, 2016

Description.

This work shall consist of furnishing and installing 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 in compliance with ANSI C136.37. LED light source(s) and driver(s) shall be RoHS compliant.

Submittal Requirements.

The Contractor shall submit, for approval, an electronic version of all associated luminaire IES files, AGi32 files and the TM-21 or TM-28 calculator spreadsheet with inputs and reports associated with the project luminaires. The Contractor shall also provide (as a minimum) an electronic (PDF) version of each of the following manufacturer's product data for each type of luminaire:

1. Descriptive literature and catalogue cuts for luminaire, LED driver, and surge protection device.

2. LED drive current, total luminaire input wattage and total luminaire current at the system operating voltage or voltage range and ambient temperature of 25 C.

3. LED efficacy per luminaire expressed in lumens per watt (lpw).

4. Initial delivered lumens at the specified color temperature, drive current, and ambient temperature.

5. Computer photometric calculation reports as specified and in the luminaire performance table.

6. TM-15 BUG rating report.

7. Isofootcandle chart with max candela point and half candela trace indicated.

8. Documentation of manufacturers experience and verification that luminaires were assembled in the U.S.A. as specified.

9. Supporting documentation of compliance with ANSI standards as well as UL listing as specified.

10. Supporting documentation of laboratory accreditations and certifications for specified testing as indicated.

11. Thermal testing documents as specified.

12. IESNA LM-79, LM-80 (or LM-84) and TM-21 (or TM-28) reports as specified.

13. Salt fog test reports and certification as specified.

14. Vibration Characteristics Test Reports and certification as specified.

15. Ingress Protection Test Reports as specified.

16. Written warranty.

A sample luminaire shall be provided upon request of the Engineer. The sample shall be as proposed for the contract and shall be delivered to the District Headquarters.

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.

Finish. Painted or finished 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.

Unless otherwise indicated in the plans, the luminaire color shall be grey.

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.

The housing shall be designed to prevent the accumulation of water, ice, dirt and debris and to ensure maximum heat dissipation.

The effective projected area of the luminaire shall not exceed 1.6 sq. ft.

The total weight of the luminaire(s) and accessories shall not exceed 75 pounds.

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.

Vibration Characteristics. All luminaires shall be vibration tested and pass ANSI C136.31 requirements. Luminaires shall be rated for “3G” peak acceleration. Vibration testing shall be run using the same luminaire in all three axes.

Labels and Decals. All luminaires shall have labels in accordance with ANSI C136.15 for an external label, and ANSI C136.22 for an internal label.

The luminaire shall be Listed for wet locations by a U.S. Occupational Safety Health administration (OSHA) Nationally Recognized Testing Laboratory (NRTL) and shall be in compliance with UL 8750 and UL 1598. It shall be identified as such by the NRTL tag/sticker on the inside of the luminaire.

Hardware. All fasteners shall be stainless steel. Captive screws are required on any components that require maintenance after installation.

Internal Luminaire Electrical Connections. Quick connect/disconnect plugs shall be supplied between the discrete electrical components within the luminaire such as the driver, surge protection device and optical assembly for easy removal. The quick connect/disconnect plugs shall be operable without the use of tools while wearing insulated gloves.

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. Integral driver components shall be mounted in the rear of the luminaire on the inside of a removable door or on a removable mounting pad. Driver wiring shall be connected by means of plugs. Upon unplugging the driver wiring the entire driver assembly shall remove for maintenance. The removable door or pad shall be secure when fastened in place and all individual components shall be secured upon the removable element. Each component shall be readily removable from the removable door or pad for replacement.

The plugs shall be keyed and shall be operable without the use of special tools by insulated, gloved hands

The driver shall tolerate indefinite open and short circuit output conditions without damage.

Ingress Protection. The driver Ingress Protection (IP) rating as defined in the ANSI/IEC 60529 standard shall have an IP66 rating.

Input Voltage. The driver shall be suitable for operation over a range of 120 to 277 volts or 347 to 480 volts as required by the system operating voltage.

Operating Temperature. The driver shall have an operating ambient temperature range of -40ºC to 70ºC.

Driver Life. The driver shall provide a life time of 100,000 hours at 25° C ambient.

Safety/UL. The driver shall be UL Listed under standard UL 1012.

Power Factor. Drivers shall maintain a power factor of 0.9 or higher and total harmonic distortion of less than 20%.

Driver efficiency. Efficiency of the driver is defined by the ratio of output power and input power. The driver shall deliver a maximum efficiency of >90% at maximum load and an efficiency of >85% for the driver operating at 50% power.

Electrical Interference. The driver shall meet the Electromagnetic Compatibility (EMC) requirements per FCC Title 47 Code of Federal Regulations (CFR) Part 15 Class A.

Thermal Fold Back. The driver shall reduce the current to the LED module if the driver is overheating due to abnormal conditions.

Dimming. The driver shall have dimming capability. The driver shall accept a dimming control signal that is compliant with the 0-10V protocol in accordance with ANSI C136.37.

Leakage current. The driver shall comply with safety standards in accordance with IEC 61347-1.

The Surge Protection Device shall be UL 1449 labeled as Type 4 and be an integral part of the luminaire. The SPD shall be compliant with ANSI C136.2-2014 (Draft).

Thermal performance

Thermal Testing shall be provided as defined by ANSI/UL 1598. The luminaire shall start and operate in the ambient temperature range specified in the driver section. The maximum rated case temperature of the driver, LEDs, and other internal components shall not be exceeded when the luminaire is operated in the ambient temperature range specified.

Mechanical design of protruding external surfaces (heat sink fins) shall facilitate hose-down cleaning and discourage debris accumulation. Testing shall be submitted (whenever is available) to show the maximum rated case temperature of the driver, LEDs, and other internal components are not exceeded when the luminaire is operated with the heat sink filled with debris.

LED Optical Assembly

The LED optical assembly shall be a scalable array consisting of discrete LED panels or modules. Each panel or module shall have a minimum IP rating of 66.

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.

Lumen maintenance shall be measured for the LEDs according to LM-80 or for the luminaires according to LM-84. The LM-80 report shall be based on a minimum of 6,000 hours, yet 10,000 hour reports shall be provided for luminaires where those tests have been completed.

The luminaire shall have a BUG rating of Back Light B3 or less, Up Light rating of U0, and a Glare rating of G4 or less unless otherwise indicated in the luminaire performance table.

Lumen Maintenance Projection.

The luminaire shall have long term lumen maintenance documented according to IESNA TM-21 or IESNA TM-28. Ambient temperature shall be 25^0 C.

The submitted calculations shall incorporate the light loss factors as indicated the respective performance tables.

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 two decimal places (i.e. x.xx cd/m2). Uniformity ratios shall also be calculated to two decimal places (i.e. x.xx: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.

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
STREET LIGHTING

GIVEN CONDITIONS

ROADWAY DATA	Pavement Width	48	(ft)
	Number of Lanes	4	
	Median Width	52	(ft)
	I.E.S. Surface Classification	R3	
	Q-Zero Value	.07	
LIGHT POLE DATA	Mounting Height	47.5	(ft)
	Mast Arm Length	15	(ft)
	Pole Set-Back From Edge Of Pavement	17	(ft)
LUMINAIRE DATA	Lumens	22,001 – 36,000	
	BUG Rating	B3 – U0 – G4 (Max)	
	I.E.S. Vertical Distribution	Medium	
	I.E.S. Lateral Distribution	Type II	
	Total Light Loss Factor	0.70	
LAYOUT DATA	Spacing	200	(ft)
	Configuration	Single Sided	
	Luminaire Overhang over EOP	0	(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 acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ROADWAY	Average Luminance, L_{AVE}	1.1	Cd/m^2 (Max)
		0.8	Cd/m^2 (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0	(Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3	(Max)

ROADWAY LIGHTING

GIVEN CONDITIONS

ROADWAY DATA	Pavement Width	16	(ft)
	Number of Lanes	1	
	Median Width	N/A	
	I.E.S. Surface Classification	R3	
	Q-Zero Value	.07	
LIGHT POLE DATA	Mounting Height	47.5	(ft)
	Mast Arm Length	15	(ft)
	Pole Set-Back From Edge Of Pavement	17	(ft)
LUMINAIRE DATA	Lumens	22,001 – 36,000	
	BUG Rating	B3 – U0 – G4 (Max)	
	I.E.S. Vertical Distribution	Medium	
	I.E.S. Lateral Distribution	Type II	
	Total Light Loss Factor	0.70	
LAYOUT DATA	Spacing	180	(ft)
	Configuration	Single Sided	
	Luminaire Overhang over EOP	0	(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 acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ROADWAY LUMINANCE	Average Luminance, L_{AVE}	1.3	Cd/m^2 (Max)
		0.8	Cd/m^2 (Min)
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0	(Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3	(Max)

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
ROADWAY LIGHTING

GIVEN CONDITIONS

ROADWAY DATA	Pavement Width	24 (ft)
	Number of Lanes	2
	Median Width	2 (ft)
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	47.5 (ft)
	Mast Arm Length	6 (ft)
	Pole Set-Back From Edge Of Pavement	8 (ft)
LUMINAIRE DATA	Lumens	22,001 – 36,000
	BUG Rating	B3 – U0 – G4 (Max)
	I.E.S. Vertical Distribution	Medium
	I.E.S. Lateral Distribution	Type II
	Total Light Loss Factor	0.70
LAYOUT DATA	Spacing	240 (ft)
	Configuration	Median Mount
	Luminaire Overhang over EOP	0 (ft)

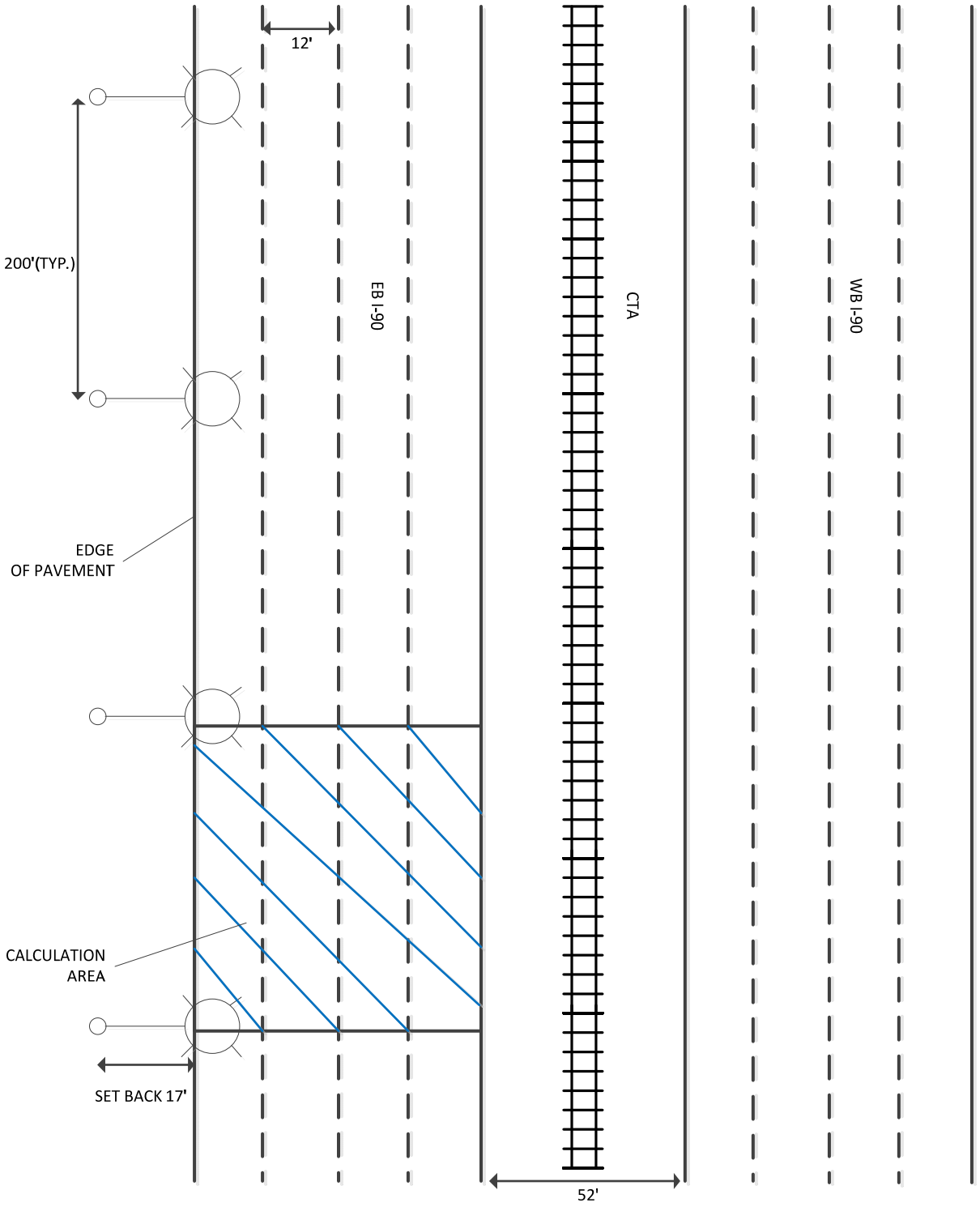
NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS

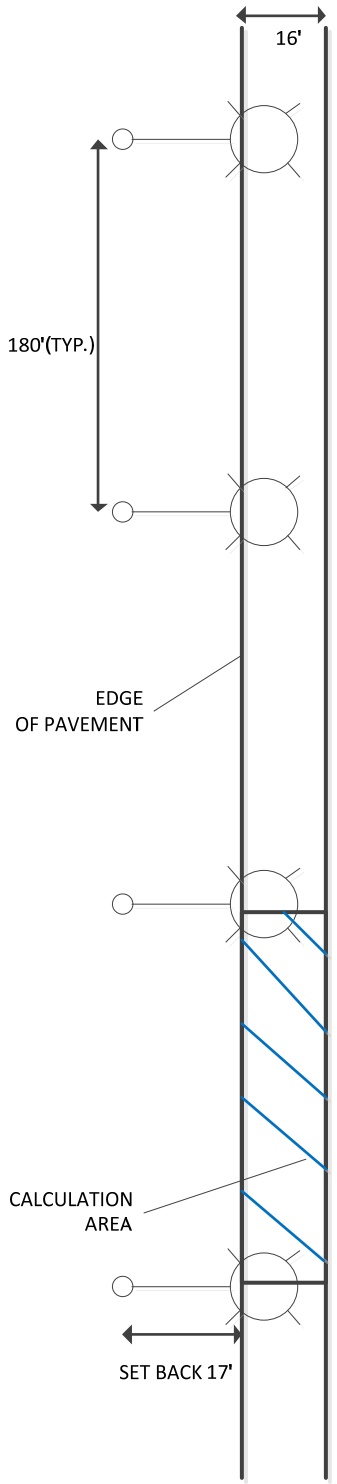
NOTE: These performance requirements shall be the acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ROADWAY	Average Luminance, L_{AVE}	1.2	Cd/m^2 (Max)
		0.8	Cd/m^2 (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0	(Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3	(Max)

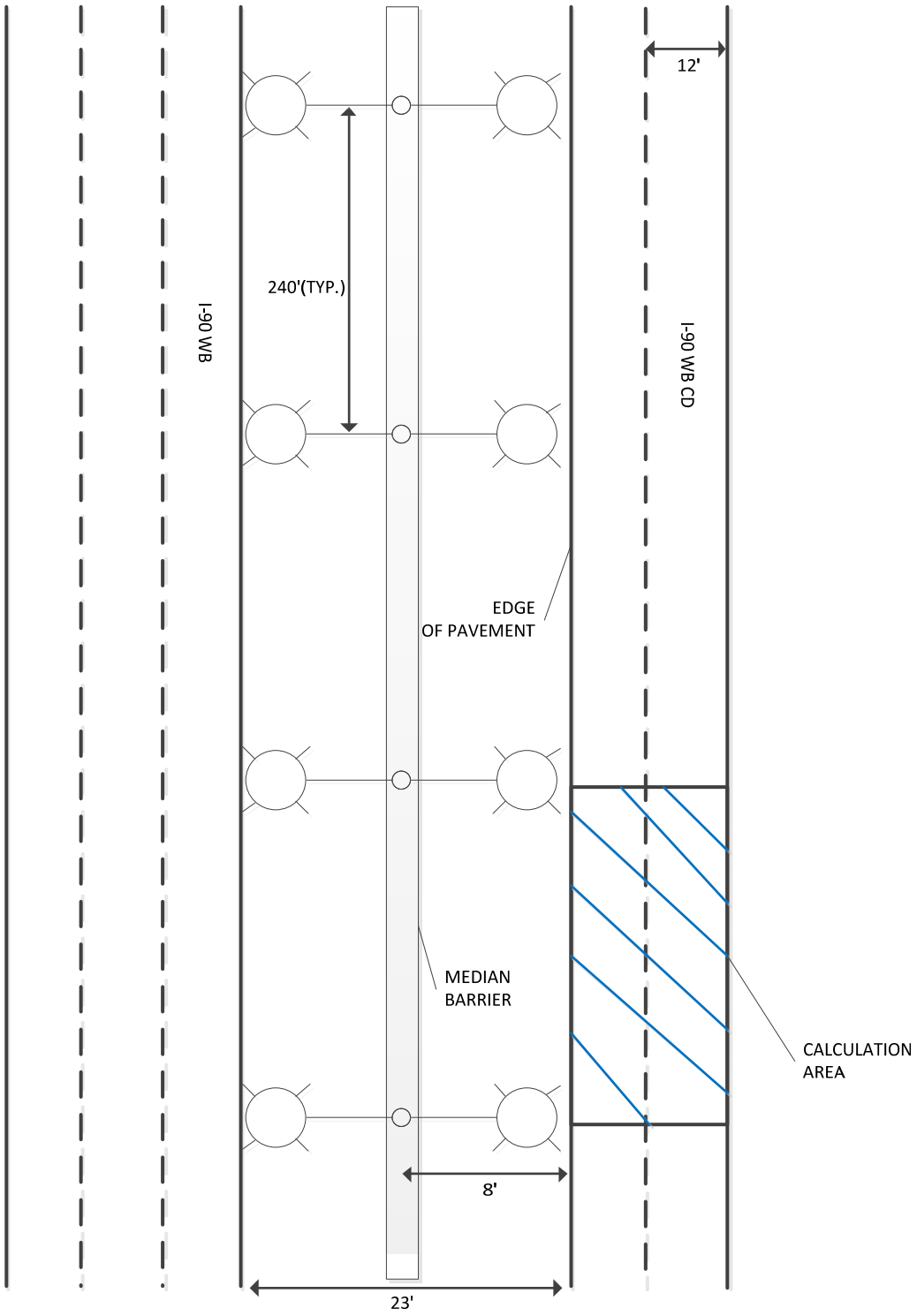
IDOT DISTRICT 1 LUMINAIRE PERFORMANCE DETAIL
I-90 WB Final Lighting – 4 Lanes (Typical Section)



IDOT DISTRICT 1 LUMINAIRE PERFORMANCE DETAIL
I-90 WB Final Lighting – Ramp Lanes (Typical Section)



IDOT DISTRICT 1 LUMINAIRE PERFORMANCE DETAIL
I-90 WB Final Lighting Median Mount – 2 Lanes (Typical Section)



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
1-29	0 (unless otherwise noted)
30-80	2
81-130	3
131-180	4
181-230	5
231-280	6
281-330	7

The Contractor shall coordinate the testing with the contract schedule taking into account 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.

Luminaires shall be tested at a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory approved for each of the required tests. 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 approval.

The testing performed shall include photometric and electrical testing.

Photometric testing shall be according to IES recommendations 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 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.

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 before it is approved. 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. 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 ampere.

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 project final acceptance. A copy of the acceptance letter shall be sent to the luminaire manufacturer and luminaire manufacturer's representative by the Contractor upon final acceptance.

The replacement luminaire shall be of the same manufacturer, model, and photometric distribution as the original.

Method of Measurement.

LED Luminaire classification shall be as follows:

Type	Min Lumens	Max Lumens
A	3,000	12,000
B	12,001	22,000
C	22,001	36,000
D	36,001	50,000

Where delivered lumens is defined as the initial delivered lumens at the specified color temperature.

Note: Luminaires above the stated maximums for the specified type will not be accepted

Basis of Payment.

This work will be paid for at the contract unit price per each for **LUMINAIRE, LED**, **HORIZONTAL MOUNT**, of the **TYPE** indicated.

LUMINAIRE, UNDERPASS, LED
Effective: January 1, 2016

Description.

This work shall consist of furnishing and installing LED underpass 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 in compliance with ANSI C136.37. LED light source(s) and driver(s) shall be RoHS compliant.

Submittal Requirements.

The Contractor shall submit, for approval, an electronic version of all associated luminaire IES files, AGi32 files and the TM-21 or TM-28 calculator spreadsheet with inputs and reports associated with the project luminaires. The Contractor shall also provide (as a minimum) an electronic (PDF) version of each of the following manufacturer's product data for each type of luminaire:

1. Descriptive literature and catalogue cuts for luminaire, LED driver, and surge protection device.

2. LED drive current, total luminaire input wattage and total luminaire current at the system operating voltage or voltage range and ambient temperature of 25 C.

3. LED efficacy per luminaire expressed in lumens per watt (lpw).

4. Initial delivered lumens at the specified color temperature, drive current, and ambient temperature.

5. Computer photometric calculation reports as specified and in the luminaire performance table.

6. TM-15 BUG rating report.

7. Isofootcandle chart with max candela point and half candela trace indicated.

8. Documentation of manufacturers experience and verification that luminaires were assembled in the U.S.A. as specified.

9. Supporting documentation of compliance with ANSI standards as well as UL listing as specified.

10. Supporting documentation of laboratory accreditations and certifications for specified testing as indicated.

11. Thermal testing documents as specified.

12. IESNA LM-79, LM-80 (or LM-84) and TM-21 (or TM-28) reports as specified.

13. Salt fog test reports and certification as specified.

14. Vibration Characteristics Test Reports and certification as specified.

15. Ingress Protection Test Reports as specified.

16. Written warranty.

17. A sample luminaire shall be provided upon request of the Engineer. The sample shall be as proposed for the contract.

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.

Finish.

Cast aluminum housing. Painted or finished 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 stainless steel housing does not need to be painted. The manufacturer may paint the luminaire at no additional cost.

Unless otherwise indicated in the plans, the luminaire color shall be grey.

The housing shall be designed to prevent the accumulation of water, ice, dirt and debris and to ensure maximum heat dissipation.

The total weight of the luminaire(s) and accessories shall not exceed 75 pounds.

A passive cooling method with no moving, rotating parts, or liquids shall be employed for heat management.

Vibration Characteristics. All luminaires shall be vibration tested and pass ANSI C136.31 requirements. Luminaires shall be rated for “3G” peak acceleration. Vibration testing shall be run using the same luminaire in all three axes.

Labels and Decals. All luminaires shall have labels in accordance with ANSI C136.15 for an external label, and ANSI C136.22 for an internal label.

The luminaire shall be Listed for wet locations by a U.S. Occupational Safety Health administration (OSHA) Nationally Recognized Testing Laboratory (NRTL) and shall be in compliance with UL 8750 and UL 1598. It shall be identified as such by the NRTL tag/sticker on the inside of the luminaire.

Hardware. All hardware shall be stainless steel. Captive screws are required on any components that require maintenance after installation.

Internal Luminaire Electrical Connections. Quick connect/disconnect plugs shall be supplied between the discrete electrical components within the luminaire such as the driver, surge protection device and optical assembly for easy removal. The quick connect/disconnect plugs shall be operable without the use of tools while wearing insulated gloves.

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.

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 luminaire shall have an opening in the housing for installation (by others) of a 28.1 mm (3/4 inch) diameter flexible conduit. The location of the opening shall be coordinated with the installation to minimize the length of flexible conduit required.

The mounting brackets shall be fully coordinated with the luminaire mounting method indicated in plans.

Driver.

The driver shall be integral to the luminaire. Integral driver components shall be mounted in the rear of the luminaire on the inside of a removable door or on a removable mounting pad. Driver wiring shall be connected by means of plugs. Upon unplugging the driver wiring the entire driver assembly shall remove for maintenance. The removable door or pad shall be secure when fastened in place and all individual components shall be secured upon the removable element. Each component shall be readily removable from the removable door or pad for replacement.

The plugs shall be keyed and shall be operable without the use of special tools by insulated, gloved hands

The driver shall be installed in a manner to keep it mechanically separated from the LED array heat sink.

The driver shall tolerate indefinite open and short circuit output conditions without damage.

Ingress Protection. The driver Ingress Protection (IP) rating as defined in the ANSI/IEC 60529 standard shall have an IP66 rating.

Input Voltage. The driver shall be suitable for operation over a range of 120 to 277 volts or 347 to 480 volts as required by the system operating voltage.

Operating Temperature. The driver shall have an operating ambient temperature range of -40ºC to 70ºC.

Driver Life. The driver shall provide a life time of 100,000 hours at 25° C ambient.

Safety/UL. The driver shall be UL Listed under standard UL 1012.

Power Factor. Drivers shall maintain a power factor of 0.9 or higher and total harmonic distortion of less than 20%.

Driver efficiency. Efficiency of the driver is defined by the ratio of output power and input power. The driver shall deliver a maximum efficiency of >90% at maximum load and an efficiency of >85% for the driver operating at 50% power.

Electrical Interference. The driver shall meet the Electromagnetic Compatibility (EMC) requirements per FCC Title 47 Code of Federal Regulations (CFR) Part 15 Class A.

Thermal Fold Back. The driver shall reduce the current to the LED module if the driver is overheating due to abnormal conditions.

Dimming. The driver shall have dimming capability. The driver shall accept a dimming control signal that is compliant with the 0-10V protocol.

Leakage current. The driver shall comply with safety standards in accordance with IEC 61347-1.

The Surge Protection Device shall be UL 1449 labeled as Type 4 and be an integral part of the luminaire. The SPD shall be compliant with ANSI C136.2-2014 (Draft).

Thermal performance

Thermal Testing shall be provided as defined by ANSI/UL 1598. The luminaire shall start and operate in the ambient temperature range specified in the driver section. The maximum rated case temperature of the driver, LEDs, and other internal components shall not be exceeded when the luminaire is operated in the ambient temperature range specified.

Mechanical design of protruding external surfaces (heat sink fins) shall facilitate hose-down cleaning and discourage debris accumulation. Testing shall be submitted (whenever is available) to show the maximum rated case temperature of the driver, LEDs, and other internal components are not exceeded when the luminaire is operated with the heat sink filled with debris.

LED Optical Assembly

The LED optical assembly shall be a scalable array consisting of discrete LED panels or modules. Each panel or module shall have a minimum IP rating of 66.

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 must have a clear glass lens over the LED modules. The lens shall be made of tempered crystal clear borosilicate glass. Material other than glass will not be acceptable.

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.

Lumen maintenance shall be measured for the LEDs according to LM-80 or for the luminaires according to LM-84. The LM-80 report shall be based on a minimum of 6,000 hours, yet 10,000 hour reports shall be provided for luminaires where those tests have been completed.

The luminaire shall have a BUG upward rating of U0 and a Glare rating of G4 or less.

Lumen Maintenance Projection.

The luminaire shall have long term lumen maintenance documented according to IESNA TM-21 or IESNA TM-28. Ambient temperature shall be 25^0 C.

The submitted calculations shall incorporate the light loss factors as indicated the respective performance tables.

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 two decimal places (i.e. x.xx cd/m2). Uniformity ratios shall also be calculated to two decimal places (i.e. x.xx: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.

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
CUMBERLAND AVENUE UNDERPASS
ROADWAY LIGHTING

GIVEN CONDITIONS

ROADWAY DATA	Pavement Width	60 (ft)
	Number of Lanes	5
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16.8 (ft)
	Mast Arm Length	0 (ft)
	Pole Set-Back From Edge Of Pavement	2 (ft)
LUMINAIRE DATA	Lumens	6,001 – 9,000
	BUG Rating	B1 – U0 – G4
	I.E.S. Vertical Distribution	Short
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	Type IV
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	65 (ft)
	Configuration	Opposite Side
	Luminaire Overhang over EOP	0 (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 acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ROADWAY	Average Luminance, L_{AVE}	1.5	Cd/m^2 (Max)
		1.2	Cd/m^2 (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0	(Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3	(Max)

ORIOLE AVENUE/CANFIELD AVENUE UNDERPASS
ROADWAY LIGHTING

GIVEN CONDITIONS

ROADWAY DATA	Pavement Width	48 (ft)
	Number of Lanes	4
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16.8 (ft)
	Mast Arm Length	0 (ft)
	Pole Set-Back From Edge Of Pavement	2 (ft)
LUMINAIRE DATA	Lumens	6,001 – 9,000
	BUG Rating	B1 – U0 – G4
	I.E.S. Vertical Distribution	Short
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	Type IV
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	55 (ft)
	Configuration	Opposite Side
	Luminaire Overhang over EOP	0 (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 acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

ROADWAY	Average Luminance, L_{AVE}	1.5	Cd/m^2 (Max)
		1.2	Cd/m^2 (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0	(Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3	(Max)

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
HARLEM CTA STATION UNDERPASS
ROADWAY LIGHTING

GIVEN CONDITIONS

ROADWAY DATA	Pavement Width	36 (ft)
	Number of Lanes	3
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16.8 (ft)
	Mast Arm Length	0 (ft)
	Pole Set-Back From Edge Of Pavement	2 (ft)
LUMINAIRE DATA	Lumens	6,001 – 9,000
	BUG Rating	B1 – U0 – G4
	I.E.S. Vertical Distribution	Short
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	Type IV
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	35 (ft)
	Configuration	Staggered
	Luminaire Overhang over EOP	0 (ft)

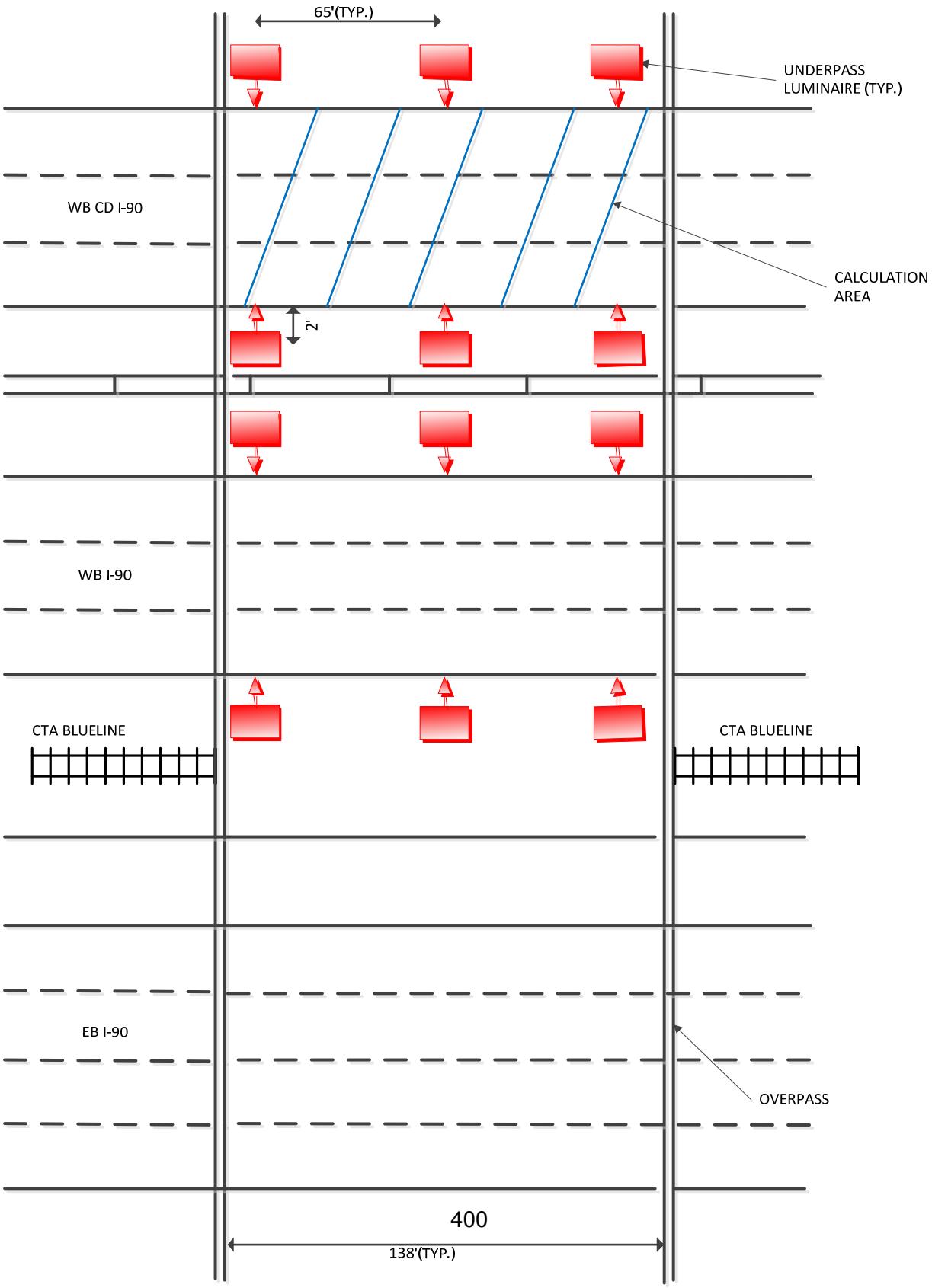
NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

PERFORMANCE REQUIREMENTS

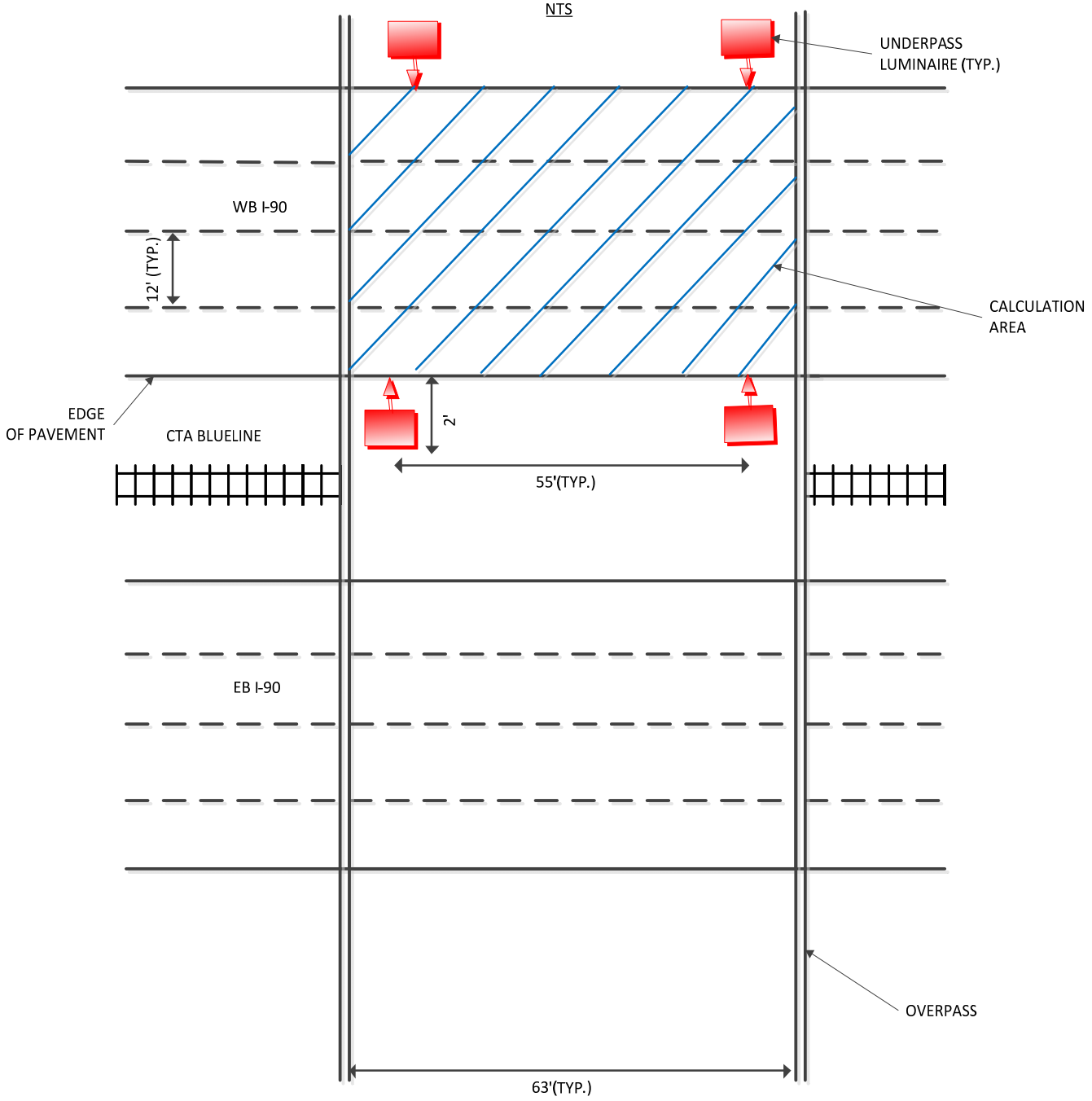
NOTE: These performance requirements shall be the acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

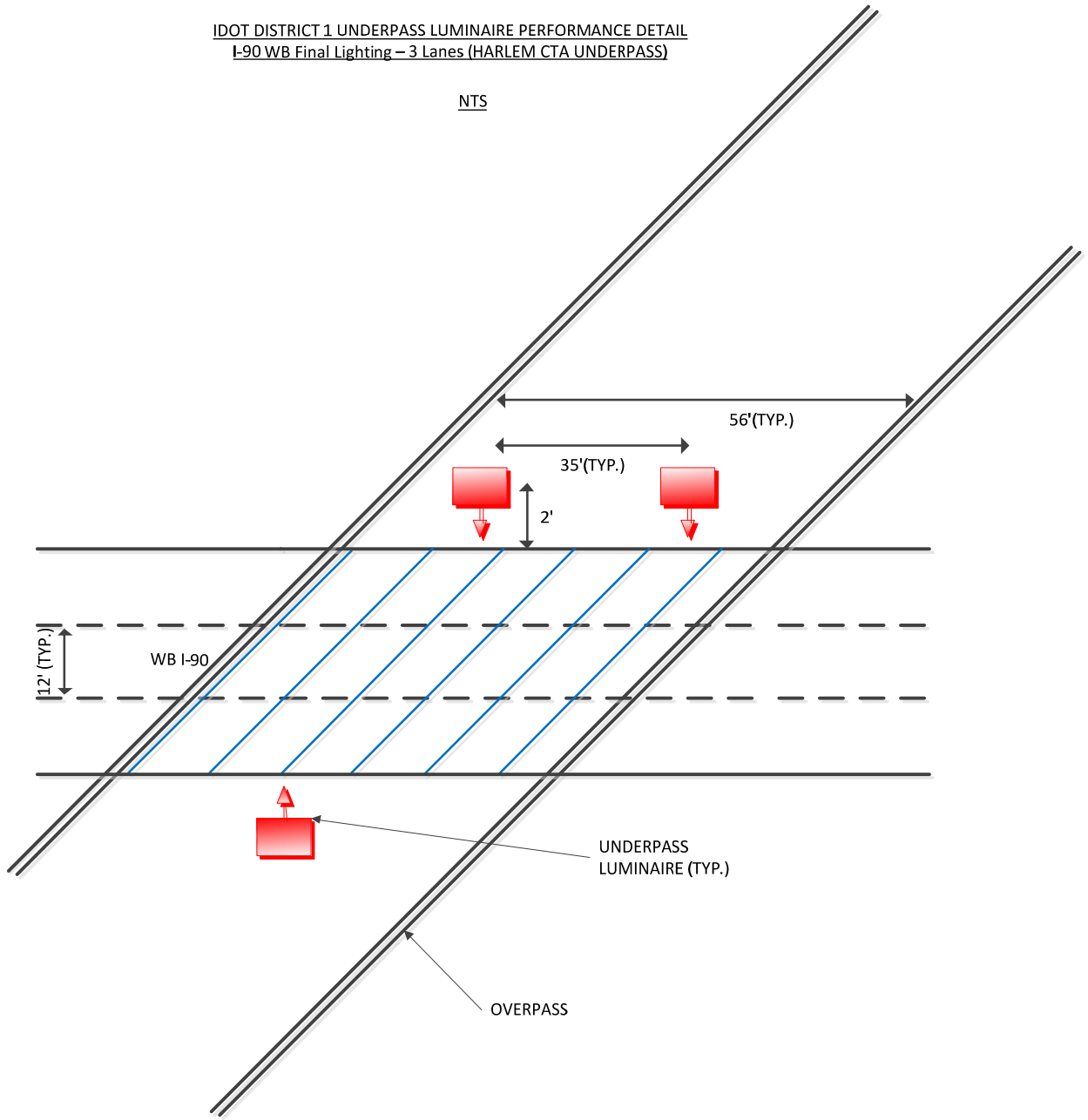
ROADWAY	Average Luminance, L_{AVE}	1.5	Cd/m^2 (Max)
		1.2	Cd/m^2 (Min)
LUMINANCE	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0	(Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0	(Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3	(Max)

IDOT DISTRICT 1 UNDERPASS LUMINAIRE PERFORMANCE DETAIL
I-90 WB Final Lighting – 6 Lanes (HARLEM AVENUE)
NTS



IDOT DISTRICT 1 UNDERPASS LUMINAIRE PERFORMANCE DETAIL
I-90 WB Final Lighting – 4 Lanes (ORIOLE & CANFIELD AVENUE)
NTS





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
1-29	0 (unless otherwise noted)
30-80	2
81-130	3
131-180	4
181-230	5
231-280	6
281-330	7

The Contractor shall coordinate the testing with the contract schedule taking into account 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.

Luminaires shall be tested at a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory approved for each of the required tests. 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 approval.

The testing performed shall include photometric and electrical testing.

Photometric testing shall be according to IES recommendations 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 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.

Luminaires shall be leveled/adjusted before being energized. 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 before it is approved. 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.

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.

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.

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.

The Engineer reserves the right to select the final light distribution pattern, luminaire aiming angle and change it as deemed necessary to produce the proper pavement luminance.

Surface mounted luminaires, all luminaires not mounted on suspension rods, shall have one-inch thick stainless steel spacers installed between the luminaire and the deck or wall.

An aluminum underpass luminaire numbering decal bracket for each underpass luminaire shall be installed as shown on the plan. The bracket shall be large enough to accommodate the identification and shall be mounted on the pier or retaining wall from which the luminaires are electrically fed as directed by the Engineer.

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 project final acceptance. A copy of the acceptance letter shall be sent to the luminaire manufacturer and luminaire manufacturer's representative by the Contractor upon final acceptance.

The replacement luminaire shall be of the same manufacturer, model, and photometric distribution as the original.

Method of Measurement.

LED Luminaire classification shall be as follows:

Type	Min Lumens	Max Lumens
A	3,000	6,000
B	6,001	9,000
C	9,001	12,000

Where delivered lumens is defined as the initial delivered lumens at the specified color temperature. Luminaires above the stated maximums for the specified type will not be accepted

Basis of Payment.

This work will be paid for at the contract unit price per each for **LUMINAIRE, UNDERPASS, LED**, of the **TYPE** indicated.

LUMINAIRE (D-1)
Effective: January 1, 2012

Add the following to first paragraph of Article 1067(c) of the Standard Specifications:

"The reflector shall not be altered by paint or other opaque coatings which would cover or coat the reflecting surface. Control of the light distribution by any method other than the reflecting material and the aforementioned clear protective coating that will alter the reflective properties of the reflecting surface is unacceptable"

Add the following to Article 1067(f) of the Standard Specifications:

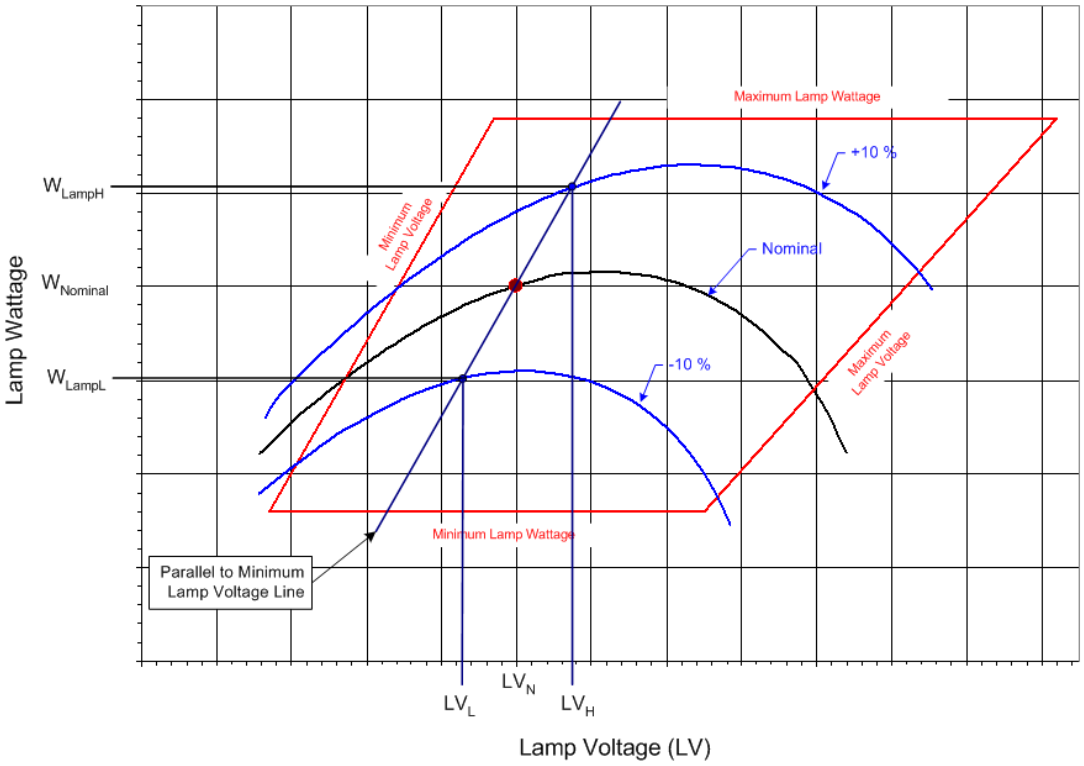
"The ballast shall be a High Pressure Sodium, high power factor, constant wattage auto-regulator, lead type (CWA) for operation on a nominal 240 volt system."

Revise Article 1067(f)(1) of the Standard Specifications to read:

"The high pressure sodium, auto-regulator, lead type (CWA) ballast shall be designed to ANSI Standards and shall be designed and rated for operation on a nominal 240 volt system. The ballast shall provide positive lamp ignition at the input voltage of 216 volts. It shall operate the lamp over a range of input voltages from 216 to 264 volts without damage to the ballast. It shall provide lamp operation within lamp specifications for rated lamp life at input design voltage range. Operating characteristics shall produce output regulation not exceeding the following values:

Nominal Ballast Wattage	Maximum Ballast Regulation
750	25%
400	26%
310	26%
250	26%
150	24%
70	18%

For this measure, regulation shall be defined as the ratio of the lamp watt difference between the upper and lower operating curves to the nominal lamp watts; with the lamp watt difference taken within the ANSI trapezoid at the nominal lamp operating voltage point parallel to the minimum lamp volt line:



$$\text{Ballast Regulation} = \frac{W_{LampH} - W_{LampL}}{W_{LampN}} \times 100$$

where:
W_{LampH} = lamp watts at +10% line voltage when Lamp voltage = LV_H
W_{LampL} = lamp watts at - 10% line voltage when lamp voltage = LV_L
W_{lampN} = lamp watts at nominal lamp operating voltage = LV_N

Wattage	Nominal Lamp Voltage, LV_N	LV_L	LV_H
750	120v	115v	125v
400	100v	95v	105v
310	100v	95v	105v
250	100v	95v	105v
150	55v	50v	60v
70	52v	47v	57v

Ballast losses, based on cold bench tests, shall not exceed the following values:

Nominal Ballast Wattage	Maximum Ballast Losses
750	15%
400	20%
310	21%
250	24%
150	26%
70	34%

Ballast losses shall be calculated based on input watts and lamp watts at nominal system voltage as indicated in the following equation:

$$\text{Ballast Losses} = \frac{W_{Line} - W_{Lamp}}{W_{Lamp}} \times 100$$

where:
W_{line} = line watts at nominal system voltage
W_{lamp} = lamp watts at nominal system voltage

Ballast output to lamp. At nominal system voltage and nominal lamp voltage, the ballast shall deliver lamp wattage with the variation specified in the following table.

Nominal Ballast Wattage	Output to lamp variation
750	± 7.5%
400	± 7.5%
310	± 7.5%
250	± 7.5%
150	± 7.5%
70	± 7.5%

Example: *For a 400w luminaire, the ballast shall deliver 400 watts ±7.5% at a lamp voltage of 100v for the nominal system voltage of 240v which is the range of 370w to 430w.*

Ballast output over lamp life. Over the life of the lamp the ballast shall produce average output wattage of the nominal lamp rating as specified in the following table. Lamp wattage readings shall be taken at 5-volt increments throughout the ballast trapezoid. Reading shall begin at the lamp voltage (L_V) specified in the table and continue at 5 volt increments until the right side of the trapezoid is reached. The lamp wattage values shall then be averaged and shall be within the specified value of the nominal ballast rating. Submittal documents shall include a tabulation of the lamp wattage vs. lamp voltage readings.

Nominal Ballast Wattage	LV Readings begin at	Maximum Wattage Variation
750	110v	± 7.5%
400	90v	± 7.5%
310	90v	± 7.5%
250	90v	± 7.5%
150	50v	± 7.5%
70	45v	± 7.5%

Example: *For a 400w luminaire, the averaged lamp wattage reading shall not exceed the range of ±7.5% which is 370w to 430w*"

Add the following to Article 1067(h) of the Standard Specifications:

"Independent Testing. Independent testing of luminaires shall be required whenever the pay item quantity of luminaires of a given pay item, as indicated on the plans, is 50 or more. For each luminaire type to be so tested, one luminaire plus one luminaire for each 50 luminaires shall be tested. Example: *A plan pay item quantity of 75 luminaires for a specific pay item would dictate that 2 be tested; 135 luminaires would dictate that three be tested*." If the luminaire performance table is missing from the contract documents, the luminaire(s) shall be tested and the test results shall be evaluated against the manufacturer's data as provided in the approved material submittal. The test luminaire(s) results shall be equal to or better than the published data. If the test results indicated performance not meeting the published data, the test luminaire will be designated as failed and corrective action as described herein shall be performed.

The Contractor shall be responsible for all costs associated with the specified testing, including but not limited to shipping, travel and lodging costs as well as the costs of the tests themselves, all as part of the bid unit price for this item. Travel, lodging and other associated costs for travel by the Engineer shall be direct-billed to or shall be pre-paid by the Contractor, requiring no direct reimbursement to the Engineer or the independent witness, as applicable"

The Contractor shall select one of the following options for the required testing with the Engineer's approval:

a. Engineer Factory Selection for Independent Lab: The Contractor may select this option if the luminaire manufacturing facility is within the state of Illinois. The Contractor shall propose an independent test laboratory for approval by the Engineer. The selected luminaires shall be marked by the Engineer and shipped to the independent laboratory for tests.

b. Engineer Witness of Independent Lab Test: The Contractor may select this option if the independent testing laboratory is within the state of Illinois. The Engineer shall select, from the project luminaires at the manufacturer's facility or at the Contractor's storage facility, luminaires for testing by the independent laboratory.

c. Independent Witness of Manufacturer Testing: The independent witness shall select from the project luminaires at the manufacturers facility or at the Contractor's storage facility, the luminaires for testing. The Contractor shall propose a qualified independent agent, familiar with the luminaire requirements and test procedures, for approval by the Engineer, to witness the required tests as performed by the luminaire manufacturer.

   The independent witness shall as a minimum meet the following requirements:

   - Have been involved with roadway lighting design for at least 15 years.
   - Not have been the employee of a luminaire or ballast manufacturer within the last 5 years.
   - Not associated in any way (plan preparation, construction or supply) with the particular project being tested.
   - Be a member of IESNA in good standing.
   - Provide a list of professional references.

   This list is not an all-inclusive list and the Engineer will make the final determination as to the acceptability of the proposed independent witness.

d. Engineer Factory Selection and Witness of Manufacturer Testing: The Contractor may select this option if the luminaire manufacturing facility is within the state of Illinois. At the Manufacturer's facility, the Engineer shall select the luminaires to be tested and shall be present during the testing process. The Contractor shall schedule travel by the Engineer to and from the Manufacturer's laboratory to witness the performance of the required tests.

Should any of the tested luminaires fail to satisfy the specifications and perform according to approved submittal information, the luminaire 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 corrections made 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. The number of luminaires to be tested shall be the same quantity as originally tested; i.e. if three luminaires were tested originally, one, two or three failed, another three must be tested after corrective action is taken.

Revise Article 1067.06(a)(1) of the Standard Specifications to read:

"The lamps shall be of the clear type and shall have a color of 1900° to 2200° Kelvin."

Add the following table(s) to Article 1067 of the Standard Specifications:

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
I-90 EB Lighting – 7 Lanes

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	See Sketch
	Number of Lanes	See Sketch
	Median Width	See Sketch
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	120 (ft)
	Mast Arm Length	6 (ft)
	Pole Set-Back From Edge of Pavement	See Sketch
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	50000
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	See Sketch
	Configuration	Single Sided
	Luminaire Overhang over edge of pavement	0 (ft)

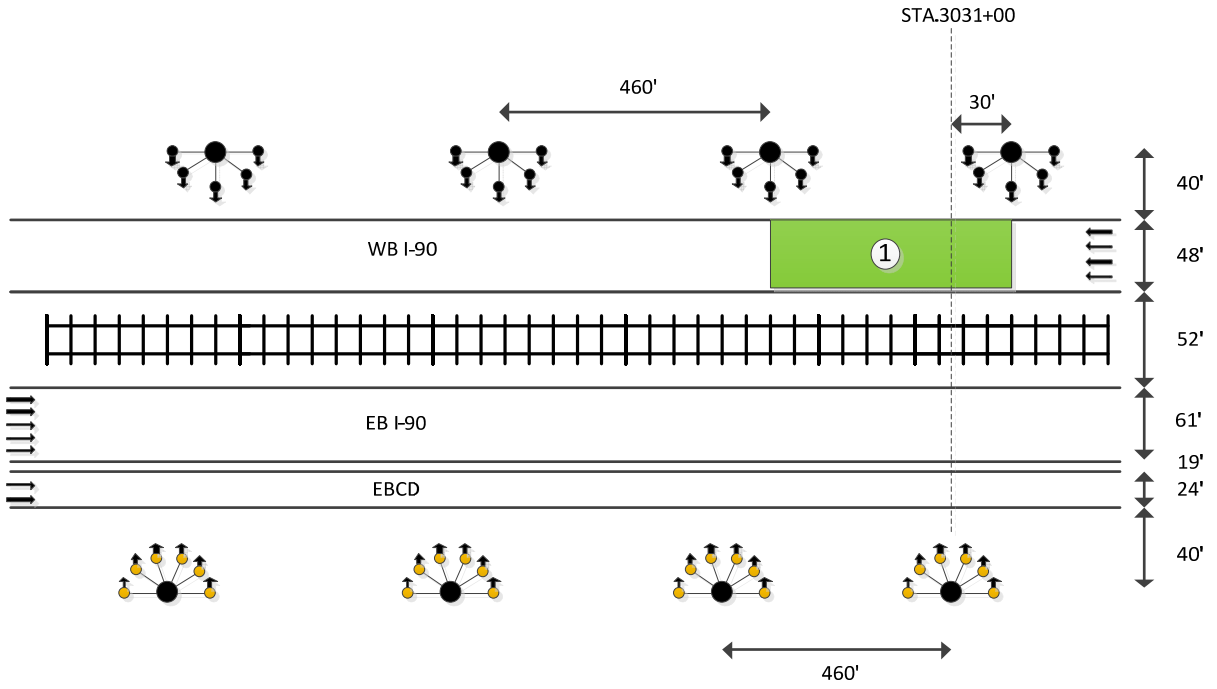
NOTE: Variations from the above specified I.E.S. distribution pattern may be requested and acceptance of variations will be subject to review by the Engineer based on how well the performance requirements are met.

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.

LUMINANCE	Average Luminance, L_{AVE}	0.8 Cd/m^2
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0 (Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0 (Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3 (Max)

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE DETAIL
I-90 EB Lighting – 7 lanes



Cumberland Ave to I-190/I-90 Interchange

EXISTING LIGHT TOWER WITH MC-III, (6)400W HPS, CUT OFF, 120' MH, 6FT MA, 50,000 LUMENS

1 PHOTOMETRIC CALCULATION GRID & ID

PROPOSED LIGHT TOWER WITH MC-III, (6)400W HPS, CUT OFF, 120' MH, 6FT MA, 50,000 LUMENS

UNDERPASS LUMINAIRE, HPS, STAINLESS STEEL HOUSING (D-1)
Effective: January 1, 2007 Revised: January 1, 2012

1. **Description.** This item shall consist of furnishing, testing as required, and installing a luminaire suitable for roadway underpasses as specified herein.

2. **General.**

2.1 The luminaire shall be optically sealed, mechanically strong and easy to maintain.

2.2 All wiring within the fixture shall have a minimum temperature rating of 125º C. In addition, the unit shall be designed to allow for a maximum supply wire rating of 90º C.

2.3 All hardware of the housing, reflector, and ballast assembly shall be captive

2.4 The luminaire shall be UL Listed for Wet Locations.

2.5 The underpass luminaire shall be suitable for lighting a roadway underpass at approximate mounting height of 16 feet from a position suspended directly above the roadway.

2.6 The luminaire shall be certified by the U.L. testing laboratory to meet the IP66 criteria of the International Electro technical Commission Standard 529.

3. **Housing.**

3.1 The housing shall be stainless steel and be made of 16 gauge minimum thickness stainless steel, Type 304, #2B finish.

3.2 Since the installed location of the luminaires has severe space limitations that prohibit servicing the luminaire from the top or side of the fixture, the luminaire must be serviceable from the bottom of the housing when in the installed position. Both ballast and optical compartments must be serviceable from the bottom of the fixture. Fixtures which open from the top or sides are not acceptable.

3.3 The housing shall have a maximum width of 13”

3.4 All internal and external hardware, unless specifically specified otherwise, shall be made of stainless steel.

3.5 Stainless Steel Housing

3.5.1 The stainless steel housing, and lens frame shall be made of 16 gauge minimum thickness stainless steel, Type 304 #2B.

3.5.2 All housing and frame components shall be cut within with a laser with a positioning accuracy of +/- .004" for assembly accuracy and machine welded to minimize irregularities in the weld joint.

3.5.3 All seams in the housing enclosure shall be welded by continuous welding. Stainless steel weld wire shall be used for all welds. A sample weld shall be submitted for review and approval.

3.5.4 The luminaire lens shall be flush, within 3.1 mm (0.122"), of the lens frame.

3.5.5 The lens frame shall be flat and the frame and luminaire housing shall not have any protruding flanges.

3.5.6 The lens frame assembly shall consist of a one-piece 16 gauge 304 stainless steel external frame with the lens facing toward the housing and a 16 gauge 304 stainless internal frame with the legs facing away from the housing. The internal frame shall have seam welded corners for added strength. The two panels will sandwich the glass lens and be fastened together with the use of no less than 10 #10 stainless steel fasteners.

3.5.7 The lens frame and the door frame shall each be secured through the use of two stainless steel draw latches secured to the fixture housing.

3.5.8 When in open position, it shall be possible to un-hinge and remove the lens frame for maintenance. The lens frame hinge shall be stainless steel and designed so that there must be a conscious action of the maintenance personnel to remove the lens frame. The frame hinging method shall not be designed so that bumping the frame accidentally could allow the frame to fall to the roadway surface. The removal method must be accomplished without the use of tools or hardware. The hinge pin shall be a minimum of 6.35 mm (0.250") in diameter. The pin shall be spring loaded and retractable with a safety catch to hold the pin in the retracted position for ease of maintenance.

3.5.9 The suspended housing shall be divided into two compartments, one for the ballast and optical assembly, the other for wire connections. The optical chamber shall be sealed from the environment. The wire portal between compartments shall be sealed so as to prevent air exchange through the portal. There shall be an internally mounted breather mechanism to allow internal and external air pressure to equalize without permitting dust or water into the unit.

3.5.10 The ballast and all electrical equipment shall be mounted to a removable aluminum chassis with a minimum thickness of 3.175, (0.125”). The chassis shall be held in place with captive stainless steel hardware. The hardware shall include a bracket that can be loosened and shifted to allow the chassis to pivot away from fastened position for removal. The splice box shall include a heavy-duty 3 pole terminal block to accommodate #6 conductors and a KTK 2 amp fuse with HPC fuse holder or approved equal. Quick-connect power distribution terminal blocks shall be a molded thermoset plastic, rated 70A, 600V and hove 3 poles, each with (4) .250 quick connect terminals. Operating temperature rating to be 150º C. Input wire size shall accommodate #2-#14 AWG. Torque rating shall be 45 in./lb. Maximum. Agency approvals shall be UL E62622; CSA LR15364.

3.5.11 Ballast compartment surfaces shall be deburred and free of sharp edges, points or corners that may come in contact with installers or service personnel.

4. **Gasketing:**

4.1 The junction between the lens frame and the ballast housing door and the housing shall be sealed with a one-piece vulcanized or molded high temperature solid silicone rubber gasket with the equivalent of a 60 Shore A durometer rating. The gasket between the lens frame and the luminaire housing shall be securely attached by mechanical means, such a retaining lip to prevent the movement of the gasket. The gasket may not be secured by adhesive means exclusively. The lens and ballast housing doors shall be designed and constructed so they seal to the gasket on a flat surface. The frame shall not seal to the gasket using the edge of leg on a doorframe. The lens shall be sealed inside of the lens frame with the use of a one-piece solid silicone rubber gasket with ribbed flanges and a rating of 60 Shore A Durometer

4.2 The junction between conduit connections to the luminaire and the lens frame junction to the housing shall withstand entry of water when subjected to a water jet pressure of 207 kPa (30 lbs. Per sq. inch), tested under laboratory conditions. Submittal information shall include data relative to gasket thickness and density and the means of securing it in place.

5. **Mounting Brackets**

5.1 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.

5.2 The luminaire shall have an opening in the housing for installation (by others) of a 28.1 mm (3/4 inch) diameter flexible conduit. The location of the opening will be determined by the Engineer during the shop drawing review.

6. **Lamp Socket:**

6.1 The lamp socket shall be a 4KV pulse rated mogul type, porcelain glazed enclosed, and be provided with grips, or other suitable means to hold the lamp against vibration. The rating of the socket shall exceed the lamp starting voltage, or starting pulse voltage rating.

6.2 If the lamp socket is of the sealed removable type, proper alignment of the socket shall be provided and molded into the socket assembly and indicated in a contrasting color.

6.3 If the lamp socket is adjustable, the factory setting must be indicated legibly in the luminaire housing.

7. **ANSI Identification Decal:**

A decal, complying to ANSI standard C136-15 for luminaire wattage and distribution type, shall be factory attached permanently to the luminaire. The information contained in the decal shall enable a viewer, from the ground level, to identify the lamp wattage and type of luminaire distribution.

8. **Optical Assembly:**

8.1 Lens and Lens Frame. The lens shall be made of crystal clear, impact and heat resistant tempered glass a minimum of 6.35 mm (0.25”) thick. The lens shall be held in such a manner as to allow for its expansion and contraction, due to temperature variation. The lens shall be a flat glass design.

8.2 Reflectror:

8.2.1 The reflector shall be hydro formed aluminum, 0.063” thick, bright-dip and clear anodized finish.

8.2.2 The reflector shall be secured with a stainless steel aircraft cable during maintenance operations.

8.2.3 If the reflector has multiple light distribution positions, each position must have positive stop/mounting with the original factory distribution identified.

8.2.4 The luminaire shall be photometrically efficient. Luminaire efficiency, defined by the I.E.S. as "the ratio or luminous flux (lumens) emitted by a luminaire to that emitted by the lamp or lamps used within", shall not be less than 67%. Submittal information shall include published efficiency data.

8.2.5 The reflector, the refractor or lens, and the entire optical assembly shall not develop any discoloration over the normal life span of the luminaire.

1.2.6 The reflector shall not be altered by paint or other opaque coatings which would cover or coat the reflecting surface. Control of the light distribution by any method other than the reflecting material and the aforementioned clear protective coating that will alter the reflective properties of the reflecting surface is unacceptable

9. **Ballast:**

9.1 The ballast shall be a High Pressure Sodium, high power factor, lead type, Isolated Regulator Ballast (CWI) or a Constant Wattage Auto-regulator (CWA), for operation on a nominal 240 volt system.

9.2 The ballast shall be designed to furnish proper electrical characteristics for starting and operating a high pressure sodium vapor lamp of the specified rating at ambient temperatures of -29 degrees to +40 degrees C. The ballast windings shall be adequately impregnated and treated for protection against the entrance of moisture, insulated with Class H insulation, and able to withstand the NEMA standard dielectric test.

9.3 The ballast shall include an electronic starting assembly. The starter assembly shall be comprised of solid state devices capable of withstanding ambient temperatures of 85 degrees C. The starter shall provide timed pulsing with sufficient follow-through current to completely ionize and start all lamps. Minimum amplitude of the pulse shall be 2,500 volts, with a width of one (1) microsecond at 2,250 volts, and shall be applied within 20 electrical degrees of the peak of the open circuit voltage wave with a repetition rate as recommended by the lamp manufacturer for the 60 cycle wave. The lamp peak pulse current shall be a minimum of 0.2 amperes. Proper ignition shall be provided over a range of input voltage from 216 to 264 volts. The starter component shall be field replaceable and completely interchangeable with no adjustment necessary for proper operation. The starter component shall have push-on type electrical terminations to provide good electrical and mechanical integrity and ease of replacement. Terminal configuration shall preclude improper insertion of plug-in components. The starter circuit board shall be treated in an approved manner to provide a water and contaminant-resistant coating.

9.4 The ballast shall have an overall power factor of at least 0.9 when operated under rated lamp load.

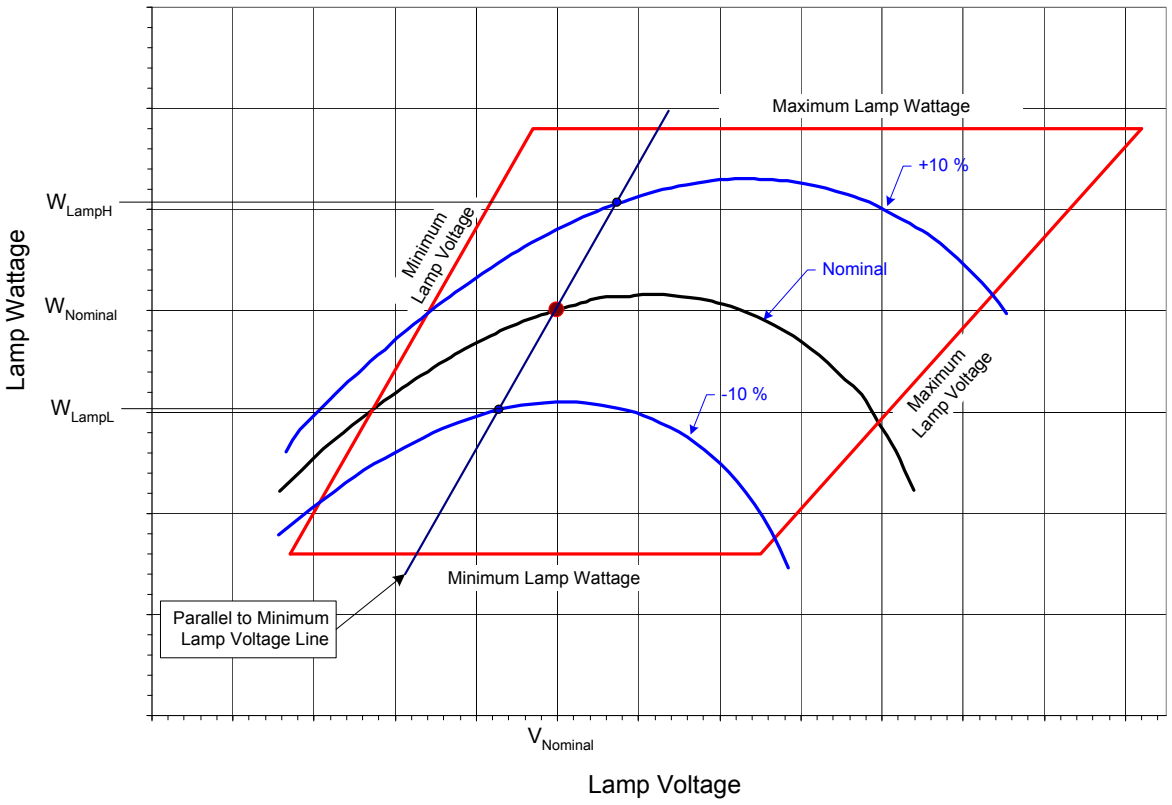
9.5 The ballast shall withstand a 2,500 volt dielectric test between the core and windings without damage to the insulation.

9.6 The ballast shall not subject the lamp to a crest factor exceeding 1.8 and shall operate the lamp without affecting adversely the lamp life and performance.

9.7 The ballast shall be designed to ANSI Standards and shall be designed and rated for operation on a nominal 240 volt system. The ballast shall provide positive lamp ignition at the input voltage of 216 volts. It shall operate the lamp over a range of input voltages from 216 to 264 volts without damage to the ballast. It shall provide lamp operation within lamp specifications for rated lamp life at input design voltage range. Operating characteristics shall produce output regulation not exceeding the following values:

Nominal Ballast Wattage	Maximum Ballast Regulation
400	25%
310	26%
250	22%
150	22%
70	17%

For this measure, regulation shall be defined as the ratio of the lamp watt difference between the upper and lower operating curves to the nominal lamp watts; with the lamp watt difference taken within the ANSI trapezoid at the nominal lamp operating voltage point parallel to the minimum lamp volt line:



$$\text{Ballast Regulation} = \frac{W_{LampH} - W_{LampL}}{W_{LampN}} \times 100$$

where:
W_{LampH} = lamp watts at +10% line voltage (264v)
W_{LampL} = lamp watts at - 10% line voltage (216v)
W_{lampN} = lamp watts at 240v”

9.8 Ballast losses, based on cold bench tests, shall not exceed the following values:

Nominal Ballast Wattage	Maximum Ballast Losses
400	16.0%
310	19.0%
250	17.5%
150	26.0%
70	34.0%

Ballast losses shall be calculated based on input watts and lamp watts at nominal system voltage as indicated in the following equation:

$$\text{Ballast Losses} = \frac{W_{Line} - W_{Lamp}}{W_{Lamp}} \times 100$$

where:
W_{line} = line watts at 240v
W_{lamp} = lamp watts at 240v

9.9 Ballast output to lamp. At nominal system voltage and a lamp voltage of 52v, the ballast shall deliver a lamp wattage within ±4% of the nominal lamp wattage. For a 70w luminaire, the ballast shall deliver 70 watts ±4% at a lamp voltage of 52v for the nominal system voltage of 240v.

9.10 Ballast output over lamp life. Over the life of the lamp the ballast shall produce an average of the nominal lamp rating ±5%. Lamp wattage readings shall be taken at 5-volt increments throughout the ballast trapezoid. The lamp wattage values shall then be averaged within the trapezoid and shall be within ±5% of the nominal ballast rating. Submittal documents shall include a tabulation of the lamp wattage vs. lamp voltage readings.

9.11 The ballast shall be integral to the luminaire. The ballast components shall be mounted on a removable door or on a removable mounting tray. The ballast tray or mounting door shall be manufactured with dissimilar metal conflicts kept to a minimum.

9.12 Ballast wiring and lamp socket wiring shall be connected by means of keyed plugs. Upon unplugging the ballast wiring the entire ballast assembly shall removable for maintenance. The plugs shall not be interchangeable to avoid improper connection of the assemblies.

9.13 The mounting adjustments and wiring terminals shall be readily accessible. The removable door or pad shall be secure when fastened in place and all individual components shall be secure upon the removable element. Upon ballast assembly removal, each component shall be readily removable for replacement.

9.14 The luminaire shall be completely wired. All wiring connections within the luminaire shall be made with insulated compression connectors or insulated terminal blocks. An insulated terminal block shall be provided to terminate the incoming supply wires. The terminal block shall be rated for 600 volts and shall accommodate wire sizes from #10 to #6 AWG. The use of “wire nuts” is unacceptable. A ground terminal shall be provided for the connection of a ground wire.

9.15 Ballast and lamp Leads shall not be smaller than #16 AWG conductors rated at a minimum temperature rating of 90º C.

9.16 All wires shall be coded by tagging and/or color coding for proper identification. A complete legible permanently attached wiring diagram (no smaller than 3” x 4” with a min. font size of 8 pts.) coordinated with the wire identifications shall be displayed at the convenient location on the interior of the luminaire. The wiring diagram shall be oriented so that it is right side up and readable when the luminaire is in the installed position.

9.17 The ballast shall not be excessively noisy. Noticeable noisy ballasts, as determined by the Engineer, shall be replaced at no additional cost to the State.

9.18 The ballast shall provide lamp operation within lamp specifications for the rated lamp life at the input design voltage range. It shall have a 6 month operation capability with a cycling lamp.

9.19 Submittal information shall include manufacturer's literature and date to confirm compliance with all specified requirements including an ANSI Standard Ballast Characteristic Graph (Trapezoid) diagram, with all items clearly identified.

10. **Photometric Performance:**

10.1 The luminaire photometric performance shall produce results equal to or better than those listed in the included Luminaire Performance Table. Submittal information shall include computer calculations based on the controlling given conditions which demonstrate achievement of all listed performance requirements. The computer calculations shall be done according to I.E.S. recommendations and the submitted calculations shall include point-by-point illuminance, luminance and veiling luminance as well as listings of all indicated averages and ratios as applicable. Calculations shall be performed with AGI32. The program used to perform the calculations shall be identified on the submittal. The submittal data shall also include all photometric calculations files with the proposed photometric data on a CD ROM. The performance requirements shall define the minimum number of decimal places used in the calculations. Rounding of calculations shall not be allowed.

10.2 In addition to computer printouts of photometric performance, submittal information shall include: Descriptive literature; an Isofootcandle chart of horizontal lux (footcandles); Utilization curve; Isocandela diagram; Luminaire classification per ANSI designation; Candlepower values at every 2.5 degree intervals; Candlepower tables are to be provided on CD ROM in the IES format as specified in IES publication LM-63.

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
EAST RIVER ROAD UNDERPASS – 2 Lanes

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	24 (ft)
	Number of Lanes	2
	Median Width	n/a
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16 (ft)
	Mast Arm Length	n/a
	Pole Set-Back From Edge of Pavement	2 (ft)
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	30 (ft)
	Configuration	Single Sided
	Luminaire Overhang over edge of pavement	0 (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.

LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m^2
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0 (Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0 (Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3 (Max)

IDOT DISTRICT 1 LUMINAIRE PERFORMANCE TABLE
EAST RIVER ROAD UNDERPASS – 3 Lanes

GIVEN CONDITIONS		
ROADWAY DATA	Pavement Width	36 (ft)
	Number of Lanes	3
	Median Width	n/a
	I.E.S. Surface Classification	R3
	Q-Zero Value	.07
LIGHT POLE DATA	Mounting Height	16 (ft)
	Mast Arm Length	n/a
	Pole Set-Back From Edge of Pavement	2 (ft)
LUMINAIRE DATA	Lamp Type	HPS
	Lamp Lumens	6300
	I.E.S. Vertical Distribution	Medium
	I.E.S. Control Of Distribution	Cutoff
	I.E.S. Lateral Distribution	III
	Total Light Loss Factor	0.7
LAYOUT DATA	Spacing	45 (ft)
	Configuration	Opposite side
	Luminaire Overhang over edge of pavement	0 (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		
LUMINANCE	Average Luminance, L_{AVE}	1.2 Cd/m^2
	Uniformity Ratio, L_{AVE}/L_{MIN}	3.0 (Max)
	Uniformity Ratio, L_{MAX}/L_{MIN}	5.0 (Max)
	Veiling Luminance Ratio, L_V/L_{AVE}	0.3 (Max)

NOTE: These performance requirements shall be the minimum acceptable standards of photometric performance for the luminaire, based on the given conditions listed above.

11. Independent Testing:

11.1 Independent testing of luminaires shall be required whenever the quantity of luminaires of a given wattage and distribution, as indicated on the plans, is 50 or more. For each luminaire type to be so tested, one luminaire plus one luminaire for each 50 luminaires shall be tested. Example: *A plan quantity of 75 luminaires would dictate that 2 to be tested; 135 luminaires would dictate that three be tested*.

11.2 The Contractor shall be responsible for all costs associated with the specified testing, including but not limited to shipping, travel and lodging costs as well as the costs of the tests themselves, all as part of the bid unit price for this item. Travel, lodging and other associated costs for travel by the Engineer shall be direct-billed to or shall be pre-paid by the Contractor, requiring no direct reimbursement to the Engineer or the independent witness, as applicable.

11.3 Commitment to test. The Vendor shall select one of the following options for the required testing with the Engineer's approval:

a. Engineer Factory Selection for Independent Lab: The Contractor may select this option if the luminaire manufacturing facility is within the state of Illinois. The Contractor shall propose an independent test laboratory for approval by the Engineer. The selected luminaires shall be marked by the Engineer and shipped to the independent laboratory for tests.

b. Engineer Witness of Independent Lab Test: The Contractor may select this option if the independent testing laboratory is within the state of Illinois. The Engineer shall select, from the project luminaires at the manufacturer’s facility or at the Contractor's storage facility, luminaires for testing by the independent laboratory.

c. Independent Witness of Manufacturer Testing: The independent witness shall select from the project luminaires at the manufacturer's facility or at the Contractor's storage facility, the luminaires for testing. The Contractor shall propose a qualified independent agent, familiar with the luminaire requirements and test procedures, for approval by the Engineer, to witness the required tests as performed by the luminaire manufacturer. The independent witness shall:

- Have been involved with roadway lighting design for at least 15 years.
- Not have been the employee of a luminaire or ballast manufacturer within the last 5 years.
- Be a member of IESNA in good standing.
- Provide a list of professional references.

d. Engineer Factory Selection and Witness of Manufacturer Testing: The Contractor may select this option if the manufacturing facility is within the state of Illinois. At the manufacturer's facility, the Engineer shall select the luminaires to be tested and shall be present during the testing process. The Contractor shall schedule travel by the Engineer to and from the Manufacturer's laboratory to witness the performance of the required tests.

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. The selection of the testing option shall be presented with the information submitted for approval. The proposed independent laboratory or independent witness shall be included with that information. The selection of the testing option shall be presented with the information submitted for approval. The proposed independent laboratory or independent witness shall be included with that information.

11.4 The testing performed shall include photometric, electrical, heat and water jet testing.

11.5 Photometric testing shall be in accordance with IES recommendations except that the selected luminaire(s) shall be tested as manufactured without any disassembly or modification and, as a minimum shall yield an isofootcandle chart, with max candela point and half candela trace indicated, an isocandela diagram, maximum plane and cone plots of candela, a candlepower table (house and street side), a coefficient of utilization chart, a luminous flux distribution table, and complete calculations based on specified requirements and tests.

11.6 Electrical testing shall conform to NEMA and ANSI standards and as a minimum, shall yield a complete check of wiring connections, a ballast dielectric test, total ballast losses in watts and percent of input, a lamp volt-watt trace, regulation data, a starter test, lamp current crest factor, power factor (minimum over the design range of input voltage at nominal lamp voltage) and, a table of ballast characteristics showing input amperes, watts and power factor, output volts, amperes, watts and lamp crest factor as well as ballast losses over the range of values required to produce the lamp volt-watt trace. Ballast test data shall also be provided in an electronic format acceptable to the Engineer to demonstrate compliance with sections 9.7, 9.8, 9.9 and 9.10.

11.7 Heat Testing. Heat testing shall be conducted to ensure that the luminaire complies with UL 1572 An ambient temperature of 40 degrees centigrade (104 degrees F) shall be used for the test.

11.8 Water spray test. The luminaires must pass the following water spray test.:

A spray apparatus consisting of four spray nozzles set at an angle of 30 degrees from the vertical plane space 30 inches apart on a 2 inch pipe, each delivering 12 gallons of water per minute at a minimum of 100 psi at each nozzle in a 90 degree cone. A water pressure gauge shall be installed at the first nozzle.

The luminaires shall be mounted in a ceiling configuration and with each nozzle set a distance of 18 inches below the fixture in the vertical plane and 18 inches away in the horizontal plane from the fixture lens, apply spray for a duration of 3 minutes at a minimum of 100 psi. When opened, the fixture shall not show any signs of leakage.

The above test shall be repeated in the opposite horizontal plane from the fixture lens with no signs of leakage.

The summary report and the test results shall be certified by the independent test laboratory or the independent witness, as applicable, and shall be sent by certified mail directly to the Engineer. A copy of this material shall be sent to the Contractor and luminaire manufacturer at the same time.

11.9 Should any of the tested luminaires of a given distribution type and wattage fail to satisfy the specifications and perform according to approved submittal information, the luminaire 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 Vendor shall advise the Engineer of corrections made 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. The number of luminaires to be tested shall be the same quantity as originally tested. Luminaires which are not modified or corrected shall not be re-tested without prior approval from the Engineer.

Coordination shall be the Vendor's responsibility. Failure to coordinate arrangements and notice 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.

12. Installation.

12.1 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 appurent items, shall be included as part of this item.

12.2 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.

12.3 The Engineer reserves the right to select the final light distribution pattern, luminaire aiming angle and change it as deemed necessary to produce the proper pavement luminance.

12.4 Surface mounted luminaires, all luminaires not mounted on suspension rods, shall have one-inch thick stainless steel spacers installed between the luminaire and the deck or wall.

13. Guarantee.

The Vendor shall provide a written guarantee for materials, and workmanship for a period of 6 months after final acceptable of the lighting system.

14. Documentation.

All instruction sheets required to be furnished by the manufacturer for materials and supplies and for operation of the equipment shall be delivered to the Engineer.

The manufacturer shall have been incorporated for at least five years and shall have at least five years in the design and manufacturing of roadway underpass lighting. The manufacturer shall provide evidence of financial strength to finance the production of the project by submitting the name of at least three projects completed in the previous calendar year of greater than $250,000 each. All steel used in the project shall be certified to be provided domestically, and all fixture components used shall be manufactured domestically.

15. Method of Measurement. Luminaires shall be counted, each.

16. Basis of Payment. This item shall be paid at the contract unit price each for **UNDERPASS LUMINAIRE**, of the wattage specified, **HIGH PRESSURE SODIUM VAPOR,** which shall be payment in full for the material and work described herein.

REMOVAL OF LIGHT TOWER, SALVAGE

Description. This special provision describes the removal of existing high mast roadway lighting towers with no salvage, and removal of existing high mast lighting luminaires with salvage.
Materials. Not applicable.

Installation. Removal shall be according to Article 842 of Standard Specifications for Road and Bridge Construction, adopted January 1, 2012, as modified for high mast roadway lighting towers as follows: removal shall include lamps, luminaires, mounting rings, towers, and all associated hardware and appurtenances.

Basis of Payment. This work will be paid for according to the contract unit price each for REMOVAL OF LIGHT TOWER, SALVAGE at the locations indicated on plan and details.

REMOVAL OF TOWER FOUNDATION

Description. This special provision describes the removal of existing high mast roadway lighting tower foundations.

Materials. Not applicable.

Installation. Removal shall be according to Article 842 of Standard Specifications for Road and Bridge Construction, adopted January 1, 2012, for the increased size of foundations used for high mast roadway lighting towers.

Basis of Payment. This work will be paid for according to the contract unit price each for REMOVAL OF LIGHT TOWER FOUNDATION at the locations indicated on plan and details.

LIGHT TOWER
Effective: April 1, 2016

1. Description. This work shall consist of furnishing and delivering a light tower complete with lowering device, and all appurtenances required for a complete operating unit.

2. Definitions.

   Light Tower: The complete light tower shaft and lowering device as one integral working system.
   Shaft: The light tower shaft.
   Lowering Device: The components involved with the mounting, operation, and raising and lowering of the luminaire ring, luminaires.
   Tower Height: The height of the tower shall be measured from the bottom of the base plate to the center-line of the luminaire tenon arm. This dimension is also referred to as Mounting Height.

3. Materials. Materials shall be as specified elsewhere herein.

4. Submittals and Certifications. Shop drawings, product data and certifications shall be submitted. The submitted information shall be complete and shall include information relative to all specified requirements suitable for verification of compliance.

   THE SUBMITTALS SHALL BE ARRANGED AND CROSS-REFERENCED TO THE SPECIAL PROVISIONS. FAILURE TO CROSS-REFERENCE THE SUBMITTAL INFORMATION WITH THE SPECIAL PROVISIONS WILL RESULT IN THE SUBMITTAL BEING RETURNED WITHOUT REVIEW.

   The submittal information shall be dated, current, project specific, identified as to the project, and shall also include the following calculations and certifications:

   - Shaft design calculations, including Registered Engineer Certification.
   - Lowering device seating force calculations.
   - Certification of intent to provide domestic steel in accordance with Article 106.01 of the Standard Specifications.
   - Welding details and procedures.
   - Letter of intent to provide specified weld inspection reports.
   - Confirmation of coordination between anchor rod supplier and tower manufacturer for adequacy of anchor rod assembly.
   - Manufacturer's recommended installation procedures.
   - Letter of intent to provide manufacturer's representative during installation and to provide specified installation certification.

All certifications shall be notarized. A PDF format copy of the submittal shall be provided with all submittals, including resubmittals, on CDROM. Light tower submittals will require a longer review time than other items as and such the review period referenced in Article 105.04 shall be 60 days.

5. Deleted

6. Light Tower

6.1 General. Light towers (high mast poles) shall consist of any poles 24 m (80 ft) or more in length.

Each light tower shall be complete with internal, integral motorized lowering mechanism, luminaire ring, pole top hood, internal electric power cables, luminaire counter-weight (when applicable), and all appurtenances required for a complete operating unit.

The design shall be based upon AASHTO “LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals” in effect on the date of invitation for bids, however the width of reinforced opening requirement in Chapter 5, Section 5.6.6.1 shall not apply. Light Towers shall be designed for ADT > 10,000, Risk Category Typical, and Fatigue Importance Category I.

A minimum total combined luminaire weight of 600 lb (272 kg) shall be used plus a combined hood area and lowering ring weight of 400 lb (181 kg). The associated total projected area shall be 24 sq ft (2.23 sq m) and 10 sq ft (0.93 sq m) respectively. Additional weights and areas shall be added when necessary for such things as luminaire shields. Project specific weights and areas shall be used in the design calculations when they exceed the above minimums.

Light towers shall be designed and constructed so no structural member or other component is applied in excess of the manufacturer's recommended rating (when applicable) or the published rating, whichever is lower.

The light towers shall be of a height and luminaire capacity as indicated and shall be of the non-latching ring support design. A latching-type ring support will not be acceptable.

The tower shall be provided as a single coordinated assembly, with one entity responsible as manufacturer of the whole. One entity must be the manufacturer of the lowering device or the tower shaft, or both, shall warrant the entire coordinated assembly.

6.2 Deflection. The design of the tower shaft shall achieve a maximum, fully loaded deflection at the top of the pole, which is not greater than the following percentage of the tower height:

Light Tower Maximum Deflection		
Tower Height		Maximum Deflection as % of Tower Height
Meters	Feet	
49	160	13.70
46	150	10.04
43	140	7.80
40	130	6.02
36	120	10.75
33	110	7.80
30	100	5.30
27	90	4.50
24	80	3.50

6.3 Shaft.

6.3.1 The tower shaft shall be a low deflection tapered shaft having polysided, circular, or elliptical cross sections. The shaft cross section at the top shall be not less than 7.5 in. (190 mm) in diameter. The shaft cross section at the bottom shall not be greater than that which is compatible with the base plate bolt circle specified, and shall not be less than 24 in. (600 mm) in diameter for new installations. The minimum wall thickness of the bottom portion of the tower shaft shall be 0.2391 in. (3 gauge).

6.3.2 All tower shaft components shall be fabricated from high strength, low alloy, steel according to AASHTO M 270 (M 270M); ASTM A 595 (A 595M), Grade A or B; ASTM A 1011 (A 1011M); ASTM A 606 (A 606M); ASTM A 588 (A 588M), or ASTM A 871 (A 871M) Grade 65, with a minimum yield strength of 50,000 psi (345,000 kPa).

All tower shaft hardware, such as ground lugs, hardware for the handhole door, including the clamp assemblies, hinge and door stop, shall be stainless steel according to Article 1006.31. Ground lugs shall be protected by removable plastic plugs or caps.

6.3.3 Each tower shaft shall be constructed of not more than the following welded or slip fitted sections:

Maximum Light Tower Sections		
Tower Height		Maximum Number of Sections
Meters	Feet	
49	160	4
46	150	4
43	140	4
40	130	4
36	120	3
33	110	3
30	100	3
27	90	3
24	80	2

6.3.4 Sections which are slip fitted shall have slip joints with a minimum overlap of 1.5 times the diameter of the bottom of the upper section at the slip joint. Towers having slip joint construction shall be pre-fitted and match marked at the factory and shall be shipped disassembled for assembly at the job site. Slip joints shall be marked with a scribe to allow verification that 1.5 times diameter insertion is provided. A copper bonding jumper, included with the tower, shall bond slip fit pole sections together with a flat copper mesh and UL Listed ground lugs. The bonding jumper shall not interfere with the operation of the luminaire ring.

6.4 Handhole.

6.4.1 Each tower shaft shall be constructed with a handhole/access door for access to power connections and lowering mechanism equipment. The handhole shall be large enough to make the following items visible from an extended operating position and accessible for maintenance: cable drum, transition plate, and the drive train oil level indicator. The handhole shall be sized and arranged to permit removal of the lowering mechanism without excessive dismantling of the equipment. The handhole may be a reinforced opening in the pole shaft as detailed on the plans or may be a part of a flared shaft base assembly as approved by the Engineer. The flared base shall not be considered a separate section of the tower shaft.

Minimum opening dimension for the handhole shall be 300 mm x 900 mm (12 in. x 36 in.) and it shall have a lockable door. The handhole shall be located so as to not interfere with the operation of the door clamps, and it shall be positioned on the tower shaft to align on center with one of the anchor bolt (rod) positions and at a minimum height, as detailed on the plans, to facilitate access to mounting nuts with tools required for installation.

6.4.2 The handholes in the pole shafts shall have rounded corners and shall be reinforced to maintain the original strength of the tower shaft. Flared base assemblies shall maintain the strength of the shaft and have no non-round protrusions.

6.4.3 Handhole Door. The handhole shall have a door with a full-height stainless steel piano hinge, or with not less than two stainless steel hinges. A bolt through a door and frame eyelet shall not constitute an acceptable hinge. Hinges shall be heavy duty, suitable for the weight of the handhole door. The handhole door shall not be warped in any direction. The door hinge shall be attached with stainless steel nuts and bolts.

6.4.4 Handhole door gasket. The door/opening shall be gasketed in a manner which will prevent the entry of water into the tower and the door shall have a tight compressive seal employing a tubular gasket to assure compressibility. The gasket shall be a one piece design and shall be jointed by chemical fusion at the bottom of the opening. The gasket shall be attached mechanically. Adhesives alone are not acceptable.

6.4.5 Handhole door clamps. The door shall be held closed with a 12 gauge captive adjustable, spring loaded, stainless steel clamp assembly. The clamps shall have a depth stop feature to insure uniform sealing pressure at all clamp points. A minimum of five clamps shall be used around the non-hinged sides of the door assembly. The door clamp locations and handhole shall be coordinated with the tower so that the clamps can operate over their full range of movement without any interference from other tower components including anchor bolts which may protrude up to 6” above the top surface of the base plate. The door clamps shall be attached with stainless steel nuts and bolts.

6.4.6 Padlock provision. A stainless steel padlock hasp and staple shall be provided for locking the door. Door hardware shall be stainless steel. The door shall be equipped with an integral door stop/hold-open mechanism.

6.4.7 Rain Shield. A rain shield shall be placed above the handhole to direct water away from the handhole. The shield shall be fabricated of the same material as the pole shaft, shall have rounded corners, and shall be permanently welded to the shaft. The rain shield cannot interfere with operation of the handhole door or door clamps. Details of the configuration and welding shall be submitted for the Engineer's approval.

6.4.8 Cable Hook. A cable hook/cradle, readily accessible from the front of the tower, shall be provided to hang the control operator cable assembly when not in use. The hook or cradle shall be made from steel rod no less than ½-inch in diameter and shall be galvanized as the pole is. This hook or cradle shall be large enough to hold 25 ft. (7.5m) of power cable and positioned for practical in-field use. The hook shall not have sharp edges or protrusions that could damage the cable and it shall not interfere with the operation of the lowering mechanism.

6.4.9 Each tower shaft shall have a handhole accessible ground pad welded to the shaft for connection of ground conductors. The pad shall be NEMA 2-hole pad and accessible with the lowering device installed.

6.4.10 Interior Bolt Exposure. Bolts attaching the various components to the tower, handhole, and handhole door shall be properly sized and coordinated with the matching nuts so that no more than 0.25" of thread is exposed past the nut when properly tightened.

6.5 Deleted.

6.6 Base Plate.

6.6.1 The base plate shall be factory predrilled (slotted) for the number and configuration of anchor rods as provided in the following table:

Base Plate Configuration

Tower Height		Min, number anchor rods	Rod Circle	
Meters	Feet		mm	inches
49	160	8	965	38
46	150	8	965	38
43	140	8	914	36
40	130	8	914	36
36	120	8	914	36
33	110	8	762	30
30	100	8	762	30
27	90	8	762	30
24	80	6	762	30

The base plate shall have a round (disk) shape of the specified outer diameter or as otherwise approved by the Engineer. The minimum thickness of the base plate shall be 50 mm (2.0 in.). The base plate shall be circumferentially welded to the tower shaft. A backer ring shall be used for this circumferential weld. All crevices at the backer ring shall be completely sealed to moisture and corrosion. The plate shall be oriented such that one anchor rod is aligned with the vertical center line of the handhole.

7. Welding.

7.1 Manufacturer Welding Requirements.

7.1.1 Circumferential welds. Circumferential welds, including top flange welds, shall be full penetration welds.

7.1.2 Longitudinal welds. Longitudinal welds shall have a minimum of 60 percent penetration, except the longitudinal welds on both the male and female shaft sections shall be full penetration welds within a distance of two diameters of overlap joints.

Minimum preheats for welds shall be 40º C (100º F) for fillets, 65º C (150º F) for seams, and 110º C (225º F) for circumferential welds.

Weld procedure specifications for seams and circumferential welds must be qualified according to Section 4, Part B of AWS D1.1. Charpy V-Notch (CVN) impact specimens shall be tested according to Table III-1 (note 2) of Appendix III for minimum values of 34 J (25 ft lb) at 4º C (40º F). Fillet weld procedures shall be tested according to Table 4.4 of AWS D1.1.

The welds shall be smooth and thoroughly cleaned of flux and spatter and be according to the AWS.

All full penetration welds shall be inspected for soundness by the ultrasonic method and all partial penetration welds shall be inspected by the magnetic particle method. Welding inspection reports shall be submitted to the Engineer for approval. The welding symbols and complete information regarding location, type, size, welding sequence, and WPSs shall be shown on all shop drawings. The Contractor shall submit the manufacturer's welding procedures, including inspection procedures, to the Engineer for approval.

7.2 Independent Welding Inspection. In addition to manufacturer's own welding inspection, the Contractor shall have welding inspected by an independent Certified Welding Inspector (CWI). The selected inspector shall be approved by the Engineer before any inspecting is performed. The NDE inspector(s) shall be independent nondestructive testing inspector(s), certified as level II in RT, UT, and/or MT as applicable. The methods for testing full penetration and partial penetration welds by the independent welding inspector(s) shall be the same as specified above in section 7.1

The independent welding inspector shall send the test results directly to the Engineers, as follows: Illinois Department of Transportation, Attn: Engineer of Structural Services, 2300 S. Dirksen Parkway, Bureau of Bridges & Structures, Springfield, Illinois 62764 and to: Illinois Department of Transportation, District 1, Attn: Electrical Design Section Chief, Bureau of Traffic Operations, 201 West Center Court, Schaumburg, Illinois 60196. All welds must pass inspection. Any deficient welds must be brought to the attention of the Engineer and corrective measures must be outlined.

8. Light Tower Finish.

The light tower shall be hot-dip galvanized including the handhole, handhole door, base plate, mounting plate and all other elements welded to the shaft according to AASHTO M 111. Stainless steel components shall remain the natural stainless steel finish.

9. Head Frame.

9.1 Each tower shall be equipped with a head frame assembly to support and guide the luminaire ring assembly.

9.2 The head frame and luminaire ring shall have a positive mating/alignment interface at which the seating force is applied at each support cable. The interface shall be designed to operate with not less than 1.3 kN (300 lbs.) of total seating force distributed among the interface points. Manufacturer calculations shall be submitted to confirm this requirement. The stop used at the top of the tower shall not deform with the full force applied.

9.3 All head frame members and components, including support arms, shall be fabricated of steel of the same type as specified for the tower shafts or stainless steel of appropriate strength. The head frame shall have a head plate, a support, and 2 pulleys for each support cable. All openings in the head frame assembly shall be machined smooth and free from any burrs and sharp edges which could damage the support cables and power cable.

The head frame plate and attached components shall be fabricated of the same type of steel as the tower shaft or of Type 201L or Type 304 stainless steel. It shall then be hot-dipped galvanized according to AASHTO M 111 or painted as specified for the tower shaft or fabricated from stainless steel.

9.4 The head frame shall have a power cable pulley arrangement placed between and roughly equidistant from two support arms, and allow a minimum cable bending radius of not less than 6 1/2 in. (163 mm). The head frame shall have a minimum diameter of 36 in. (1 m).

9.5 The power cable shall pass through the head frame assembly utilizing a four-way roller guide assembly sized to accommodate the outside diameter of the power cable.

9.6 Pulleys shall be constructed to allow associated cables to ride freely within pulley grooves and cable guides shall be incorporated to prevent cables from riding out of pulleys.

9.7 Pulleys, attachment hardware, latches, hinges and the like shall be stainless steel. Pulleys shall be made of Unified Numbering System type 300 stainless steel and have permanently lubricated sealed bearings except the power cable pulleys may be cast aluminum or high-strength nylon.

9.8 The head frame assembly shall be equipped with an aluminum hood with a minimum thickness of 0.125 in. (3 mm). The hood shall protect the operating head frame components from damage or deterioration from weather but shall permit pole ventilation while preventing the entry of birds. The hood shall have a strong secure mechanical means to open/raise the hood for the future maintenance of the head frame such as a spin screw mount, and shall have a double-secured latching system to assure closure. The Design shall be such as to minimize the risk that the hood will be displaced from gusts of wind. The head frame assembly shall be match-marked to its tower shaft and shall be attached to the shaft by stainless steel hardware.

10. Luminaire Ring.

10.1 Each tower shall be provided with a luminaire ring suitable for eight (8) or twelve (12) luminaires of the type, and orientation specified. The ring shall mate/align with the head frame and shall be coordinated relative to seating force.

10.2 The ring shall be designed for lowering to a position with the center line of luminaire arms 1.4 m (54 inches) or less above the top of the tower base plate. The exact fully-lowered position shall be adjustable in the field. Wiring shall be fully enclosed in a metal raceway.

10.3 The ring shall be equipped with spring loaded bumpers, spring loaded rollers, spring-loaded outriggers or other shock-absorbing mechanism to guide the ring during the raising/lowering operations. The guide mechanism shall be spring loaded and shall be designed to minimize shock to the luminaire during raising and lowering. These devices shall be attached in a secure manner. The mechanism does not have to maintain constant contact with the tower shaft.

10.4 Arms for the attachment of luminaires shall be standard 50 mm (2-inch) diameter tenon arms. The arms shall be attached to the ring in a secure manner either by welding or by means of stainless steel bolts, nuts, lock washers and hardware such that a permanent rigid attachment is achieved. Arms shall be coordinated with luminaire size and configuration and shall be arranged so that the overall diameter of the ring, including the luminaire, does not exceed 3.4 m (11 ft.). Tenon arm ends shall be threaded to accept a PVC pipe cap. All tenon arms shall be capped. The tenon arms shall be level when the ring is in the raised position.

10.5 The ring raceway shall be arranged with screened weep holes of not less than ½-inch diameter at no less than 90 degree intervals around the ring.

10.6 The ring shall be equipped with an enclosed wire raceway and a stainless steel NEMA 4X terminal box for wiring of the luminaires.

10.6.1 Junction Box. The box shall be made of Type 304 stainless steel, not less than 2.03 mm (14 gauge), with all seams continuously welded with stainless steel weld wire and ground smooth. Exterior surfaces shall have a smooth polished finish. The box shall be UL 50 "Junction and Pull Box", "Junction Box", or "Pull Box".

A grounding lug shall be provided for the connection of the equipment grounding conductors as required by NEC Article 250-114.

The box shall have an overlapping stainless steel cover and shall be secured to the box with a continuous stainless steel hinge and a minimum of 4 captive stainless steel clamps utilizing captive stainless steel hex-head bolts or deep slotted stainless steel screws.

Be suitable for surface mounting, complete with external stainless steel mounting lugs or brackets welded to the enclosure.

The box cover shall have a continuous formed, seamless, urethane, oil-resistant gasket. The gasket shall be extruded directly onto the junction box cover. The gasket shall adhere to the cover without the use of adhesives. A neoprene strip gasket, or urethane strip gasket cut out of a larger sheet and glued to the junction box will not be acceptable.

The box shall have a UL Listed stainless steel vent drain mounted in the bottom of the box. This vent drain shall also function as an air pressure equalizer. The vent drain shall maintain the NEMA rating of the junction box when installed.

10.6.2 The box shall be arranged and connected to the top of the ring from the top of the box in a manner that precludes moisture draining from the ring into the box. All fittings penetrating the box shall be watertight hubs with an integral O-ring. The hubs shall be watertight and corrosion resistant NEMA 4X and have an insulated polycarbonate throat. The insulated throat shall be rated up to 105º C. The hubs shall be UL Listed and comply with UL Standard 514B.

10.6.3 The box shall be equipped with a hinged door and a latch or with captive stainless steel closure hardware acceptable to the Engineer and an external special fixed-mount plug with a retained cap as specified elsewhere herein to accept a test power connection when the ring is in the lowered position.

10.6.4 The box shall, on the side, have the main tower cable entry and the entry for the luminaire wires; it shall also contain a terminal strip with identified terminals for connection of the main power cord, luminaires, and the test power receptacle. The terminal strip shall have terminals sized to accommodate the cables to be connected and shall have luminaire connection terminals to accommodate the usage of all luminaire positions.

10.7 The ring shall facilitate ease of wiring to the arms by the use of removable gasketed covers, physical arrangement, or other means acceptable to the Engineer. Arms shall be factory or field wired according to NEC Article 410-31.

The arms shall be wired using No. 12 AWG, Type SOOW. The cord shall have three conductor, flexible CPE jacketed construction according to UL 62 and be MSHA approved. The cord shall be rated 600 V and -58 to 221 °F (-50 to 105 °C). Each conductor shall be No.12 AWG stranded annealed copper per ASTM B 174 with EPDM insulation.

Wiring shall be color coded (black, red, white, and green, as applicable) with coloring via outer material color or by painting with a process approved by the Engineer. Wire rating information shall be visible in a contrasting color. Wires shall be installed to all luminaire arms.

Luminaire wires shall extend 600 mm (24 inches) longer than their respective tenon arm and shall be trained back into the arm which shall then be closed with a protective cap for shipment of the jobsite. All wires shall be capped and crimped with sealant and heat-shrink insulating sleeves (wire nuts, tape, crimps, etc. will not be acceptable.). Wiring shall alternate circuits to the luminaire arms so that adjacent arms are not on the same circuit. All ring wires shall be tagged with wire markers at both ends. The tenon arms shall also be tagged corresponding to the wiring contained within.

10.8 The luminaire ring shall be factory checked and marked for proper positioning and luminaire orientation. Catalog cuts and shop drawings shall indicate the orientation of the luminaire ring, handhole, and bolt circle in relation to each other on a single drawing.

10.9 The ring shall be complete with a counterweight for each unmatched luminaire to maintain ring balance. Counterweights shall be coordinated with the luminaires to be installed.

10.10 All luminaire rings shall be arranged to accommodate the complete indicated compliment of luminaires, regardless of the number actually to be installed, to facilitate luminaire positioning and orientation.

10.11 The fully enclosed luminaire ring and attached components shall be fabricated of the same type of steel as the tower shaft or of Type 201L or Type 304 stainless steel. If it is not fabricated of stainless steel, it shall then be hot-dip galvanized according to AASHTO M 111 or painted according to Article 1069.08(c)(1). An open ring system shall be fabricated of Type 201L or Type 304 stainless steel.

11. Lowering and Support Mechanism.

11.1 The support shall be of the non-latching design.

11.2 The mechanism shall operate to raise the luminaire ring to its fully raised position and to lower the ring to a position with the centerline of the luminaire tenon arms 1.4 m (54 inches) or less above the top of the tower base plate. The exact fully-lowered position shall be adjustable in the field.

11.3 The lowering and support mechanism shall include, but not be limited to the support cables, power cable, pulleys, winch, gear reducer, mechanical clutch, electric motor, control and all accessories and appurtenances for a coordinated operating system.

11.4 The lowering and support scheme shall be of the 2-cable or 3-cable type as specified.

11.5 Three-cable mechanisms shall incorporate 3 support cables joined via an appropriate proven transition design to a single hoist cable wound around a single hoist winch. The transition design shall be such to prevent twisting of the support cables, to assure smooth winding of the cables on the winch and to prevent binding on the inside of the tower shaft.

11.6 Two-cable mechanisms shall incorporate 2 support/hoist cables wound around a dual winch assembly. The design shall be such to prevent twisting of the cables and to assure smooth winding of the cables on their respective winches and to prevent binding on the inside of the tower shaft.

11.7 The hoisting system shall be securely mounted and the lower assembly, i.e. motor, winch, mechanical clutch, gear reducer, etc., shall be designed to allow ease in removal of the equipment via the tower handhole without dismantling the system. Individual components shall be accessible and removable without the removal of other components. Mounting plates and other mounting templates and provisions shall have standardized dimensions to facilitate removal and interchangeability from unit to unit. Mounting hardware shall have an abundant strength safety factor and shall be positioned for even distribution of load.

11.8 The lowering device shall tightly position the luminaire mounting ring against the head assembly frame by applying a holding force evenly distributed among the seating/interface points. The total force required by the system must not be less than 1.3 kN (300 lbs.) greater than the weight of the luminaire mounting ring with all luminaire positions occupied by luminaires. There shall be a positive indication at the handhole that the required force has been applied, visible from the extended operating position away from the handhole and not under the ring. Submittal information shall include load and seating force calculations to demonstrate compliance with specified requirements.

11.9 The mechanism shall be equipped with a multipoint safety chain and hook assembly to hold the luminaire ring in place during maintenance. All hardware shall be stainless steel. Chains shall be stainless steel. Two chains are required for each tower with each chain having sufficient strength as to independently withstand the weight of the entire luminaire ring assembly and seating force.

11.10 The system shall be designed so that unbroken power cable, suspension and/or hoist cable can be replaced from ground level.

11.11 Support and Hoist Cables.

11.11.1 Cables (wire rope) shall be manufactured from Type 304 or Type 302 stainless steel and shall be stranded assembly coated with a friction-limiting non-corrosive lubricant.

11.11.2 Cables shall be 7x19 wire strand and have no strand joints or strand splices.

11.11.3 Cables shall be manufactured and listed for compliance with military specification MIL-W-83420, Type 1, Composition B.

11.11.4 Cable terminals shall be stainless steel whenever possible, shall be compatible with the cable, and shall be as recommended by the cable manufacturer. The terminals, swaging, etc. shall meet the requirements of military specification MIL-DTL-781. Stainless steel oval sleeves shall be according to military specification MS51844. Care shall be exercised to assure a match of connector sizes to the wire rope size(s), and, to the extent possible, connectors shall have visible size markings.

11.11.5 For 3-cable systems, the support cables shall each be not less than 5 mm (3/16 inch) in diameter and the hoist cable shall not be less than 8 mm (5/16 inch) in diameter.

11.11.6 For 2-cable systems, the support/hoist cables shall each be not less than 6 mm (1/4 inch) in diameter.

11.11.7 As part of the tower shop drawings and product data submitted for approval, support and hoist cable information shall be provided. Submittals without such information will be incomplete and will be rejected. The information shall include, but not limited to:

- Catalog information to confirm sizing, stranding and other specified requirements.
- Evidence of listing as military specification cable as specified.
- Certification of compliance with all specification requirements made by the cable manufacturer.

Documentation of arrangement to provide a sample of the support cable to an independent laboratory as selected by the Engineer for testing to the military specifications listed herein, with results to be sent directly to the Engineer, all included incidental to this item. Copies of recent test reports made on identical cable indicating compliance with military specification requirements shall be submitted. The test reports shall include as a minimum, the following:

- Breaking Strength test.
- Endurance test.
- Stretch test.
- Test load.
- Chemical Composition.

11.12 Winch.

11.12.1 Drum. The winch/gear reducer assembly shall have a drum suitable for the hoist of support/hoist cables, arranged to provide smooth winding of the cable and to prevent slippage. The drum shall be stainless steel or cast/ductile iron and shall have a diameter not less than 18 times the diameter of its respective cable (wire rope). The winch drum shall be designed with cable guides for a smooth cable take-up of level lays and to prevent the cable from riding over the drum flange. The drum shall have the end of the cable attached by means of a swaged connection and one full layer of cable shall be wound on the drum even when the ring is in the fully lowered position. The drum flange axle shall be supported at both ends.

11.12.2 Gear Reducer. Each assembly shall incorporate a gear reducer having a reduction ratio which will prevent free fall of the luminaire ring upon failure or disengagement of the drive unit and which will produce a travel rate of 3 m (10 ft.) to 4.6 m (15 ft.) per minute under normal operation.

11.12.3 The unit shall have a worm gear which is totally enclosed in a lubricating reservoir. The lubricant shall have a viscosity range suitable for proper operation in ambient temperatures from -40º C to 49º C (-40º F. to 120º F.)

11.12.4 The worm shall be manufactured of case hardened ground alloy steel or cast iron.

11.12.5 The gear shall be of bronze alloy or of a proven alternate material and design acceptable to the Engineer with and the gear shall be keyed to the output shaft. The output shaft shall be high quality medium carbon steel ground to close tolerances. The worm and output shaft shall be mounted on anti-friction bearings. All shaft extensions shall be equipped with a lip-type synthetic element and oil seals.

11.12.6 The unit shall have provisions to verify oil levels in all gear boxes, and oil level indication shall be visible from the handhole when the unit is installed.

11.13 Clutch. The mechanism shall incorporate a mechanical clutch, installed between the winch/gear reducer and the cable winch assembly. The clutch shall be of mechanical type, in a sealed cast metal housing. The clutch torque shall be factory calibrated and coordinated with the electric motor. The clutch shall act to limit the seating force of the raised ring to 300 lb (1.3 kN). The clutch shall be suitable for the application and torque limitation and shall not deteriorate with use.

11.14 Motor.

11.14.1 The electric motor shall be matched to the load and torque characteristics required for a fully loaded luminaire ring and shall not be less than 746 watts (1 horsepower).

11.14.2 The motor shall be capable of producing torque in excess of the clutch maximum torque rating. The motor shall be totally enclosed fan cooled (TEFC), shall be reversible to operate the lowering mechanism in both directions, and shall be suitable for operation on the power supply characteristics shown on the drawings. Submittal information shall include complete motor data, including, but not limited to:

- Manufacturer
- Nameplate Rated Watts (Horsepower)
- Rated Voltage
- Full Load RPM
- Full Load Current
- Locked Rotor Current
- NEMA Design Letter
- Insulation Class
- Torque Data
- Dimensional Data
- Calculations to verify the compatibility of the drive unit components (motor, gear reducer, clutch and winch). Calculations shall verify the 300 lb (1.3 kN) seating force.

11.15 Lowering Device Control.

11.15.1 The lowering device control shall consist of motor short circuit and motor running overcurrent protection and motor control complete with all appurtenances and interconnecting wiring. The control may incorporate a reversing motor starter or a suitably-rated reversing control station.

11.15.2 The lowering device control may be provided in a separate NEMA 4X stainless steel enclosure or in the enclosure with the tower main Electrical breaker, provided the remote control station is a separate remote device.

11.15.3 The lowering device motor shall have a motor disconnecting means circuit and running overload protection according to N.E.C. requirements. The motor disconnect and short circuit protection shall be achieved by a molded case thermal magnetic bolt-on circuit breaker rated at 600 volts, of an ampere rating suitable for the motor and having a UL-listed interrupting rating of not less than 14,000 rms symmetrical amperes at 480 volts and 10,000 rms symmetrical amperes at 240 volts.

11.15.4 Running overcurrent protection shall be according to N.E.C. requirements. Motor overload protection shall be achieved by an appropriate dual element fuse in a spring-loaded screw-in type small-dimension fuse holder mounted within the enclosure in a suitable box or other arrangement approved by the Engineer.

11.15.5 The motor starter, if incorporated, shall not be smaller than NEMA size 1, shall be rated 600 volts and shall be full voltage, reversing type, with arc-extinguishing characteristics and renewable silver-to-silver contacts. A reversing control switch, if incorporated, shall be rated well in excess of the duty required and in no case less than 2,240 watts (3 horsepower) at 230 volts single phase. The control shall be momentary contact, raise-stop-lower with a neutral stop condition, requiring positive action by the person operating the device to keep the motor energized. The control shall have auxiliary contacts as indicated and as required for the control.

11.15.6 The enclosure shall have an exterior position-indicating trip-free operating handle for the motor circuit breaker. The enclosure(s) shall have exterior nameplates to read "LOWERING DEVICE CONTROL" and "MOTOR CIRCUIT BREAKER" as well as an interior nameplate "MOTOR OVERLOAD FUSE" which shall also be inscribed with the applicable fuse type and ratings. Nameplates shall be engraved, 2-color, attached with screws.

11.15.7 The line side power to the lowering device control shall be obtained via a plug extended connection to the power distribution cord/receptacle.

11.15.8 The control shall be complete with a cable-connected remote control station. The control station shall incorporate heavy duty control devices in a non-metallic impact-resistant NEMA 4X enclosure. The control shall be "dead man" type with "RAISE" and "LOWER" controls, requiring the operator to hold the respective control depressed in position for movement of the ring in either direction and with release of the control to stop the mechanism. The cord shall incorporate a No. 12 ground wire and the number of conductors required for a control, with control conductors not less than No. 14. The cord shall be weatherproof with watertight connections at either end and it shall be long enough to allow the operator to stand 7.5 m (25 ft.) away from the lowered luminaire ring. Provisions for storage of the control station and cord such as a suitable hanger cradle, shall be provided in a manner easily accessible at the handhole and in a location which precludes interference with the internal components of the lowering mechanism.

11.15.9 Cables extended from the enclosure shall be passed through a watertight sealing bushing and the cable shall be supported and arranged to preclude interference with the lowering mechanism. Wiring shall be in compliance with NEC requirements. Motor wires shall not be less than No. 12 and motor wiring shall be extended in UL-listed extra-flexible, weatherproof cord or other cord approved by the Engineer with suitable fittings, bushings and supports. All equipment shall be grounded and bonded via an appropriately sized equipment ground wire.

11.16 Electric Power Distribution.

11.16.1 Electric power for motorized operation of the lowering mechanism and for the power supply to the lighting shall be taken from the lighting circuitry feeding the tower. The distribution shall provide termination of the supply feeder, extension to a tower main breaker and distribution to lighting and the lowering device. The power cable extension from the branch circuit feeding the light tower shall be a sealed with a multi-leg heat shrink break out boot. The power cord extension shall be included as a part of this item.

11.16.2 The tower shall be equipped with a main circuit breaker. The circuit breaker shall be molded case, 2-pole, 40-ampere thermal magnetic, bolt-on type having a UL-listed interrupting rating of not less than 14,000 rms symmetrical amperes at 480 volts. The breaker shall indicate "ON", "OFF" and "TRIPPED" conditions and the handle shall be trip-free.

11.16.3 The main breaker shall be housed in NEMA 4X stainless steel enclosure with an external, position-indicating operating handle with padlock provisions. The enclosure shall have a 2-color engraved nameplate to read "MAIN BREAKER", attached with screws. The box shall have openings and suitable bushings for cable extensions.

11.16.4 The main breaker shall be arranged for line-side connection to incoming feeder conductors entering the base of the tower via an extension of multi-conductor cable. The load side of the main breaker shall be connected to a cord and receptacle which shall be arranged for connection to either the luminaire ring main power, the lowered luminaire ring test power or the lowering device control.

11.16.5 Each connection to the main breaker shall be made with the specified electric power cable, extended from the enclosure through a watertight sealing/support bushing. The cables shall be arranged and secured to preclude any interference with the lowering device operation.

11.17 Electric Power Cable.

11.17.1 The electric power cable shall consist of a 4-conductor jacketed extra flexible cable, (2 phase conductors, neutral conductor and a ground conductor).

11.17.2 The power cable shall be Type W industrial grade portable power cord and shall be No. 8 AWG or larger. The cord shall have a multi-conductor, extra flexible CPE or CSPE jacketed construction with reinforced fillers to maintain a smooth round surface according to ICEA S-75-381, NEMA WC 58, UL 1650, and be MSHA approved. The cord shall be rated 2000 V and -40 to 194 °F (-40 to 90 °C). Each conductor shall be No. 8 AWG rope lay stranded annealed copper per ASTM B 172 or ASTM B 173.

11.17.3 Each individual conductor's insulation shall be color coded; one black, one red, one white and one green.

11.17.4 The individual conductors shall be assembled in a cable, with non-hydroscopic reinforced rubber fillers to maintain a smooth round outer surface, with a jacket applied overall. The jacket shall be a heavy duty jacket manufactured according to ASTM D 752 and shall be imprinted with the manufacturer, conductor size number of conductors, type of cable, voltage rating.

12. Ground Continuity.

12.1 A flexible copper braid connector of #2 copper equivalent shall be attached with studs and exothermic welds at tower shaft sections or the shafts shall be electrically joined by other means approved by the Engineer. Towers shall include all materials to achieve this bond.

13. Power Receptacles and Plugs.

13.1 Power receptacles and plugs shall be circuit-breaking devices which shall mate with each other. The plugs and receptacles shall be 4-wire 4-pole, 600 volt, 60 ampere weatherproof devices according to UL Standard 498 and International Electrical Commission Standard 309. The devices shall be listed by the manufacturer as suitable for make and break operation at rated current.

13.2 Components and insert assemblies shall be interchangeable to accept either pin or socket inserts to allow either plug or receptacle to be configured in an energized or de-energized condition, i.e. reverse-contact configurations shall be available. Locations of reverse-contact devices shall be as indicated.

13.3 Each plug or receptacle connection to a power cord shall be complete with a suitable non-metallic sealing connector body with a wire mesh strain relief. Other plugs and receptacles shall be complete with suitable sealing angle-adapter panel of box mounting bodies, as applicable and shall be complete with back-boxes if so dictated by the power distribution configuration.

13.4 Each plug and each receptacle shall be complete with a retained flap-type or retained screw-on cover.

13.5 Plugs and receptacles shall be water-tight, dust-tight, and chemical resistant and be suitable for use when exposed to the weather and shall be applicable for safe use in harsh, wet weather conditions. The Engineer shall be the judge of applicability.

14. Shipment and Installation.

14.1 The light tower, luminaire ring, etc., and hardware shall be packaged during shipment to protect all surfaces from being scratched, marred, chipped, or damaged in any way. Prior to installation, the tower and all its components will be inspected by the Engineer and any parts found to be damaged or defective shall be replaced. Any minor damage to a completely painted light tower surface shall be touched up in a professional manner as approved by the paint manufacturer.

14.2 The tower shall be set plumb on the foundation and fastened to the anchor rods with double nuts and washers. Flat washers shall be installed below and above the base plate of the pole. Locknuts with nylon or steel inserts shall be installed on top of the top nut. The nuts shall be tightened in compliance with torque specifications recommended by the manufacturer of the lighting unit.

The use of jam nuts will not be allowed.

14.3 The space between the finished top of the foundation and the bottom of the base plate of the pole shall be enclosed with an expanded metal screen made of stainless steel. The size of the mesh of the screen shall be 1/4 in. (6 mm) or less and #18 gauge (1.22 mm) thick, or heavier as approved by the Engineer. The screen shall be held in place with a stainless steel band installed around the tower base plate. The band shall be held tight by a ratchet-type device. Grouting shall not be used to enclose the above described space.

14.4 The light tower shall be straight and centered on its longitudinal axis, under no-wind conditions, so, when examined with a transit from any direction, the deviation from the normal shall not exceed 1/8 in. in 3 ft (3 mm in 1 m) within any 5 ft (1.5 m) of height, with total deviation not to exceed 3 in. (75 mm) from the vertical axis through the center of the pole base.

14.5 When the luminaire position and orientation has been confirmed and approved by the Engineer, the luminaire shall be anchored with a minimum size 1/4-20NC stainless steel set screw installed through tapped holes in the tenon and mounting bracket of the luminaire. Counterweights on un-used tenons shall be mounted in a similar manner.

14.6 The assembly and installation of light towers shall be supervised by a qualified representative of the tower or lowering device manufacturer. On-site supervision shall be provided on the first day of tower assembly and installation. Support by telephone shall be available thereafter. At the time of the final inspection, the Contractor shall provide to the Engineer the manufacturer’s written certification, signed by their supervising representative, that all towers and lowering devices have been properly installed. The entire coordinated assembly shall be warranted by the tower or lowering device manufacturer.

15. Inspection.

    Light tower inspection shall include the complete operational demonstration of each light tower. The contractor shall provide sufficient manpower to perform this demonstration as a part on this item. Inspection check sheets will be provided.

16. Method of Measurement. Each light tower which is delivered and installed shall be counted as a unit for payment.

17. Basis of Payment. This work will be paid for at the contract unit price each for **LIGHT TOWER** of the mounting height, **LUMINAIRE MT – 8** or **LUMINAIRE MT – 12** as specified.

JUNCTION BOX EMBEDDED IN STRUCTURE, SPECIAL

Description. This work shall consist of furnishing and installing an embedded Composite Concrete Junction box in concrete.

Materials. The box and cover shall be constructed of a polymer concrete and reinforced with a heavy-weave fiberglass cloth. The material shall have the following properties:

Mechanical Property	Value	Physical Property	Value
Compressive strength	9,000 – 15,000 psi	Density	85-150 lbs/ft^2
flexural strength	3,000 – 6,000 psi	Barcol Hardness	45
Impact Energy	30 – 72 ft.-lbs	Water Absorption	Less Than 1%
tensile strength	800 – 1,100 psi		

The resulting enclosure shall have a Tier 8 Load Rating in accordance with ANSI/SCTE 77 2002. The material shall have light gray color to match the surrounding concrete. The cover shall be made of the same material. The junction box and cover shall be arranged to fit flush with the structure surface. The cover shall be gasketed and attached with a minimum of four stainless steel hex-head bolts factory coated with anti-seize compound. The enclosure shall be UL Listed.

Installation. The embedded junction box shall be set flush with the adjoining surface and shall be properly supported during concrete placement. The junction box shall not be installed in areas where

Field cut conduit openings shall be uniform and smooth. All burrs and rough edges shall be filed smooth to the satisfaction of the Engineer prior to the installation of conduit(s) into the junction box. Field cut conduit openings shall be fitted with the appropriate conduit fittings and accessories. Conduit fittings and accessories shall be provided according to Article 1088.01 and as shown on the plans.

Slight deviations to a larger size than the specified sizes may be allowed to conform to a standard manufacturer's production size with the approval of the Engineer.

Basis of Payment. This work will be paid for at the contract unit price each for JUNCTION BOX, EMBEDDED IN STRUCTURE, SPECIAL of the type and size when specified. The Contractor may, with the approval of the Engineer, use box sizes larger than indicated, at no additional cost to the Department.

WELDED WIRE FABRIC 6X6

Description. This work shall consist of furnishing and placing welded wire fabric of the spacing and size shown in the plans. Welded wire fabric shall be epoxy coated where specified on the plans.

Materials. Materials shall be according to Article 1006.10 of the Standard Specficiations. Epoxy coated welded wire fabric shall be according to Article 1006.10(b) and shall be epoxy coated according to AASHTO M284 and Article 1006.10(a)(2)(a), 1006.10(a)(2)(b) and 1006.10(a)(2)(c) of the Standard Specifications.

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 WELDED WIRE FABRIC 6X6.

NIGHTTIME WORK ZONE LIGHTING (D-1)
Effective: November 1, 2008 Revised: June 15, 2010

Description. This work shall consist of furnishing, installing, maintaining, moving, and removing lighting for nighttime work zones. Nighttime shall be defined as occurring shortly before sunset until after sunrise.

Materials. The lighting shall consist of mobile and/or stationary lighting systems as required herein for the specific type of construction. Mobile lighting systems shall consist of luminaires attached to construction equipment or moveable carts. Stationary lighting systems shall consist of roadway luminaires mounted on temporary poles or trailer mounted light towers at fixed locations. Some lighting systems, such as balloon lights, may be adapted to both mobile and stationary applications.

Equipment. The Contractor shall furnish an illuminance meter for use by the Engineer. The meter shall have a digital display calibrated to NIST standards, shall be cosine and color corrected, and shall have an accuracy of ± five percent. The sensor shall have a level indicator to ensure measurements are taken in a horizontal plane.

CONSTRUCTION REQUIREMENTS

General. At the preconstruction conference, the Contractor shall submit the type(s) of lighting system to be used and the locations of all devices.

Before nighttime construction may begin, the lighting system shall be demonstrated as being operational.

Nighttime Flagging. The requirements for nighttime flagging shall be according to Article 701.13 of the Standard Specifications and the glare control requirements contained herein.

Lighting System Design. The lighting system shall be designed to meet the following.

(a) Lighting Levels. The lighting system shall provide a minimum of 5 foot candles (54 lux) throughout the work area. For mobile operations, the work area shall be defined as 25 ft (9 m) in front of and behind moving equipment. For stationary operations, the work area shall be defined as the entire area where work is being performed.

Lighting levels will be measured with an illuminance meter. Readings will be taken in a horizontal plane 3 ft (1 m) above the pavement or ground surface.

(b) Glare Control. The lighting system shall be designed and operated so as to avoid glare that interferes with traffic, workers, or inspection personnel. Lighting systems with flood, spot, or stadium type luminaires shall be aimed downward at the work and rotated outward no greater than 30 degrees from nadir (straight down). Balloon lights shall be positioned at least 12 ft (3.6 m) above the roadway.

As a large component of glare, the headlights of construction vehicles and equipment shall not be operated within the work zone except as allowed for specific construction operations. Headlights shall never be used when facing oncoming traffic.

(c) Light Trespass. The lighting system shall be designed to effectively light the work area without spilling over to adjoining property. When, in the opinion of the Engineer, the lighting is disturbing adjoining property, the Contractor shall modify the lighting arrangement or add hardware to shield the light trespass.

Construction Operations. The lighting design required above shall be provided at any location where construction equipment is operating or workers are present on foot. When multiple operations are being carried on simultaneously, lighting shall be provided at each separate work area.

The lighting requirements for specific construction operations shall be as follows.

(a) Installation or Removal of Work Zone Traffic Control. The required lighting level shall be provided at each truck and piece of equipment used during the installation or removal of work zone traffic control. Headlights may be operated in the work zone.

(b) Guardrail, Fence and High Tension Cable Barrier Median Repair. The required lighting level shall be provided by mounting a minimum of one balloon light to each piece of mobile construction equipment used in the work zone. This would include all machines but not include trucks used to transport materials and personnel or other vehicles that are continuously moving in and out of the work zone. The headlights of construction equipment shall not be operated within the work zone.

(c) Pavement Marking and Raised Reflective Pavement Marker Removal/Installation. The striping truck and the attenuator/arrow board trucks may by operated by headlights alone; however, additional lighting may be necessary for the operator of the striping truck to perform the work.

For raised reflective pavement marker removal and installation and other pavement marking operations where workers are on foot, the required lighting level shall be provided at each truck and piece of equipment.

(d) Sweeping. The required lighting level shall be mounted on the sweeping train vehicles during the sweeping operations. Headlights may be operated in the work zone.

(e) Layout, Testing, and Inspection. The required lighting level shall be provided for each active area of construction layout, material testing, and inspection. The work area shall be defined as 15 ft (7.6 m) in front and back of the individual(s) performing the tasks.

Nighttime Work Zone Lighting will not be paid for as a separate item, but the cost shall be considered as included in the contract unit prices for the construction items involved, and no additional compensation will be allowed.

SHOULDER RUMBLE STRIP REMOVAL

Description. This work shall consist of the scarification of existing shoulder rumble strips constructed in hot-mix asphalt shoulders, and the furnishing and placement of hot-mix asphalt in the scarified area, prior to placing traffic onto the shoulder in a construction stage. This work shall take place per the limits shown on the Plans and/or as directed by the Engineer.

General Requirements. The nominal depth of scarification of the hot-mix asphalt shoulders shall be 2 inches. Unless otherwise shown in the Plans, the width of scarification shall be three (3) feet.

After removing all millings from the scarified limits, the surface shall be primed in accordance with Article 406.05(g) of the Standard Specifications.

The scarified area shall then be filled with hot-mix asphalt surface course and compacted flush with the adjoining pavement and shoulder surfaces. The mix to be used for this item shall be the IDOT Hot Mix Asphalt Surface Course, Mix D, N70, unless otherwise specified in the Contract.

Method of Measurement. This work will be measured for payment in square yards. Any portion of this work constructed outside the dimensions shown on the Plans or as directed by the Engineer will not be measured for payment.

Basis of Payment. This work will be paid at the contract unit price per square yard for SHOULDER RUMBLE STRIP REMOVAL, which payment shall constitute full compensation for scarifying the designated portion of hot-mix asphalt shoulder; cleaning the scarified area and removing all debris; applying prime, furnishing, placing and compacting hot-mix asphalt surface mix; and for all labor, equipment, tools and incidental necessary to complete the work as specified.

CLEANING WEEP HOLES

Description. This work consists of locating and cleaning existing weep hole (3"- 6" diameter cast iron pipe through the concrete retaining walls at various locations) for proper drainage of the wall backfill as shown in plans and described in the Special Provisions.

Construction.

The Contractor shall locate, clean and core the weep hole to allow free flow of drainage from the corrugated metal pipe underdrain behind the wall. The proposed contractors scheme and equipment shall not damage the existing weep hole or the underdrain system or the concrete surface or the landscaping near the wall. Contractor shall document and provide location plans for each weep hole that is cleaned. Any damages to the piping and the concrete wall as result of the contractor's construction method shall be repaired to the satisfaction of the engineer at the no additional cost to State. The weep hole shall be cleaned to the satisfaction of the Engineer.

Method of Measurement. This item shall be measured for payment as each for locating, cleaning and coring the weep hole as required within the project limits.

Basis of Payment. This work will be paid for at the contract unit price each for WEEP HOLE CLEANED AND CORED. This price shall be payment in full for all labor, materials, transportation, handling, and incidental work necessary to locate and clean the weep hole as required in the plans and specifications.

REPLACING JOINT FILLER

Description. This work consists of locating, removing portion of the of joint filler, preparing concrete surface and installing preformed expansion joint filler as shown in the plans and described in the Special Provisions.

Material. A 1/2 in. (13 mm) thick preformed joint filler shall be placed at the expansion joint between retaining wall panels. Joint filler materials shall be according to the articles 1051 of the Standard Specifications.

Construction.

Removal. The Contractor shall locate and remove the protruding joint filler from the expansion joint to the limits described herein. The limit of removal will be one foot beyond the limits of joint filler which is protruding beyond the concrete wall surface.

Preparation. Expansion joint face of the wall panels shall be cleaned of any loose filler material or debris left after removal of the existing joint filler.

Installation. Preformed Expansion Joint Filler shall be placed in correct position to fit exactly and completely fill the space between wall panels. Loose fitting or open points between sections of existing and new filler will not be permitted.

Method of Measurement. This work will be measured for payment in feet of the joint filler replaced.

Basis of Payment. This work will be paid for at the contract unit price per foot for REPLACE JOINT FILLER measured as provided above and as shown in the plans.

NOISE ABATEMENT WALL ANCHOR ROD ASSEMBLY

Description. This work shall consist of furnishing and installing Anchor Rod Assembly for future Noise Abatement Wall installation that will be installed in future contracts. It includes installation of threaded anchor rods, nuts and washers, anchor plate and an installation template plate as detailed in plans.

Material. Materials shall be according to the following articles of Section 601 - Materials:

Item	Article/Section
Structural Steel	1006.04
Anchor Bolts and Rods	1006.09
High Strength Steel Nuts and Washers	1006.08(a)

Construction. All structural steel related work shall be according to section 505 of the Standard Specifications.

All anchor rods shall be of the type and dimensions as shown on the plans. Fully threaded anchor rods shall be according to ASTM F 1554 Grade 105. Washers and nuts shall match with the hardness of the anchor rod.

Anchor rods, conforming to ASTM F 1554 shall satisfy the applicable specification for the grade specified and the supplemental Charpy V-Notch (CVN) toughness requirements herein specified. Grade 105 anchor rods shall satisfy Supplemental Requirement S5 and Table S1.2 of ASTM F 1554.

Welding of anchor rods is not permitted.

Anchor rods, nuts and washers shall be hot dipped galvanized according to the requirements of AASHTO M111.

Anchor Rod Assemblies shall be installed according to the Section 521.06 of the Standard Specification.

Method of Measurement. This work will be measured for payment as each. Each will be defined as complete anchor rod assembly which shall include furnishing and installing of anchor rods, washers, nuts, steel plates, installation template and galvanizing.

Basis of Payment. Anchor rod assembly furnished and installed will be paid for at the contract unit price each for NOISE ABATEMENT WALL ANCHOR ROD ASSEMBLY.

SOIL NAILED RETAINING WALLS
Effective: December 5, 2003 Revised: October 1, 2007

Description. This work shall consist of preparing the design, furnishing the materials, conducting nail testing and constructing the soil nailed retaining wall to the lines, grades and dimensions shown in the contract plans and as directed by the Engineer.

General. The soil nailed wall installation consists of making limited excavations to create near vertical soil faces on which geocomposite wall drains are placed and a reinforced shotcrete facing is applied. Soil nails are installed as the excavation approaches their locations and then connected to the shotcrete facing. Each subsequent excavation layer requires the splicing and extension of the geocomposite wall drains and shotcrete reinforcement, promptly followed by the application of shotcrete and installation of soil nails as required. As the final excavation lift nears completion, the geocomposite wall drains are connected to a pipe underdrain or series weep holes as shown on the plans and a reinforced concrete facing is cast against the shotcrete facing and nail head anchorage. The soil nails shall have sufficient strength, quantity and pullout resistance, beyond the failure surface, as required by design. The material, fabrication and construction shall comply with this Special Provision and the requirements specified by the approved subcontractor in their approved shop drawings.

Submittals. The Contractor shall submit the following:

(a) Qualifications. At the time of the preconstruction conference, the Contractor shall provide the following documentation to the Engineer for approval:

(1) A list containing at least three (3) projects completed within the three (3) years prior to this project's bid date which the sub-contractor performing this work has installed soil nailed walls of similar retained heights 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, the soils conditions, maximum height and total square footage of wall face.

(2) Name and experience record of the engineer responsible for soil nailed wall design, the on site installation supervisor, the drill operator, and shotcrete nozzle operator who will be assigned to this project. The engineer and on site installation supervisor shall each have a minimum of 3 years experience on at least 3 projects involving the design and installation of soil nailed walls while the drill operator and shotcrete operator shall have at least 1 year experience on at least one project.

(b) Shop Drawings and Calculations. The contractor shall submit complete design calculations and shop drawings to the Department for review and approval no later than 90 days prior to beginning construction of the wall. All submittals shall be sealed by a Illinois Licensed Structural Engineer and shall include all details, dimensions, quantities and cross sections necessary to construct the wall and shall include, but not be limited to, the following items:

(1) Plan, elevation and cross section sheet(s) for each wall showing the following:

(a). A plan view of the wall indicating the offsets from the construction centerline to the face of the wall at all changes in horizontal alignment. The plan view shall show the soil nail type, spacing, length, orientation, and locations where changes in nail length and/or size occur if not shown on the elevation view. The centerline shall be shown for all drainage structures or pipes behind or passing through and/or under the wall.

(b). An elevation view of the wall indicating the elevations of the top and bottom of the concrete facing as shown on the contract plans. This view shall show the locations of all soil nails by elevations and stations (or by vertical and horizontal spacing dimensions relative to the concrete facing stations and elevations). The soil nail type, spacing, length, orientation, and locations where changes in nail length and/or size occur must be designated if not indicated on the plan view. The locations of the verification and proof test nails shall be indicated.

(c). Typical wall cross section(s) showing the soil nail inclination angle, vertical spacing, geocomposite and drainage outlet system, shotcrete and concrete facing, and their relationship to the right-of-way limits, existing utilities or substructures as well as existing or proposed ground surfaces.

(d). Typical longitudinal and cross section of production nail indicating the drilled diameter, nail elements including bar type and size, epoxy coating, encapsulation, grout stages and centralizer locations.

(e). Longitudinal section(s) of the verification and proof test nails with their bonded and unbonded lengths indicated. Details for the nail testing apparatus including the reaction system for distribution test load pressures to the excavation surface, appropriate test nail bar sizes, reaction plate size, load cell, deflection dial gages, pressure gauge and jacking system to be used.

(2) Nail head anchorage details indicating bearing dimensions and thickness, bar hole diameter, shear stud diameter, length and locations, nuts and washers, and encapsulation connection to plate.

(3) All details for the geocomposite wall drain, drain splice detail, protection from shotcrete or soil intrusions and water outlet system.

(4) Complete layout of the concrete facing and reinforcing steel including expansion and construction joints.

(5) Any unique details for the soil nail installation around appurtenances located behind, on top of, or passing through the soil nail wall volume such as foundation elements, utilities etc. shall be clearly indicated.

(6) All general notes, material strengths, a sequence of wall construction, description of the nail assembly, drilling methods, grouting system, and equipment proposed for construction.

(7) Design calculations to support the selection of the soil nail wall elements shown in the shop drawings. The calculations as a minimum would address the following:

(a) Geotechnical calculations supporting the proposed nail lengths, drilled diameter, spacings, inclination angles, ultimate and allowable soil/grout bond stress. Local and global limit equilibrium stability analysis shall be provided at each design section for critical construction stages and long term conditions.
(b) Structural calculations supporting the selection of the nail head anchorage element sizes including plate, shear studs, nuts, bar as well as the reinforced shotcrete and reinforced concrete facing.

(c) Research data, field testing and resources used to select the soils parameters, nail capacity, and design methodology.

The initial submittal shall include three sets of shop drawings and one set of calculations. One set of drawings will be returned to the Contractor with any corrections indicated. After approval, the Contractor shall furnish the Engineer with eight sets of corrected plan prints and one mylar set of plans for distribution by the Department. No work or ordering of materials for the structure shall be done until the submittal has been approved by the Engineer.

Materials. Materials for soil nail walls shall satisfy the following requirements:

(a) Nails. Nails shall be threaded, epoxy coated, deformed steel bars conforming to AASHTO M 31 for Grade 60 or 75 bars, ASTM A722 for Grade 150 bars (AASHTO M 31M for Grade 420 or 520 bars, ASTM A722M for Grade 1035 bars). The bars shall be supplied without welds or splices unless approved by the Engineer. Threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g. Dywidag or Williams continuous threadbars) or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, the next larger bar number designation from that specified in the approved design shall be used. Certified mill test results indicating the guaranteed ultimate tensile strength, yield strength, elongation, and composition of the nail steel shall be provided to the engineer for verification.

(b) Encapsulation. Minimum 0.04 inch (1mm) thick corrugated, HDPE tube conforming to AASHTO M252 (M252M) or corrugated PVC tube conforming to ASTM D1784, Class 13464-B.

(c) Epoxy Coatings. The epoxy coating and application thereof shall conform to Article 1006.10(a)(2) of the Standard Specifications.

(d) Steel Welded Wire Fabric. Welded Wire Mesh shall conform to AASHTO M55 (M55M).

(e) Concrete Facing. The concrete facing placed over the shotcrete shall conform to Section 503 of the Standard Specifications.

(f) Geocomposite Wall Drain. The geocomposite wall drain shall conform to Section 591 of the Standard Specifications.

(g) Shotcrete. Shotcrete may be either dry or wet mix. Shotcrete shall be proportioned to produce a mix capable of attaining 1,500 psi (10,300 kPa) compressive strength in 3 days and 3,000 psi (20,700 kPa) in 28 days. The shotcrete mix design and method of placement proposed for use at the jobsite shall be submitted by the Contractor at least 14 calendar days prior to beginning shotcrete placement. No admixture shall be used without the permission of the Engineer. If admixtures are used to entrain air, to reduce water-cement ratio, to retard or accelerate setting time, or to accelerate the development of strength, the admixtures shall be used at the rate specified by the manufacturer and approved by the Engineer.

(h) Grout. Provide a neat cement or a sand cement grout to be used in soil nail anchorage consisting of a pumpable mixture capable of attaining 1,500 psi (10,300 kPa) compressive strength in 3 days and 3,000 psi (20,700 kPa) in 28 days per AASHTO T106 (T106M). Chemical additives which control bleed, improve flowability, reduce water content and retard set in the grout are to be used only when approved in writing by the Engineer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Accelerators and expansive additives are not permitted. Grout shall be tested in accordance with AASHTO T106 (T106M) at a frequency of no less than one test for every 50 cubic yards (40 cubic meters) of grout placed. Grout cubes shall promptly be provided to the department for testing.

(i) Nail head anchorage elements. The bearing plates, nuts, shear studs and associated hardware shall conform to the applicable portions of Section 505 of the Standard Specifications. Electrostatically apply epoxy to bearing plates, hardware, and nuts in accordance with AASHTO M284 (M284M). Minimum epoxy thickness shall be 12 mils (300 microns).

(j) Centralizers. Centralizers shall be fabricated from Schedule 40 PVC pipe or tube, steel, or material not detrimental to the nail steel (wood shall not be used).

Design Criteria. The design shall in accordance with the Federal Highway Administration (FHWA) document "Geotechnical Engineering Circular No. 7 Soil Nail Walls" publication number FHWA-IF-03-017, dated March 2003 except as modified herein. The wall supplier shall be responsible for all slope stability aspects of the wall design and shall supply the Department with computations for each designed wall section.

Local and global limit equilibrium stability analysis for critical construction stages and for long term shall be conducted at each design section. A minimum factor of safety against slope stability failure of 1.5 shall be used in the design. The soil/grout bond stress used shall have a minimum factor of two times the ultimate value indicated in the nail verification testing.

Nails shall not extend beyond the right-of-way or easement limits shown on the Plans.

External loads, such as those applied through structure foundations, from traffic or railroads, slope surcharge etc., shall be accounted for in the stability design. The presence of all appurtenances behind, in front of, mounted upon, or passing through the wall volume such as drainage structures, utilities, structure foundation elements or other items shall be accounted for in the design of the wall.

Centralizers shall be spaced no further than 8 ft. (2.5 m) apart with the last centralizers located 1.5 ft (0.5 m) from each end of the nail. They shall be sized to position the nail bar within 1 inch (25 mm) of the center of the drill hole while allowing tremie pipe insertion to the bottom of the drill hole and permit grout to freely flow up the drill hole.

Construction Requirements

General. The soil nailed wall contractor shall direct the overall construction sequence according to the approved shop drawings. If upon excavation, the stability of the wall appears to be in jeopardy, the soil nailed wall contractor may deviate from the approved construction sequence and may limit the area of wall excavated, drill nails through soil berms, or backfill unstable portions of the wall and notify the Engineer.

Excavation. The excavation downward shall proceed in stages, exposing the minimum amount of soil or rock face which will allow the practical and expeditious application of the initial layer of shotcrete and the installation of soil nails while assuring stability of the excavated face and minimizing ground movements. Grade the excavation such that both surface and ground water passing though geocomposite wall drain will flow away from the wall face. Temporary weep holes or other method shall be employed to ensure that no build up of hydrostatic pressure occurs in geocomposite wall drain during construction. Excavation of the next-lower lift shall not proceed until nail installation, reinforced shotcrete placement and cure, bearing plate and nut attachment and testing have been completed in the current lift.

Structure excavation to place the concrete facing shall be measured according to Section 502 except that the horizontal limits for structure excavation shall be from the theoretical rear face of the shotcrete shown on the contract plans and to a vertical plane 2 ft. (600 mm) from the bottom of the outside face of the concrete facing. The depth shall be from the top of the original ground surface to the bottom of the concrete facing. The additional excavation necessary remove material in front of the wall may be paid as part of the roadway excavation but will only be permitted to be completed if approved by the soil nailed wall contractor and the Engineer.

Geocomposite Wall Drain. The geocomposite wall drain shall be installed according to Section 591 except where otherwise directed on the plans and shop drawings. The drain shall be installed with the pervious (fabric) side placed against the soil and kept on a continuous roll or installed in sections and spliced in such a way as to insure unimpeded water flow, and prevent soil or shotcrete from entering the drain core.

Shotcrete. After each stage is cut, in anticipation of shotcreting, the surface shall be cleaned of all loose material, mud, and other foreign matter that will prevent bond of shotcrete. Dampening the application surfaces may be required before shotcreting. Install approved depth gages to verify shotcrete thickness on 6 ft. (1.8 m) max. spacing vertically and horizontally. Previous placed shotcrete shall not be re-covered until it has been allowed to develop its initial set. Then, all laitance and rebound must be removed by brooming or scraping. Remove curing compound placed on previously placed shotcrete surfaces by sandblasting.

Firmly position the wire fabric to prevent vibration while the shotcrete is being applied. Lap mesh one-and-a-half squares in both directions. A minimum cover of 2 inches (50 mm) of shotcrete shall be required.

The shotcrete shall be applied from the bottom up to prevent accumulation of rebound on the surface still to be covered. Shotcrete shall emerge from the nozzle in a steady uninterrupted flow and provide suitable means to screen the nozzle stream if wind or air currents cause separation of the stream during placement.

The contractor shall check for hollow areas by sounding with a hammer. Use approved methods to correct deficient areas. Repair surface defects as soon as possible after initial placement of the shotcrete. All shotcrete which lacks uniformity, exhibits segregation, honeycombing, or lamination, or which contains any dry patches, slugs, voids, or sand pockets shall be removed and replaced with fresh shotcrete.

Nail Installation. Only the drilling, installation, and grouting methods which have been

successfully verification-tested shall be used. Changes in the procedure will require additional

testing at the Contractor’s expense prior to approval.

(a) Handling. Nails shall be handled and stored in a manner to avoid damage or corrosion. The nail steel shall be protected if welding is to be performed in the vicinity. Grounding of welding leads to the nail steel will not be allowed. Nail steel shall be protected from dirt, rust, abrasions, cuts, weld splatter and deleterious substances which might cause material rejection.

(b) Drilling. Holes shall be drilled without the loss of ground or subsidence and may require the use of casing or other installation methods. Small amounts of water may be used in conjunction with air to aid the drilling process. After drilling, the nail shall be installed and fully grouted before placing the reinforced shotcrete. Subject to the Engineer’s approval, the Contractor may place the initial reinforced shotcrete layer prior to drilling nail holes by placing blackouts at the nail locations.

(c) Placement tolerance. Nail head location deviation from plan must not exceed 6 inches (150 mm) in any direction. Nail inclination deviation from plan must not exceed 3 degrees in any direction. Location tolerances are applicable to each nail and not accumulative over large wall areas. Center nail bars within 1 inch (25 mm) of the center of the drill hole.

Soil nails which do not satisfy the specified tolerances will be replaced at no additional cost. Backfill abandoned nail drill holes with tremied grout. Nails which encounter unanticipated obstructions during drilling shall be relocated, as approved by the Engineer. Cost of drilling and backfilling drill holes abandoned due to unanticipated obstructions will be paid for according to Article 109.04 of the Standard Specifications.

(d) Grouting. Grout equipment shall produce a uniformly mixed grout free of lumps and undispersed cement, and be capable of continuously agitating the mix. Use a positive displacement grout pump equipped with a pressure gauge which can measure at least twice the intended grout pressure. Size the grouting equipment to enable the entire nail to be grouted in one continuous operation. Place the grout within 60 minutes after mixing or within the time recommended by the admixture manufacturer, if admixtures are used.

Each drill hole will be grouted within 2 hours of completion of drilling, unless otherwise approved by the Engineer. Inject the grout at the lowest point of each drill hole through a grout tube, casing, hollow-stem auger, or drill rods. Keep the outlet end of the conduit delivering the grout below the surface of the grout as the conduit is withdrawn to prevent the creation of voids. Completely fill the drill hole in one continuous operation. Cold joints in the grout column are not allowed except at the top of the test bond length of verification and proof tested production nails. At the Contractor's option, the grout tube may remain in the hole provided it is filled with grout. Grouting before insertion of the nail is allowed provided the nail bar is immediately inserted through the grout to the specified length without difficulty.

During casing removal for drill holes advanced by either cased or hollow-stem auger methods, maintain sufficient grout level within the casing to offset the external groundwater/soil pressure and prevent hole caving. Maintain grout head or grout pressures sufficient to ensure that the drill hole will be completely filled with grout and to prevent unstable soil or groundwater from contaminating or diluting the grout. Record the grout pressures for soil nails installed using pressure grouting techniques. Control grout pressures to prevent excessive ground heave or fracturing. Nail grout shall set a minimum of 72 hours unless it as attained the specified 3-day compressive strength prior to testing.

(e) Nail head anchorage. The bearing plate and nut shall be attached as shown on the approved shop drawings. The plate shall be seated on a wet grout pad of a pasty consistency similar to that of mortar for bricklaying. The nut shall then be sufficiently tightened to achieve full bearing on the surface behind the plate. After the shotcrete and grout have set a minimum of 24 hours and prior to excavation of the next lift, the nut shall be wrench tightened 100 ft-lbs (1.5 kN-m) of torque. Any visible damage to the corrosion protection on the exposed portions of the nail bar, bearing plate, or nut or shear studs shall be field repaired using manufacturer recommended epoxy kits.

Nail Testing. Verification test(s) shall be conducted on site to establish or confirm the ultimate soil/grout bond stress assumed in the soil nailed wall design calculations. Proof testing will also be required on selected production nails to assure that the design assumptions are satisfied.

The Contractor shall supply all material, equipment, and labor to perform the tests. This equipment shall include 2 dial gauges, dial support, jack, pressure gauge, electronic load cell, and a reaction frame. The pressure gauge shall be graduated in 75 psi (500 kPa) increments or less. The nail head movement shall be measured with 2 dial gauges capable of measuring to 0.001 inch (25 microns). The load applied to the nails during the tests shall be monitored with an electric load cell with compatible read-out device, and recent calibration curve.

All test nails shall have both bonded and temporary unbonded portions to insure test loading the bonded length indicated on the shop drawings and maintain the stability of the drillhole within the unbonded test length. The unbonded length of the test nail shall be at least a 3 ft (1 m).

(a) Verification Testing. Prior to installing production nails, verification testing shall be performed on nails installed with the proposed production drilling and grouting installation system to verify the Contractor's procedures, hole diameter, and design assumptions. The verification test nails shall be sacrificial and not be incorporated as production nails.

Where casing of the unbonded zone is utilized, casing shall be placed in a manner which precludes any reaction against the grouted bond zone nail during testing. The test bonded length L_{BVT} shall be at least 10 ft. (3 m) but not longer than the maximum verification bonded length L_{BVTmax} ft. (m) such that the nail load does not exceed 90 percent of the nail bar capacity during the verification test. The Max. Verification Bonded Length L_{BVTmax} shall be computed as follows:

$$L_{BVTmax} = C \cdot f_y \cdot A_S / (2.0 \cdot Q_{all})$$

where:

C = 0.9 for Grade 60 (420) and 75 (520) verification nails or 0.8 for Grade 150 (1035) verification nails.

f_y = Verification Nail Yield for Grade 60 (420) and 75 (520) or Ultimate stress for Grade 150 (1035), in ksi (MPa).

A_S= Verification Nail Steel Area, in in^2 (mm^2).

Q_{all}= Allowable pullout resistance used in design, in kip/ft (N/m).

The Design Test Load (DTL) shall be taken as $L_{BVT} \cdot Q_{all}$

Verification test nails shall be incrementally loaded to the maximum test load in accordance with the following loading schedule. The soil nail movements shall be recorded at each load increment. The jack shall be positioned at the beginning of the test such that unloading and repositioning of the jack during the test will not be required.

VERIFICATION TEST LOADING SCHEDULE

Test Load	Load-Hold Time
0.05 DTL max.(AL)	1 minute
0.25 DTL	10 minutes
0.50 DTL	10 minutes
0.75 DTL	10 minutes
1.00 DTL	10 minutes
1.25 DTL	10 minutes
1.50 DTL (Creep Test)	60 minutes
1.75 DTL	10 minutes
2.00 DTL	10 minutes
0.05 DTL max.(AL)	1 min. (record permanent set)

The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 5 percent to the DTL. Dial gauges should be set to "zero" after the alignment load has been applied. Following application of the maximum load (2.0 DTL) reduce the load to the alignment load (0.05 DTL maximum) and record the permanent set.

The load-hold period shall start as soon as the test load is applied. The verification test nails shall be monitored for creep at the 1.50 DTL load increment. Nail movements during the creep portion of the test shall be measured and recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50 and 60 minutes. The load during the creep test shall be maintained within 2 percent of the intended load by use of the load cell.

Proof Testing. Proof testing shall be performed on at least 5 percent of the production nails in each nail row or minimum of 1 per row as shown on the approved shop drawings or as directed by the Engineer. The test bonded length L_{BPT} shall be at least 10 ft. (3 m) but not longer than the maximum proof bonded length L_{BPTmax} ft. (m) such that the nail load does not exceed 90 percent of the bar capacity during the proof test. Production proof test nails shorter than 12 ft (3.6 m) in length may use less than 10 ft. (3 m) bonded lengths. The Max. Proof Bonded Length shall be computed as follows:

$$L_{BPTmax} = C \cdot f_y \cdot A_S / (1.5 \cdot Q_{all})$$

where:

C = 0.9 for grade 60 (420) and 75 (520) proof nails or 0.8 for grade 150 (1035) proof nails.

f_y = Proof Nail Yield for grade 60 (420) and 75 (520) or Ultimate stress for grade 150 (1035), in ksi (MPa).

A_S= Proof Nail Steel Area, in in^2 (mm^2).

Q_{all}= Allowable pullout resistance used in design, in kip/ft (N/m).

The Design Test Load (DTL) shall be taken as $= L_{BPT} \cdot Q_{all}$

Proof test nails shall be incrementally loaded to the maximum test load in accordance with the following loading schedule. The soil nail movements shall be recorded at each load increment.

PROOF TEST LOADING SCHEDULE

Test Load	Load-Hold Time
0.05 DTL max.(AL)	Until Movement Stabilizes
0.25 DTL	Until Movement Stabilizes
0.50 DTL	Until Movement Stabilizes
0.75 DTL	Until Movement Stabilizes
1.00 DTL	Until Movement Stabilizes
1.25 DTL	Until Movement Stabilizes
1.50 DTL (max. test load)	Creep Test (see below)

The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 5 percent to the DTL. Dial gauges should be set to “zero” after the alignment load has been applied.

The creep period shall start as soon as the test load (1.5 DTL) is applied and the nail movement shall be measured and recorded at 1, 2, 3, 5, 6, and 10 minutes. Where the nail movement between 1 minute and 10 minutes exceeds 0.04 inch (1 mm), the maximum test load shall be maintained an additional 50 minutes and movements shall be recorded at 20 minutes, 30, 50, and 60 minutes. The load during the creep test shall be maintained within 5 percent of the intended.

(b) Test Acceptance Criteria. A test nail shall be considered acceptable when all of the following criteria are met:

(1) For verification tests, the total creep movement is less than 0.08 inch (2 mm) between the 6 and 60 minute readings and the creep rate is linear or decreasing throughout the creep test load hold period.
(2) For proof tests, the total creep movement is less than 0.04 inches (1 mm) between the 10 minute readings or the total creep movement is less than 0.08 inches (2 mm) during the 60 minute readings and the creep rate is linear or decreasing throughout the creep test load hold period.
(3) For verification and proof tests, the total measured movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the test nail unbonded length.
(4) A pullout failure does not occur at the 2.0 DTL under verification testing and 1.5 DTL test load under proof testing. Pullout failure is defined as the point where the jack cannot maintain the desired load for the desired period due to nail movement.
(5) Stability of the drill hole excavation has been maintained in the unbonded portion of the nail length during and after testing.

Verification test nails not satisfying the testing criteria shall be replaced with an additional verification test nail using alternative drilling and grouting methods or lower allowable grout to soil bond stress which would necessitate wall design revisions.

Proof test nails not satisfying the testing criteria shall require the Contractor to replace some or all of the installed production nails between a failed proof test nail and an adjacent passing proof test nail. The Engineer may also require design modifications including additional nails, reducing the nail design load, increasing the drill hole diameter or revising the construction procedures and testing additional nails.

Method of Measurement. Soil Nailed Retaining Wall will be measured for payment in square feet (square meters). This measurement will be taken form the top of the concrete facing to the base extending along the length of the wall.

The geocomposite wall drain will be measured for payment in place in square yards of the actual surface area covered as approved in the contractors shop drawings.

Basis of Payment. This work, including excavation, reinforced shotcrete, soil nails, concrete facing, and accessories will be paid for at the contract unit price per square foot (square meter) for SOIL NAILED RETAINING WALL.

The geocomposite wall drain shall be paid for at the contract unit price per square yard (square meter) for GEOCOMPOSITE WALL DRAIN.

Obstruction mitigation shall be paid for according to Article 109.04.

SUBGRADE FILTER FABRIC (ILLINOIS TOLLWAY)
Effective: December 18, 2013 Revised: April 1, 2016

Description. This work shall consist of furnishing and installing geotextile filter fabric on a prepared earth surface for subgrade separation from the open graded coarse aggregate used with the pay item for AGGREGATE SUBBASE SPECIAL under pavements.

Materials. The filter fabric shall be in accordance with Article 1080.03 of the Standard Specifications with the physical properties of gradation 4 & 5.

CONSTRUCTION METHODS
Construction for the placement or installation of the filter fabric over prepared subgrades shall be in accordance with Section 282 of the Standard Specifications except as modified herein.

Revise Article 282.04 of the Standard Specifications to read as follows:

"Prior to the installation of the fabric, the application surface shall be cleared of debris and sharp objects. The filter fabric shall not be placed on a subgrade until the preparation has been approved by the Engineer. All wheel tracks or ruts in excess of 3 inches in depth shall be graded smooth or otherwise filled with soil or embankment to provide a reasonably smooth surface."

Add the following paragraphs to Article 282.05 of the Standard Specifications:

"The granular blanket or material to be placed over the installed fabric shall consist of the coarse open graded aggregate specified in the Illinois Tollway special provision for Aggregate Subbase Special. The Aggregate Subbase Special material shall be back dumped on the fabric in a sequence of operations beginning at the outer edges of the treatment area with subsequent placement towards the middle.

Placement of material on the fabric shall be accomplished by spreading dumped material off of previously placed material with a bulldozer blade or endloader, in such a manner as to prevent tearing or shoving of the cloth. Dumping of material directly on the fabric will only be permitted to establish an initial working platform. No vehicles or construction equipment shall be allowed on the fabric prior to placement of the granular material."

Replace Article 282.07 of the Standard Specifications with the following:

282.07 Protection. The granular subbase aggregate special material shall be placed to the full required minimum thickness and compacted before any loaded trucks are allowed on the subbase aggregate special material over the fabric.

Fabric which is damaged during installation or subsequent placement of granular material, due to failure of the Contractor to comply with these provisions, shall be repaired or replaced at no additional cost to the Illinois Tollway. Fabric damaged during its installation or during placement of the granular aggregate shall be replaced or repaired. Repairs shall be made by removing the material around the damage and covering it with a patch of fabric using an overlap of 4 feet in each direction. The patch shall be held in position with securing pins.

Method of Measurement. This work will be measured for payment in place and the area computed in square yards. The buried edges of the fabric will not be measured for payment and the overlap joints and seams will be measured as a single lift of material..

Basis of Payment. This work will be paid for at the contract unit price per square yard for SUBGRADE FILTER FABRIC.

The granular blanket placed over the filter fabric will be paid for at the contract unit price per cubic yard for AGGREGATE SUBBASE SPECIAL, 8 in.

Pay Item Number	Designation	Unit of Measure
JI282010	SUBGRADE FILTER FABRIC	SQ YD

ASPHALT STABILIZED SUBBASE (ILLINOIS TOLLWAY BDE)
Effective: September 21, 2011 Revised: April 1, 2016

Description. This work shall consist of constructing Stabilized Subbase Hot Mix Asphalt (HMA) or Warm Mix Asphalt (WMA) according to Section 312 of the Standard Specifications except as modified herein. When Stabilized Subbase WMA is required by design, Stabilized Subbase HMA may be utilized for special or low tonnage applications in lieu of Stabilized Subbase WMA upon approval by the Engineer at no additional cost to the Illinois Tollway. When Stabilized Subbase HMA is required by design, Stabilized Subbase WMA may be utilized for special or low tonnage application in lieu of HMA mixtures upon approval by the Engineer at no additional cost to the Illinois Tollway.

Revise Article 312.03 of the Standard Specifications to read as follows:

312.03 Materials. Materials shall be according to Section 1030 of the standard specifications except at modified herein.

"Reclaimed Asphalt Shingles (RAS) used in any mixture shall be according to the Illinois Tollway special provision for RECLAIMED ASPHALT SHINGLES.

For construction or resurfacing projects when the WMA binder and surface course mixtures are used, the WMA mix designs, production and placement shall be in accordance with the Illinois Tollway special provision for ASPHALT BINDER AND SURFACE COURSE MIXTURES."

Add Article 1030.04(a)(4) of the Standard Specifications to read as follows:

"(4) All Other Mixtures. The Job Mix Formula (JMF) shall fall within the following limits.

All Other, MIXTURE COMPOSITION, % by Dry Weight			
Without RAP		With RAP	
Virgin Aggregate	93.0 to 96.0	Virgin Aggregate	46.0 to 96.0
		RAP Materials	0 to 50
		Mineral Filler (If required)	0 to 5.0
Asphalt Binder	4.0 to 7.0	Asphalt Binder	4.0 to 7.0
Ratio Dust/Asphalt Binder	1.4 (max)	Ratio Dust/Asphalt Binder	1.2 (max)

"

Add Article 1030.04(b)(4) of the Standard Specifications to read as follows:

"(4) All Other Mixtures.

VOLUMETRIC REQUIREMENTS All Other			
Mixture Composition	Design Compactive Effort	Design Air Voids Target%	Design VMA, %, minimum
All Other	N_{DES} = 50	2.0	11.0

"

Revise Article 1030.05(d)(2)b. of the Standard Specifications to read as follows:

"b. Dust-to-Asphalt and Moisture Content. During production, the dust-to-asphalt binder ratio and the moisture content of the mixture at discharge from the mixer shall meet the following.

Parameter	High ESAL Mixture Low ESAL Mixture	All Other Mixtures
Ratio Dust/Asphalt Binder	0.6 to 1.2	0.6 to 1.4
Moisture	0.3 %	0.3 %

If at any time the dust-to-asphalt binder ratio or moisture content of the mixture falls outside the stated limits, production of the HMA shall cease. The cause shall be determined and corrective action satisfactory to the Engineer shall be initiated prior to resuming production."

Revise Article 1030.05(d)(4) of the Standard Specifications to read as follows:

"(4) Control Limits. Target values shall be determined by applying adjustment factors to the AJMF where applicable. The target values shall be plotted on the control charts within the following control limits.

CONTROL LIMITS			
Parameter	High ESAL Low ESAL Individual Test	High ESAL Low ESAL Moving Avg. of 4	All Other Individual Test
% Passing: 1/			
1/2 in. (12.5 mm)	± 6 %	± 4 %	± 15 %
No. 4 (4.75 mm)	± 5 %	± 4 %	± 10 %
No. 8 (2.36 mm)	± 5 %	± 3 %	
No. 30 (600 µm)	± 4 %	± 2.5 %	
Total Dust Content No. 200 (75 µm)	± 1.5 %	± 1.0 %	± 2.5 %
Asphalt Binder Content	± 0.3 %	± 0.2 %	± 0.5 %
Voids	± 1.2 %	± 1.0 %	± 1.2 %

1/ Based on washed ignition oven

DENSITY CONTROL LIMITS		
Mixture Composition	Parameter	Individual Test
IL-9.5, IL-12.5	Ndesign ≥ 90	92.0 – 96.0 %
IL-9.5,IL-9.5L, IL-12.5	Ndesign < 90	92.5 – 97.4 %
IL-19.0, IL-25.0	Ndesign ≥ 90	93.0 – 96.0 %
IL-19.0, IL-19.0L, IL-25.0	Ndesign < 90	93.0 – 97.4 %
All Other	Ndesign = 50	95.0 1/ - 97.4 %

1/ 92.0 % when placed as first lift on an unimproved subgrade."

Method of Measurement. This work shall be measured in accordance with Article 312.15 of the Standard Specifications.

Basis of Payment. This work shall be paid for in accordance with Article 312.16 of the Standard Specifications except as modified herein:

Add the following to Article 312.16 of the Standard Specifications:

"STABILIZED SUBBASE HMA and STABILIZED SUBBASE WMA will be paid for under its respective item. If permissive use of an HMA mixture in place of a specified WMA mixture is granted by the Engineer, a new pay item will be established for the HMA with the same unit price. If permissive use of a WMA mixture in place of a specified HMA mixture is granted by the Engineer, a new pay item will be established for the WMA with the same unit price."

Pay Item Number	Designation	Unit of Measure
JI312010	STABILIZED SUBBASE 3"	SQ YD
JI312020	STABILIZED SUBBASE – HMA, 3"	SQ YD
JI312021	STABILIZED SUBBASE – WMA, 2"	SQ YD
JI312022	STABILIZED SUBBASE – WMA, 3"	SQ YD

AGGREGATE SHOULDERS (ILLINOIS TOLLWAY RECURRING)
Effective: October 23, 2006 Revised : September 27, 2011

Revise Section 481 of the Standard Specifications to read:

"SECTION 481. AGGREGATE SHOULDERS

481.01 Description. This work shall consist of the furnishing and placing filter fabric (for new shoulders where specified) furnishing, placing, shaping and compacting aggregate on a prepared subgrade adjacent to the edges of the completed pavement structure or stabilized shoulder.

481.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate (Note 1)	1004.04
(b) RAP Material (Note 2)	1031
(c) Filter Fabric (Note 3)	1080.02

Note 1. Grading shall be CA-6 with aggregate shoulders Type A and B, and CA-1 for aggregate shoulders special, Type C.

Note 2. Reclaimed asphalt pavement (RAP) may be used as aggregate wedge shoulders Type B and Aggregate Shoulders, Type B.

Note 3. Filter fabric shall meet the requirements of Article 1080.02 for ground stabilization.

481.03 Equipment. Equipment shall be according to the following.

Item	Article/Section
(a) Tamping Rollers	1101.01
(b) Pneumatic-Tired Rollers	1101.01
(c) Three-Wheel Rollers (Note 1)	1101.01
(d) Tandem Rollers (Note 1)	1101.01
(e) Vibratory Machine (Note 2)	
(f) Aggregate Spreaders	1102.04

Note 1. Three-wheel or tandem rollers shall weigh from 6 to 10 tons and not less than 200 lb/in. nor more than 325 lb/in. of width of roller.

Note 2. The vibratory machine shall meet the approval of the Engineer.

CONSTRUCTION REQUIREMENTS

481.04 Subgrade Preparation. The subgrade shall be prepared in a manner approved by the Engineer and any required filter fabric shall be placed.

481.05 Moisture Content. Prior to being placed on the subgrade, the aggregate shall contain sufficient moisture to provide satisfactory compaction.

For Type A shoulders, the water and aggregate shall be mixed through a controlled aggregate mixing system. The system shall consist of a mechanical mixing device and aggregate and water measuring devices, meeting the approval of the Engineer. Wetting the aggregate in cars, bins, stockpiles, or trucks will not be permitted.

481.06 Aggregate Shoulders With and Without Filter Fabric, Type A and Type B. The shoulders shall be constructed in lifts of not more than 6 in. thick when compacted, except that if tests indicate the desired results are being obtained, the compacted thickness of any lift may be increased to a maximum of 8 in. . The aggregate shall be placed with a spreader.

Each lift of material shall be compacted with a tamping roller, a pneumatic-tired roller, a vibratory machine, or a combination of any of the three, until the compaction has been approved by the Engineer. If the moisture content of the material is not such as to permit satisfactory compaction during the compacting operations, water shall be added in such quantity that satisfactory compaction can be obtained. The top lift shall be given a final rolling with a three-wheel or tandem roller.

If any subgrade material is worked into the aggregate during the compacting or finishing operation, all granular material within the affected area shall be removed and replaced with new aggregate.

The shoulders shall be constructed to the thicknesses shown on the plans. Thickness determinations shall be made at such points as the Engineer may select. When the constructed thicknesses are less than 90 percent of the thicknesses shown on the plans, aggregate shall be added to obtain the required thicknesses; however, the surface elevation of the completed shoulders shall not exceed by more than 1/8 in. the surface elevation shown on the plans or authorized by the Engineer.

481.07 Aggregate Wedge Shoulders, Type B. Prior to placing the aggregate wedge shoulder, Type B, the weeds and grass on the area to be covered shall be cut. The aggregate shall be deposited in its final position with a spreader and compacted to the satisfaction of the Engineer. If the moisture content of the aggregate is not such as to permit satisfactory compaction during the rolling operations, water shall be added in such quantity that satisfactory compaction can be obtained.

481.08 Aggregate Shoulders Special, Type C. The aggregate shoulder special, Type C, shall be placed along the edge of paved shoulders or as a backfill behind curbs constructed at the edge of shoulder only where there is to be existing or new guardrail at the completion of the The Work or in other specific locations such as large wash-outs at the edge of shoulders.

Before any aggregate is placed, weeds, grass, and miscellaneous vegetation shall be removed from the area in a manner acceptable to the Engineer. The Contractor shall give the Engineer at least 48 hours notice that an area will be prepared to receive treatment, prior to the placement of the aggregate.

The aggregate shall be placed along the existing pavement or behind the existing curb in sufficient quantity and in such a manner that after compaction the aggregate shall have the configuration shown on the Plans. If any subgrade material is worked into the aggregate during the compacting or finishing operation, all granular material within the affected area shall be removed and replaced with new aggregate.

Aggregate containing free water at the time of delivery will be rejected by the Engineer and shall not be incorporated in the work.

481.08 Opening to Traffic. The road shall be open to traffic according to Article 701.07.

481.09 Method of Measurement. This work will be measured for payment in tons, cubic yards or square yards according to Article 311.08, except payment will not be made for aggregate outside the plan width.

481.10 Basis of Payment. This work will be paid for at the contract unit price per ton or per cubic yard for AGGREGATE SHOULDERS, TYPE A, AGGREGATE SHOULDERS, TYPE B, AGGREGATE SHOULDERS WITH FILTER FABRIC, TYPE A, or AGGREGATE SHOULDERS WITH FILTER FABRIC, TYPE B; at the contract unit price per ton for AGGREGATE WEDGE SHOULDER, TYPE B, or AGGREGATE SHOULDERS SPECIAL, TYPE C; or at the contract unit price per square yard for AGGREGATE SHOULDERS, TYPE A, AGGREGATE SHOULDERS, TYPE B, AGGREGATE SHOULDERS WITH FILTER FABRIC, TYPE A, or AGGREGATE SHOULDERS WITH FILTER FABRIC, TYPE B of the thickness specified."

ASPHALT SHOULDERS (ILLINOIS TOLLWAY)
Effective: March 26, 2010 Revised: August 14, 2014

Description. This work shall consist of constructing Asphalt Shoulders using hot mix asphalt (HMA) or warm mix asphalt (WMA) according to Section 482, of the Standard Specifications except as modified herein. When WMA mixtures are required by design, a HMA mixture may be utilized for special or low tonnage applications in lieu of WMA mixtures upon approval by the Engineer at no additional cost to the Tollway. When HMA mixtures are required by design, a WMA mix may be utilized for special or low tonnage application in lieu of HMA mixtures upon approval by the Engineer at no additional cost to the Tollway.

Revise Article 482.02 of the Standard Specifications to read:

482.02 Materials. Materials shall be according to Section 406 and Section 1030 of the standard specifications except at modified herein.

"For construction or resurfacing projects when the HMA or WMA binder and surface course mixtures option is used, the asphalt cement used in the top lift shall not be increased above the amount required in the mix design.

Reclaimed Asphalt Shingles (RAS) used in any mixture shall be according to the Tollway special provision for RECLAIMED ASPHALT SHINGLES.

For construction or resurfacing projects when the WMA binder and surface course mixtures are used, the WMA mix designs, production and placement shall be in accordance with the special provision for ASPHALT BINDER AND SURFACE COURSE MIXTURES. However, the Hamburg testing requirements for shoulders mixtures using WMA technology do not apply."

Revise Note 2 of Article 1030.02 of the Standard Specifications to read as follows:

"Note 2. The Contractor shall use the asphalt binder as shown on the plans"

Revise Article 1030.04(a)(3) of the Standard Specifications to read as follows:

Add the following to Article 1030.04 (b) of the Standard Specifications:

"(4) HMA and WMA N50 Binder

VOLUMETRIC REQUIREMENTS Tollway Shoulder Binder			
Ndesign	Design Air Voids Target%	Design Voids in the Mineral Aggregate (VMA), % minimum	Design Voids Filled with Asphalt Binder (VFA), %
50	3.0	12.5	65-78

"

DENSITY CONTROL LIMITS		
Mixture Composition	Parameter	Individual Test
IL-9.5, IL-12.5	Ndesign ≥ 90	92.0 – 96.0 %
IL-9.5,IL-9.5L, IL-12.5	Ndesign < 90	92.5 – 97.4 %
IL-19.0, IL-25.0	Ndesign ≥ 90	93.0 – 96.0 %
IL-19.0, IL-19.0L, IL-25.0	Ndesign ≥ 70 & < 90	93.0 – 97.4 %
IL-19.0, IL-19.0L, IL-25.0	Ndesign = 50	94.0 – 98.4%

1/ 92.0 % when placed as first lift on an unimproved subgrade."

Method of Measurement. This work will be measured for payment in accordance with Article 482.07 of the Standard Specifications.

Basis of Payment. This work will be paid for in accordance with Article 482.08 of the Standard Specifications except as modified herein.

Add the following to Article 482.08 of the Standard Specifications:

HOT-MIX ASPHALT SHOULDERS or WARM-MIX ASPHALT SHOULDERS of the specified thickness will be paid for under its respective item. If permissive use of an HMA mixture in place of a specified WMA mixture is granted by the Engineer, a new pay item will be established for the HMA with the same unit price. If permissive use of a WMA mixture in place of a specified HMA mixture is granted by the Engineer, a new pay item will be established for the WMA with the same unit price."

PORTLAND CEMENT CONCRETE PAVEMENT (ILLINOIS TOLLWAY)
Effective: November 20, 2013 Revised: October 15, 2014

DESCRIPTION
This work consists of:
1. Furnishing, mixing, and placing ternary concrete mixes to portland cement concrete pavements (jointed) as shown and described on the Drawings and in this Special Provision;
2. Supplying and installing all specified reinforcement;
3. Developing concrete mix design(s) that meets the performance requirements for the intended pavement;
4. Constructing the concrete pavement on a prepared subgrade, or subbase, without forms.
5. Verifying dowel bar alignment with periodic magnetic particle scans of joints using a magnetic imaging tomography (MIT) device.

Ternary concrete mix refers to concrete that incorporates portland cement, ground granulated blast furnace slag, fly ash, and other supplementary cementitious materials (SCM) to produce a mix with at least three constituent materials. A Type IT blended ternary cement in accordance with AASHTO M 240 shall be acceptable. A Type IP or IS blended cement in accordance with AASHTO M 240 may be used with ternary mixes when an SCM is combined as a third constituent material to produce a ternary mix. Slag, fly ash, and any other SCM's combined as constituent materials in a mix or as part of a blended cement may consist of no less than 35% and no more than 50% of the total cementitious material in any ternary mix design.

Reference Standards
Except where modified by the Illinois Department of Transportation or the Tollway, the following Standards shall apply:
Illinois Department of Transportation (IDOT)

- Standard Specifications for Road and Bridge Construction, Adopted January 1, 2012.
- Supplemental Specifications and Recurring Special Provisions, Current Edition.
- Tollway Supplemental Specifications to the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, Current Edition.

MATERIALS

Materials shall be according to Article 420.02 of the Standard Specifications except as modified herein:

Concrete supplied for the concrete pavement under this special provision will be a Tollway Class TL mix designed in accordance with the Performance Related Special Provision for Ternary Concrete Mix Designs for Portland Cement Concrete Pavement. The coarse aggregate used in the mix design shall be from sources that are certified by IDOT as 30 year life aggregates.

EQUIPMENT

Equipment shall be according to Article 420.03 of the Standard Specifications except as modified herein.

Add the following to Article 420.03 of the Standard Specifications:

"(k) MIT-Scan-2. Tollway QA shall use a MIT-Scan-2 device which is manufactured by MIT GmbH to measure dowel bar alignment following concrete placement. The device shall be validated on the Tollway's approved MIT Scan validation system for the specific dowel bar size or load transfer device being placed, and should be operated within the manufacturer's tolerances."

CONSTRUCTION METHODS

The Portland Cement Concrete Pavement shall be constructed as a Jointed Plain Concrete Pavement according to Articles 420.04 through 420.18 of the Standard Specifications except as modified herein.

Replace Article 420.05(c)(2) of the Standard Specifications with the Following:

(2) Dowel Bar Assemblies/Insertions. When dowel bars are specified in the Contract, they shall be installed with the dowel bars parallel to the proposed pavement surface and to each other. Installation shall be within the tolerances specified. The bar size, grade, and spacing shall be as specified. Dowel bars shall be furnished in a rigid welded assembly or placed by a dowel bar insertion (DBI) machine. With placements using a dowel bar assembly, the assembly shall be at right angles to the centerline of pavement. Prior to placing concrete, any deviation for the dowel bars from the correct horizontal or vertical alignment greater than 3/8 inch in 12 inches shall be corrected and a light coating of oil shall be uniformly applied to the dowel bars.

The dowel bar assembly, if used, shall act as a rigid unit with each component securely held in position relative to the other members of the assembly. Horizontal support wires or shipping tie wires shall be non-deformed bars or wires with a diameter less than or equal to 0.3249 inches (gauge 0 wire). The number of horizontal support wires or shipping tie wires shall be limited to five per assembly. The entire assembly shall be held securely in place by means of nails which shall penetrate the stabilized subbase. At least ten nails shall be used for each 10, 11, or 12 foot section of assembly. Bearing plates shall be punched to receive the nails. When bearing plates are omitted on stabilized subbase, other methods for securing the assembly with nails shall be provided.

Metal stakes shall be used instead of nails, with soil or granular subbase, to secure the dowel bar assembly. The stakes shall loop over or attach to the top parallel spacer bar of the assembly and penetrate the subgrade or subbase at least 12 inches.

The horizontal support wires or shipping tie wires of the dowel bar assembly shall be cut near the welds and removed prior to concrete placement. At the location of each dowel bar assembly, the subgrade or subbase shall be reshaped and re-tamped when necessary.

A dowel bar inserter (DBI) used with a slip-form paver meeting the requirements of Article 1103.16 may be used in lieu of the dowel bar assemblies specified above. When a dowel bar inserter is used to install dowel bars, space the bars according to design requirements. Dowel bar inserters shall insert dowel bars into the top of the plastic concrete which has been placed and consolidated to full depth. The bars shall be inserted ahead of the finishing beam or screed and the installing device shall so consolidate the concrete that no voids exist around the dowel bars. The forward movement of the finishing beam or screed shall not be interrupted by the inserting of the dowel bars.

When a DBI is used, the Contractor shall submit details and specifications of the proposed slip-form paver and DBI to the Engineer a minimum of 14 calendar days prior to the concrete pavement pre-paving meeting. The Contractor shall detail his methodology for ensuring correct marking of dowel bar insertion points and correct sawing of the joints. The Contractor shall ensure that the slip-form paver is compatible with the DBI.

Add the following to Article 420.05(c) of the Standard Specifications:

"(3) Verification of Dowel Bar Alignment.

a. Dowel Alignment Tolerances. Dowel placement tolerances for 18 inch dowel bars shall be as follows:

A weighted-score system will be used to conduct a joint–by-joint evaluation of rotational misalignments of the dowel bars. The Joint Score, as defined in this evaluation, is a measure of the combined effects of rotational misaligned dowel bars at a transverse joint between any two longitudinal joints or between a longitudinal joint and edge of pavement. A Joint Score is determined by summing the product of the weights (given in the table below) and the number of bars in each misalignment category and adding 1. For example, if a joint has four misaligned bars in the 0.6 to 0.8 inch range, the joint score is 9; if a joint has one misaligned bar in the 0.6 to 0.8 inch range and one bar in the 1 to 1.5 inch range, the score is 8. A joint score of 12, irrespective of the number of dowel bars at the joint, is the critical level, above which the risk of joint locking is considered high.

Range of Rotational Misalignment	Weight
0.4 in. < d < 0.6 in.	0
0.6 in < d < 0.8 in.	2
0.8 in. < d < 1 in.	4
1 in. < d < 1.5 in.	5

An individual dowel bar or joint may be rejected based on the Rejection Criteria.

Rejection Criteria:

Horizontal and Vertical Rotational Alignment –

- Five or more consecutive joints with joints scores greater than 12.
- Any individual bars with misalignment greater than 1.5 inches.

Longitudinal (side) Shift –

- For joints with bars only in the wheel paths, any joints with fewer than three bars in each wheel path with a minimum embedment length of 6.0 inches.
- For joints with dowels fully across the joint, any joint where the first ten bars from the right travel lane edge contains fewer than six bars with a minimum embedment length of 6.0 inches.

Depth –

- Any bar with the concrete cover above the bar less than 4.0 inches from the concrete surface.
- Any bar that has been cut during the joint saw cutting operation.
- For joints with bars only in the wheel paths, any joint with more than two bars closer than 3.0 inches from the bottom of the slab.
- For joints with dowels fully across the joint, any joint where the first ten bars from the right travel lane edge contain more than four bars closer than 3.0 inches from the bottom of the slab.

Corrective Measures:

The following corrective measures will be considered for the bars or joints that fail to meet the minimum standard as described by the Rejection Criteria. The Contractor shall submit his method of repair to the Engineer for approval. All repair materials and techniques shall be preapproved.

Joint Score -

- Saw cut one or more misaligned bars, perform dowel bar retrofit, or install Class B patch at one or more joints so that there are no more than four consecutive joints with a Joint Score greater than 12.

Individual Bar Rejection –

- Saw cut any bar with horizontal or vertical rotational alignment greater than 1.5 inches.

Depth –

- Remove any bar with concrete cover above the bar less than 4.0 inches from the concrete surface. Removal shall be done using the dowel bar retrofit procedure in accordance with the Tollway special provision for Dowel Bar Retrofit except the maximum width of the opening in the pavement shall be 4.0 inches centered on the bar. If the bar is unable to be removed using the method described above, replace the joint with a Class B patch.

For all rejection issues, ensure that a minimum of three bars per wheel path are acceptable for joints with bars only in the wheel paths. For joints with dowels fully across the joint, ensure that a minimum of six bars out of the first ten bars from the right travel lane edge are acceptable. Corrective measures can be Class B patching or dowel bar retrofits.

Regardless of the dowel bar placement method used, the Contractor shall demonstrate their ability to place dowel bars in conformance with the specifications."

Add the following to Article 420.07 of the Standard Specifications:

"When the surface temperature, as measured with a device as approved by the Engineer, of the Stabilized Subbase is 115 °F or greater the Contractor shall spray the Stabilized Subbase with a water mist with equipment that meets the approval of the Engineer. The Stabilized Subbase shall be cooled below 115 °F prior to paving on top. The water spray shall not produce excessive water runoff or leave puddles on the Stabilized Subbase at the time of paving. All cooling shall be completed a minimum of 10 minutes prior to paving. The surface temperature shall be monitored during the paving operation to determine if the Stabilized Subbase requires re-spraying. The water used shall meet the requirements of Section 1002 of the Standard Specifications.

(a) Procedures for Verification of Dowel Bar Alignment During Production. When using either dowel bar assemblies or an automatic dowel bar inserter, the Tollway shall use the calibrated MIT-Scan-2 to verify the position and alignment of the dowel bars during production. The Contractor shall ensure that the surface to be tested is clear of any loose stone or other debris. All joints to be scanned must be cleaned by the Contractor within 24 hours of placement. To facilitate data analysis, all joints evaluated shall be scanned by the Tollway with the MIT-Scan-2 device moving in the same direction as concrete placement or as directed by the Engineer.

During production, dowel bar placement testing frequency by the Tollway shall be a minimum of one location of each continuous traffic lane or ramp lane paved each day. Sections of mainline designed to be greater than 150 linear feet and less than 1,250 linear feet during a day of placement require a minimum of one test location. Testing locations shall be determined by a random procedure so that each area has a randomly selected transverse joint location. At each location, ten consecutive joints shall be tested by Tollway QA using the MIT-Scan-2 device. If a joint is rejected on the basis of the Joint Score or of the individual bar criteria, then additional joints adjacent to the ten original joints are tested until at least five consecutive joints meet all acceptance criteria. Satisfactory control is considered to have been established when no rejectable dowel bars have been identified during three consecutive days of concrete paving. Once satisfactory control is established, a minimum of one location (ten joints) within every three days of production shall be selected by the Engineer for evaluation. If a joint rejection then occurs, Tollway QA will conduct daily MIT Scan analysis until satisfactory control is re-established.

Sections of continuous pavement constructed by the project less than 150 linear feet will not require dowel bar placement testing.

All delays or costs associated with proposed equipment, materials, or processes being rejected for use by the Engineer will not be paid for by the Tollway.

For each week of production, the Tollway shall prepare a report from the measurements obtained. All data shall be submitted in the manufacturer's native file format, along with the calibration files. The Tollway shall submit a standard report generated using MagnoProof or approved equivalent software (electronic Excel report) to the Engineer at the start of each work week during production for the previous week's work.

The electronic report shall include the following:

a. Contract number, date, highway number and direction of traffic.
b. Joint number, lane number and station.
c. Bar number and x-location of dowel bar.
d. Horizontal and vertical misalignment in inches.
e. Side shift in inches.
f. Depth to center of dowel bar in inches.
g. Depth to the top end of the dowel bar in inches.
h. Joint Score.
i. All out-of-tolerance readings shall be highlighted in red.

If the Tollway determines that the measurement data for a dowel bar is affected by magnetic interference, then the dowel bar shall be evaluated using other means. If the magnetic interference occurs at a longitudinal joint, the Contractor shall verify proper tie bar placement and remediate the longitudinal joint to the satisfaction of the Engineer.

Revise Article 420.09(e)(1) of the Standard Specifications to read:

"Type A. Texturing of the top of plastic concrete shall be obtained by the use of an artificial turf drag followed immediately by a mechanically operated metal comb longitudinal tining device. Hand finishing methods will be permitted only in the event of breakdown of the mechanical equipment or for confined locations where the mechanical equipment cannot be operated. Hand methods may be used to strike off, consolidate, and finish the concrete only in the confined locations and where the concrete has already been deposited on the grade when the breakdown occurs.

The artificial turf shall be made of molded polyethylene with synthetic turf blades approximately 0.85 inches long and contain approximately 7,200 individual blades per square foot. The drag shall be suitably attached to an approved device that will permit control of the time and rate of texturing. The artificial turf shall be full pavement width and of sufficient size that during the finishing operation; approximately 2 feet. of the turf parallel to the pavement centerline will be in contact with the pavement surface. The drag shall be operated in a longitudinal direction so as to produce a uniform appearing finish meeting the approval of the Engineer. If necessary for maintaining intimate contact with the pavement surface, the drag may be weighted using lumber, rebar, or other suitable material.

The metal comb shall consist of a single line of tempered spring steel tines spaced at 0.75-inch centers and securely mounted in a suitable head. The tines shall be flat and of a size and stiffness sufficient to produce a groove of the specified dimensions in the plastic concrete without tearing of the pavement edge or surface. The Contractor shall modify the equipment or operations if an acceptable pavement edge or surface is not produced. The mechanically operated metal comb shall be attached to an exclusive piece of equipment which is mechanically self-propelled.

The tining device shall be operated so as to produce a relatively uniform pattern of grooves parallel to the pavement centerline spaced at approximately 0.75-inch centers, 0.13 to 0.19 inch deep, and 0.13 inch wide. Longitudinal tining shall stop at the edge of travel lanes. Tining devices shall be maintained clean and free from encrusted mortar and debris to ensure uniform groove dimensions. The tining finish shall not be performed too soon after pavement placement whereby the grooves may close up. The tining grooves shall be neat in appearance, parallel with the longitudinal joint, uniform in depth and in accordance with these specifications.

Hand tining or tining with a mechanically operated comb combined with the curing equipment specified in Article 1101.09 of the Standard Specifications will be permitted where the specifications permit hand finishing or vibratory screeds, one lane construction up to 16 ft. wide, gaps, projects with a net length of ½ mile or less, and where the production rate on any paving day will be less than 1,500 cubic yards per day. A foot bridge shall be provided for the hand tining operation for all pavements over 12 ft. wide, unless it can be demonstrated to the satisfaction of the Engineer that an alternate texturing operation produces satisfactory results."

SURFACE TESTS

Replace Article 420.10 of the Standard Specifications with the following:

The Contractor shall perform pavement smoothness testing for all mainline and ramp pavements in accordance with the Tollway Special Provision for Surface Smoothness Testing, except where modified herein. The requirement for surface testing according to the IDOT BDE Special Provisions for Surface Testing of Pavements shall be removed and replaced in the Tollway Special Provision for Profile Diamond Grinding with the Tollway Special Provision for Surface Smoothness Testing.

Pavement smoothness testing shall be performed by the Contractor just prior to any change in maintenance of traffic stages, before opening the pavement to public traffic, and only after any corrective actions / grinding is performed by the Contractor. The smoothness measurements shall be reported for each mainline paving section per roadway lane. The smoothness measurements shall be reported for each ramp paving section per paving lane. The Contractor shall ensure that the pavement is clear of debris and equipment prior to smoothness testing. Smoothness measurements shall be reported to the Engineer within two days of testing.

(a) Evaluation. Surface testing of the finished pavement surface shall consist of profile measurement according to the Tollway Special Provision for Surface Smoothness Testing. Each lane tested shall be evaluated and reported separately.

(b) Acceptable Smoothness Limits. The finished concrete pavement surface shall be evaluated for acceptance based on the following smoothness threshold:

Location	Maximum IRI (in/mi)	Standard Deviation
Mainline	80	10
Ramp	90	10

(c) Corrective Work. If any segment of the finished concrete pavement does not meet the specified smoothness criteria, then the nonconforming pavement shall be profiled to meet the criteria by diamond grinding in accordance with the Tollway Special Provision for Profile Diamond Grinding at the Contractor's expense. The finished concrete pavement shall be retested for surface smoothness following any corrective action.

METHOD OF MEASUREMENT

This work will be measured for payment in accordance with Article 420.19 of the Standard Specifications.

BASIS OF PAYMENT

This work will be paid for at the contract unit price per square yard for PORTLAND CEMENT CONCRETE PAVEMENT (JOINTED), of the total thickness specified.

Protective coat will be paid for at the contract unit price per square yard for PROTECTIVE COAT.

Removing and replacing curing and protective cover, when required, will be paid for according to Article 109.04 of the Tollway Supplemental specifications.

GALVANIZED STEEL PLATE BEAM GUARDRAIL (ILLINOIS TOLLWAY RECURRING)

Effective: October 1, 2009 Revised: April 1, 2016

Description. This work shall consist of furnishing and erecting steel plate beam guardrail and posts in accordance with the details shown on the Plans.

Materials. Materials shall be according to Article 630.02 of the Standard Specifications and as modified herein.

General Requirements. General requirements for steel plate beam guardrail and posts shall be according to the following Article 630.03 of the Standard Specifications, except as modified herein:

Add the following to Article 630.03 of the Standard Specifcations: The rail elements shall be of uniform section. Warped or deformed elements will be rejected. The edges of the elements shall be rolled or rounded so that they present no sharp edges. All connections and splices shall be made with button head bolts with oval shoulders in such a manner that there will be no appreciable projection on the road side of the guard rail.

When guardrail posts are to be placed within concrete or asphalt, a leave-out area shall be provided as shown on the Illinois Tollway Standard Drawing C1. The construction of the leave-out shall be considered to be included in the work under this item.

Fabrication. Fabrication of plates for the rail element shall be according to Article 630.04 of the Standard Specifications, except as modified herein:

Revise the last paragraph to read: Rail elements shall be furnished in lengths of 12.5 feet

Erection. Materials or hardware, including posts, on which the galvanizing has been damaged, shall be replaced with new materials having properly galvanized surfaces, except that, subject to the approval of the Engineer, minor damage to galvanized surfaces may be repaired by field galvanizing in accordance with the recommendations of the American Hot Dip Galvanizers Association.

The rail and post elements shall be erected to the required elevation. The top of the rail shall be visually straight in horizontal alignment and shall be continuously parallel to the roadway profile grade in vertical alignment. If insufficient adjustment is available in the holes, posts shall be reset, at no additional cost to the Illinois Tollway, until the guard rail is properly aligned. The brackets may be loosely bolted to the posts and, after erection of rail elements, the rail shall be carefully aligned and the bolts then fully tightened. Nuts shall be drawn up tight on all bolts.

Posts. All posts shall be steel. Steel posts may be driven by hand or mechanical methods provided they are protected by a suitable driving cap and the earth around the posts compacted, if necessary, after driving. When steel posts are driven to incorrect alignment or grade, they shall be removed and set according to Article 634.05 of the Standard Specifications. The 9'-0" posts shall be marked with the number "9" to ensure permanent identification. The steel posts shall be stamped prior to galvanizing. The character shall be a minimum 2 inches in height and located on each side of the post web near the top.

Block-outs. All block-outs shall be wooden, either southern pine or Douglas fir (coast region), Grade No. 1 structural. Plastic and/or steel block-outs shall not be permitted.

Post Spacing. Posts for Type A and B shall be spaced as indicated on Illinois Tollway Standard Drawing C1. Type C posts shall be spaced at 1'-6 ¾ " .

Contractor's Responsibility for Underground Facilities. It shall be the Contractor's responsibility to ascertain in advance of any work, by any and all possible means, the presence of underground electrical or telecommunications cables in or near the vicinity of the work. It shall be the Contractor's further responsibility to notify the Engineer at least ten days in advance of setting new posts when working near underground electrical or telecommunications cables. The Illinois Tollway or its representative will then locate any such cables which may be in jeopardy. It shall be the Contractor's responsibility to preserve cable location markings and all information relating thereto given to him/her, and to effectively communicate such information to his/her workers. If the Contractor cuts or damages any such cables, either through carelessness or failure to follow the foregoing procedures, he/she will then be held responsible for repairing all damages or replacing the cable without splicing, at the Illinois Tollway's option, and all at no additional cost to the Illinois Tollway or cause for the Contractor claiming delay.

Such repair or replacement shall include the immediate installation by the Contractor, without further notice to him/her, of temporary cables satisfactory to the Engineer, the temporary cables to remain in service until the directed repairs or replacements are made. Stringing temporary cables on the ground will not be allowed in any circumstances. Temporary cables shall be:

(a) Suitable for direct burial installation, acceptable to the Engineer, and shall be buried to a depth not less than 12 inches;
or
(b) Weather-proof cable, acceptable to the Engineer, and shall be suspended not less than 8 feet above the highest point of terrain between supports, unless otherwise directed by the Engineer. Suspended temporary cables may be attached to existing poles, or, in their absence, shall be attached to supports acceptable to the Engineer, furnished and installed by the Contractor.

Any posts that are to be located near or over any buried cable shall be installed by first digging a hole by hand, and then installing the post and backfilling the hole. No posts shall be driven under such conditions. Care shall be taken while digging by hand so as not to damage the cable.

All efforts on the Illinois Tollway's part to advise the Contractor as to the locations of underground cables notwithstanding, it shall be understood that such locations are at best approximate, may be in error, and that such efforts by the Illinois Tollway shall not relieve the Contractor of any responsibility for restoring damage resulting from the activities of any employee, Subcontractor, agent, or representative of the Contractor.

The Contractor shall also be responsible for notifying owners of other cables and underground facilities which may be jeopardized by the Contractor's operations in the same manner as required for notice to the Illinois Tollway.

Method of Measurement. This work will be measured for payment, complete in place, in feet. The length shall be the overall length of installed rail, measured along the top edge of the top rail element from end to end of the total rail.

Basis of Payment. This work will be paid for at the contract unit price per foot, for GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE A, 6 FOOT POSTS; GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE A, 9 FOOT POSTS;
GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE B, 6 FOOT POSTS; GALVANIZED STEELPLATE BEAM GUARDRAIL, TYPE B, 9 FOOT POSTS GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE C, 6 FOOT POSTS; or GALVANIZED STEELPLATE BEAM GUARDRAIL, TYPE C, 9 FOOT POSTS.

Pay Item Number	Designation	Unit of Measure
JI630002	GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE A, 6 FOOT POSTS	FOOT
JI630004	GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE A, 9 FOOT POSTS	FOOT
JI630007	GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE B, 6 FOOT POSTS	FOOT
JI630009	GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE B, 9 FOOT POSTS	FOOT
JI630012	GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE C, 6 FOOT POSTS	FOOT
JI630014	GALVANIZED STEEL PLATE BEAM GUARDRAIL, TYPE C, 9 FOOT POSTS	FOOT

RECLAIMED ASPHALT PAVEMENT (RAP) (ILLINOIS TOLLWAY)
Effective: October 6, 2011 Revised: April 1, 2016

Revise Section 1031 of the Standard Specifications to read:

"**SECTION 1031. Reclaimed Asphalt Pavement**

1031.01 Description. Reclaimed asphalt pavement (RAP) is reclaimed asphalt pavement resulting from cold milling or crushing of an existing dense graded hot-mix asphalt (HMA) pavement. The Contractor shall supply written documentation that the RAP originated from routes or airfields under federal, state, or local agency jurisdiction. This special provision provides the option for the use of screened fractionated RAP. Fractionated RAP (FRAP) consists of the fine aggregate portion (material passing the #4 screen) and the coarse aggregate portion, controlled with one-or-more larger screens.

1031.02 Stockpiles. The Contractor shall construct individual, sealed RAP stockpiles meeting one of the definitions for both non-fractionated and fractionated RAP described in the following subsections. No additional RAP shall be added to the pile after the pile has been sealed. Stockpiles shall be sufficiently separated to prevent intermingling at the base. Stockpiles shall be identified by signs indicating the type of non-fractionated RAP as listed below (i.e. "Homogeneous Surface"), and by signs indicating the category and size of fractionated RAP (i.e. "Category 1, fine portion – 0 to #4").

(1) When using Non-Fractionated RAP

Prior to milling, the Contractor shall request the IDOT or the Illinois Tollway to provide verification of the quality of the RAP to clarify appropriate stockpile.

(a) Homogeneous. Homogeneous RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures and represent: 1) the same aggregate quality, but shall be at least C quality; 2) the same type of crushed aggregate (either crushed natural aggregate, ACBF slag, or steel slag); 3) similar gradation; and 4) similar asphalt binder content. If approved by the Engineer, combined single pass surface/binder millings may be considered "homogenous" with a quality rating dictated by the lowest coarse aggregate quality present in the mixture.

(b) Conglomerate 5/8. Conglomerate 5/8 RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least C quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerates 5/8 RAP shall be processed prior to testing by crushing to where all RAP shall pass the 5/8 in. or smaller screen. Conglomerate 5/8 RAP stockpiles shall not contain steel slag or other expansive material as determined by the Illinois Tollway or IDOT.

(c) Conglomerate 3/8. Conglomerate 3/8 RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least B quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerate 3/8 RAP shall be processed prior to testing by crushing to where all RAP shall pass the 3/8 in. or smaller screen. Conglomerate 3/8 RAP stockpiles shall not contain steel slag or other expansive material as determined by the Illinois Tollway or IDOT.

(d) Conglomerate "D" Quality (DQ). Conglomerate DQ RAP stockpiles shall consist of RAP from Class I, Superpave (High or Low ESAL), HMA (High or Low ESAL), or equivalent mixtures. The coarse aggregate in this RAP may be crushed or round but shall be at least D quality. This RAP may have an inconsistent gradation and/or asphalt binder content. Conglomerate DQ RAP stockpiles shall not contain steel slag or other expansive material as determined by the Illinois Tollway or IDOT.

(e) Non-Quality. RAP stockpiles that do not meet the requirements of the stockpile categories listed above shall be classified as "Non-Quality".

(2) When using Fractionated RAP (mechanical separation of RAP materials into appropriate sizes using an approved separation device)

The Contractor is required to have a QC plan approved by the Illinois Tollway Materials Engineer, a fractionation device approved the Illinois Tollway Materials Engineer, and sufficient cold feed bins. Fractionated RAP shall be separated by source (category 1 and 2) and size (fine and coarse portions). Separate calibrated cold feed bins are required for each size of fractionated RAP.

Ensure that the fractionated RAP source meets one of the following source categories:

Category 1: Milled Mainline/Ramp RAP – asphalt material milled from mainline pavements or ramps under Illinois Tollway jurisdiction.

Category 2: Non-Mainline/Ramp RAP – milled, crushed and screened material removed from Illinois Tollway shoulders or from other routes or airfields under federal, state or local agency jurisdiction.

Ensure that the fractionated RAP sizes comply with the following:

Fine Portion: The fine portion of fractionated RAP is the portion of the processed material passing the No. 4 screen. The fine portion of category 1 fractionated RAP that contains steel slag or other expansive material as determined by the Illinois Tollway shall be stockpiled separately and may be used under this special provision as fractionated RAP in surface friction course mixes or SMA surface mixes.

Coarse Portion: The coarse portion of fractionated RAP is one or more of the coarse portions of the processed material larger than the No. 4 screen. The coarse portion of the fractionated RAP that contains steel slag as determined by the Illinois Tollway shall be from Category 1 sources only and stockpiled separately for potential use as fractionated RAP in surface friction course mixes. The maximum top size of the coarse portion of fractionated RAP may not exceed the following:

Nominal Asphalt Mix Designation	Maximum FRAP Screen Size 100% Passing
25.0 mm	1.5 inch
19.0 mm	1 inch
12.5 mm	3/4 inch
9.5 mm	1/2 inch

Prior to milling for fractionated RAP, the Contractor shall request the Illinois Tollway to provide verification of the quality of the RAP to clarify the appropriate category and size (identification) of the fractionated RAP stockpile as detailed below.

(a) Category 1 fine portion without steel slag. Category 1 fine portion RAP shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures milled from Illinois Tollway mainline and ramp pavements. The fine aggregate in this RAP shall be manufactured sand and may represent more than one aggregate type. All category 1 fine portion RAP shall be processed prior to testing by screening to where all RAP shall pass the No. 4 screen. Category 1 fine portion without steel slag stockpiles shall not contain steel slag or other expansive material as determined by the Illinois Tollway.

(b) Category 1 fine portion with steel slag. Category 1 fine portion with steel slag RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures milled from Illinois Tollway mainline or ramp surface friction course pavements. The fine aggregate in this RAP shall be manufactured sand and may represent more than one aggregate type. The coarse aggregate in this processed RAP shall be crushed aggregate including steel slag sources. All category 1 fine aggregate with steel slag RAP shall be processed prior to testing by screening to where all RAP shall pass the No. 4 screen.

(c) Category 2 fine portion. Category 2 fine portion RAP shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures removed from Illinois Tollway shoulders or from other routes or airfields under federal, state or local agency jurisdiction. The fine aggregate in this RAP shall be manufactured or natural sand and may represent more than one aggregate type. All category 2 fine portion RAP shall be processed prior to testing by screening to where all RAP shall pass the No. 4 screen. Category 2 fine portion stockpiles shall not contain steel slag or other expansive material as determined by the Illinois Tollway.

(d) Category 1 coarse portion without steel slag. Category 1 coarse portion RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures milled from Illinois Tollway mainline or ramp pavements. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least B quality. All category 1 coarse aggregate RAP shall be processed prior to testing by screening to where all RAP shall be retained on the No. 4 or larger screen. Category 1 coarse portion RAP stockpiles shall not contain steel slag or other expansive material as determined by the Illinois Tollway.

(e) Category 1 coarse portion with steel slag. Category 1 coarse portion with steel slag RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures milled from Illinois Tollway mainline or ramp surface friction course pavements. The coarse aggregate in this RAP shall be crushed aggregate including steel slag sources. All category 1 coarse aggregate with steel slag RAP shall be processed prior to testing by screening to where all RAP shall be retained on the No. 4 or larger screen.

(f) Category 2 coarse portion. Category 2 coarse portion RAP stockpiles shall consist of RAP from Class I, Superpave (High ESAL), HMA (High ESAL), or equivalent mixtures removed from Illinois Tollway shoulders or from other routes or airfields under federal, state or local agency jurisdiction. The coarse aggregate in this RAP may be crushed aggregate and may represent more than one aggregate type and/or quality but shall be at least C quality. All category 2 coarse aggregate RAP shall be processed prior to testing by screening to where all RAP shall be retained on the No. 4 or larger screen. Category 2 coarse portion RAP stockpiles shall not contain steel slag or other expansive material and shall not contain uncrushed gravel as determined by the Illinois Tollway.

RAP/FRAP containing contaminants, such as earth, brick, sand, concrete, sheet asphalt, bituminous surface treatment (i.e. chip seal), pavement fabric, joint sealants, etc., will be unacceptable unless the contaminants are removed to the satisfaction of the Engineer. Sheet asphalt shall be stockpiled separately.

1031.03 Testing. When used in asphalt mixtures, the RAP/FRAP shall be sampled and tested either during or after stockpiling.

For testing during stockpiling, washed extraction samples shall be run at the minimum frequency of one sample per 500 tons for the first 2000 tons and one sample per 2000 tons thereafter. A minimum of five tests shall be required for stockpiles less than 4000 tons.

For testing after stockpiling, the Contractor shall submit a plan for approval to the IDOT District or to the Illinois Tollway proposing a satisfactory method of sampling and testing the RAP/FRAP pile either in-situ or by restockpiling. The sampling plan shall meet the minimum frequency required above and detail the procedure used to obtain representative samples throughout the pile for testing.

Before extraction, each field sample shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for Illinois Tollway use. The Contractor shall extract the other test sample according to IDOT procedure. The Engineer reserves the right to test any sample (split or Department/ Illinois Tollway-taken) to verify Contractor test results.

(a) Testing Conglomerate 3/8. In addition to the requirements above, conglomerate 3/8 RAP shall be tested for maximum theoretical specific gravity (G_{mm}) at a frequency of one sample per 500 tons for the first 2000 tons and one sample per 2000 tons thereafter. A minimum of five tests shall be required for stockpiles less than 4000 tons.

(b) Evaluation of Test Results. All of the extraction results shall be compiled and averaged for asphalt binder content and gradation and, when applicable G_{mm}. Individual extraction test results, when compared to the averages, will be accepted if within the tolerances listed below.

Parameter	Homogeneous / Conglomerate	Conglomerate "D" Quality	Fractionated – Fine Portion	Fractionated – Coarse Portion
1 in. (25 mm)		± 5 %		
1/2 in. (12.5 mm)	± 8 %	± 15 %		± 8 %
No. 4 (4.75 mm)	± 6 %	± 13 %		± 6 %
No. 8 (2.36 mm)	± 5 %		± 5 %	
No. 16 (1.18 mm)		± 15 %		
No. 30 (600 μm)	± 5 %		± 5 %	
No. 200 (75 μm)	± 2.0 %	± 4.0 %	± 2.0 %	
Asphalt Binder	± 0.4 % 1/	± 0.5 %	± 0.3 %	± 0.3 %
G_{mm}	± 0.02 2/			

1/ The tolerance for conglomerate 3/8 shall be ± 0.3 %.

2/ Applies only to conglomerate 3/8. When variation of the G_{mm} exceeds the ± 0.02 % tolerance, a new conglomerate 3/8 stockpile shall be created which will also require an additional mix design.

If more than 20 percent of the individual sieves are out of the gradation tolerances, or if more than 20 percent of the asphalt binder content test results fall outside the appropriate tolerances, the RAP shall not be used in asphalt mixtures unless the RAP representing the failing tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the IDOT or the Illinois Tollway for evaluation.

With the approval of the Engineer, the ignition oven may be substituted for extractions according to the Illinois Test Procedure, "Calibration of the Ignition Oven for the Purpose of Characterizing Reclaimed Asphalt Pavement (RAP)".

1031.04 Quality Designation of Aggregate in RAP/FRAP.

(a) The aggregate quality of the RAP for homogenous, conglomerate, and conglomerate "D" quality stockpiles shall be set by the lowest quality of coarse aggregate in the RAP stockpile and are designated as follows.

(1) RAP from Class I, Superpave (High ESAL), or HMA (High ESAL) surface mixtures are designated as containing Class B quality coarse aggregate.

(2) RAP from Superpave (Low ESAL)/HMA (Low ESAL) IL-19.0L binder and IL-9.5L surface mixtures are designated as Class D quality coarse aggregate.

(3) RAP from Class I, Superpave (High ESAL), or HMA (High ESAL) binder mixtures, bituminous base course mixtures, and bituminous base course widening mixtures are designated as containing Class C quality coarse aggregate.

(4) RAP from bituminous stabilized subbase and BAM shoulders are designated as containing Class D quality coarse aggregate.

(b) The aggregate quality of FRAP shall be determined as follows.

(1) For Category 2 FRAP taken from a Illinois Tollway location, if the Engineer has documentation of the quality of the FRAP aggregate, the Contractor shall use the assigned quality provided by the Engineer. If the quality is not known, the quality shall be determined according to Article 1031.04(b)(2).
(2) For Category 2 FRAP taken from other routes or airfields under federal, state or local agency jurisdiction, the quality shall be determined according to Article 1031.04(b)(2).
(3) Category 1 FRAP taken from a Illinois Tollway Class I, Superpave mainline (high ESAL) surface or binder mixtures is designated as containing Class B quality coarse aggregate.

1031.05 Use of RAP in Asphalt Mixtures.

(1) Use of Non-Fractionated RAP in asphalt mixtures. The use of RAP in asphalt mixtures shall be as follows.

(a) Coarse Aggregate Size. The coarse aggregate in all RAP shall be equal to or less than the nominal maximum size requirement for the asphalt mixture to be produced.

(b) Steel Slag Stockpiles. RAP stockpiles containing steel slag or other expansive material, as determined by the IDOT or the Illinois Tollway, shall be homogeneous and will be approved for use in High ESAL and Low ESAL surface mixtures only.

(c) Use in Asphalt Surface Mixtures (High and Low ESAL). RAP stockpiles for use in asphalt surface mixtures (High and Low ESAL) shall be either homogeneous or conglomerate 3/8, in which the coarse aggregate is Class B quality or better.

(d) Use in Asphalt Binder Mixtures (High and Low ESAL), Asphalt Base Course, and Asphalt Base Course Widening. RAP stockpiles for use in asphalt binder mixtures (High and Low ESAL), asphalt base course, and asphalt base course widening shall be homogeneous, conglomerate 5/8, or conglomerate 3/8, in which the coarse aggregate is Class C quality or better.

(e) Use in Shoulders and Subbase. RAP stockpiles for use in asphalt shoulders and asphalt stabilized subbase shall be homogeneous, conglomerate 5/8, conglomerate 3/8, or conglomerate DQ.

(f) The use of RAP shall be a contractor’s option when constructing asphalt mixtures in all contracts. When the contractor chooses the RAP option, the percentage of RAP shall not exceed the amounts indicated in the table for a given N Design.

Maximum RAP Percentage Using Non-Fractionated RAP

Asphalt Mixtures 1/	Maximum %, Non-Fractionated RAP		
Ndesign	Binder/Leveling Binder	Surface	Polymer Modified
50	30 / 50	15	10
70	25 / 40	10	10
90	25	10	10
105	25	10	10

1/ When RAP exceeds 20 percent, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent RAP would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).

(2) Use of Fractionated RAP in Asphalt Mixtures. The use of fractionated RAP in asphalt mixtures shall be as follows.

(a) Coarse Aggregate Size. The coarse aggregate in the coarse portion of fractionated RAP shall be equal to or less than the nominal maximum size requirement for the asphalt mixture to be produced.

(b) Steel Slag Stockpiles. Fractionated RAP stockpiles containing steel slag or other expansive material, as determined by the Illinois Tollway, shall be approved for use in High ESAL surface mixtures only.

(c) Use in Asphalt Surface and Asphalt Binder Mixtures (High ESAL). Fractionated RAP for use in asphalt surface mixtures (High ESAL) shall be Category 1 or 2 fractionated RAP, in which the coarse aggregate is Class B quality or better.

(d) Use in Asphalt Surface Mixtures (Low ESAL). Fractionated RAP for use in asphalt surface mixtures (Low ESAL) shall be Category 1 or 2 fractionated RAP, in which the coarse aggregate is Class C quality or better.

(e) Use in Asphalt Binder Mixtures (Low ESAL) and Asphalt Base Course. Fractionated RAP for use in asphalt binder mixtures (Low ESAL) and asphalt base course mixtures shall be Category 1 or 2 fractionated RAP, in which the coarse aggregate is Class C quality or better.

(f) Use in Asphalt Shoulders and Asphalt Stabilized Subbase. Fractionated RAP for use in asphalt shoulder mixtures or asphalt stabilized subbase mixtures shall be Category 1 or 2 fractionated RAP.

(g) Use in SMA Mixtures. Fractionated RAP for use in SMA surface course and SMA binder course mixtures shall be the fine portion of Category 1 fractionated RAP, in which the fine aggregate is manufactured sand only.

(h) The use of fractionated RAP shall be a contractor's option when constructing asphalt mixtures in all contracts. When the contractor chooses the fractionated RAP option, the percentage of fractionated RAP shall not exceed the amounts indicated in the following tables for a given Ndesign. The percentage amounts of fractionated RAP for any given mix design shall be a combination of both fine and coarse portion FRAP.

Maximum RAP Percentage Using Category 1 Fractionated RAP

Asphalt Mixtures	Maximum %, Category 1 Fractionated RAP[2/]	
Ndesign	Binder/Leveling Binder[1/]	Surface[4/]
50	45/50	35
70	45	35
90	40	30[3/]
105	40	30[3/]

1/ For Asphalt Shoulder Binder Course N50, the amount of FRAP shall not exceed 40 percent, and for Asphalt Base Course N50, the amount of FRAP shall not exceed 50 percent of the mixture.

2/ When FRAP exceeds 20 percent the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 30 percent FRAP would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).

3/ Category 1 coarse portion fractionated RAP containing steel slag may be blended with virgin steel slag aggregate to obtain the specified properties in asphalt surface friction course mixes.

4/ Includes polymer modified surface course mixtures.

Maximum RAP Percentage Using Category 2 Fractionated RAP

Asphalt Mixtures	Maximum %, Category 2 Fractionated RAP[2/]	
Ndesign	Binder/Leveling Binder[1/]	Surface
50	40/50	30
70	40	30
90	30	15
105	30	15

1/ For Asphalt Shoulder Binder Course N50, the amount of FRAP shall not exceed 40%, and for Asphalt Base Course N50, the amount of FRAP shall not exceed 50% of the mixture.

2/ When FRAP exceeds 20 percent, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 30 percent RAP would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).

Maximum RAP Percentage Using Category 1 Fractionated RAP

SMA Mixtures[1/]	Maximum %, Category 1 Fine Portion Fractionated RAP[2/]	Maximum % Category 1 Coarse Portion Fractionated RAP[2/]
Binder	20	10
Surface	20	10

1/ Positive dust control must be used in the production of SMA mixtures.

2/ When total FRAP exceeds 20 percent in an SMA mix, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent FRAP would require a virgin asphalt binder grade of PG 76-22 to be reduced to a PG 70-28 in a polymerized mix or require a virgin asphalt binder grade of PG 64-22 GTR-12 to be reduced to a PG 58-28 GTR-12 in a GTR mix).

1031.06 Asphalt Mix Designs. At the Contractor's option, asphalt mixtures may be constructed utilizing RAP/FRAP material meeting the above detailed requirements.

RAP/FRAP designs shall be submitted for volumetric verification. If additional RAP/FRAP stockpiles are tested and found that no more than 20 percent of the results, as defined under "Testing" herein, are outside of the control tolerances set for the original RAP/FRAP stockpile and asphalt mix design, and meets all of the requirements herein, the additional RAP/FRAP stockpiles may be used in the original mix design at the percent previously verified.

With approval of the Engineer, for asphalt plants using positive dust control, the mix designer may choose to develop the mix design with less than 1.0 percent mineral filler added in the laboratory.

The Contractor's mix design shall use a bulk aggregate specific gravity (G_{sb}) of the RAP/FRAP equal to 2.660. As an option, the Contractor may have the Illinois Tollway conduct G_{sb} of the RAP/FRAP stockpile(s), for possible use in the mix design. If the Contractor chooses this option, the following procedure will be used for determining G_{sb}:

1. Provide the Illinois Tollway with a 20,000 gram representative sample of each RAP/FRAP material.
2. The RAP/FRAP will be heated to 230ºF, and the RAP/FRAP agglomerations broken down, as if conducting a maximum specific gravity test.
3. The asphalt content will be determined on a 1,000 – 1,500 gram sample of the RAP/FRAP.
4. A 3,000 gram sample of the RAP/FRAP will be dried to a constant weight. One percent virgin asphalt binder will be added to the RAP/FRAP and mixed thoroughly. The sample will be split into two parts, and the maximum specific gravity (G_{mm}) of each sample determined.
5. The G_{se} of each sample will be calculated and averaged.
6. If historical mix data or the mix design of the RAP/FRAP source is available, the asphalt absorption from that information will be used to calculate the Gsb of the RAP/FRAP. If no information is available on the RAP/FRAP source, an asphalt absorption of 1.0 percent will be used to calculate the G_{sb} of the RAP/FRAP.

1031.07 Asphalt Mixture Production. The coarse aggregate in all RAP/FRAP used shall be equal to or less than the nominal maximum size requirement for the asphalt mixture being produced.

To remove or reduce agglomerated material, a scalping screen, crushing unit, or comparable sizing device approved by the Engineer shall be used in the RAP/FRAP feed system to remove or reduce oversized material. If material passing the sizing device adversely affects the mix production or quality of the mix, the sizing device shall be set at a size specified by the Engineer.

If the RAP/FRAP control tolerances or QC/QA test results require corrective action, the Contractor shall cease production of the mixture containing RAP/FRAP and either switch to the virgin aggregate design or submit a new RAP/FRAP design. When producing SMA mixtures or mixtures containing conglomerate 3/8 RAP, a positive dust control system shall be utilized.

Asphalt mixture plants utilizing RAP/FRAP shall be capable of automatically recording and printing the following information.

(a) Dryer Drum Plants.

(1) Date, month, year, and time to the nearest minute for each print.

(2) Asphalt mix number assigned by IDOT or Illinois Tollway.

(3) Accumulated weight of dry aggregate (combined or individual) in tons (metric tons) to the nearest 0.1 ton.

(4) Accumulated dry weight of RAP/FRAP in tons to the nearest 0.1 ton.

(5) Accumulated mineral filler in revolutions, tons, etc. to the nearest 0.1 unit.

(6) Accumulated asphalt binder in gallons, tons, etc. to the nearest 0.1 unit.

(7) Residual asphalt binder in the RAP/FRAP material as a percent of the total mix to the nearest 0.1 percent.

(8) Aggregate and RAP/FRAP moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAP/FRAP are printed in wet condition.)

(b) Batch Plants.

(1) Date, month, year, and time to the nearest minute for each print.

(2) Asphalt mix number assigned by IDOT or Illinois Tollway.

(3) Individual virgin aggregate hot bin batch weights to the nearest pound (kilogram).

(4) Mineral filler weight to the nearest pound.

(5) RAP/FRAP weight to the nearest pound.

(6) Virgin asphalt binder weight to the nearest pound.

(7) Residual asphalt binder in the RAP/FRAP material as a percent of the total mix to the nearest 0.1 percent.

The printouts shall be maintained in a file at the plant for a minimum of one year or as directed by the Engineer and shall be made available upon request. The printing system will be inspected by the Engineer prior to production and verified at the beginning of each construction season thereafter.

1031.08 RAP in Aggregate Surface Course and Aggregate Shoulders. The use of RAP in aggregate surface course and aggregate shoulders shall be as follows.

(a) Stockpiles and Testing. RAP stockpiles may be any of those listed in Article 1031.02, except “Non-Quality” and “FRAP.” The testing requirements of Article 1031.03 shall not apply.

(b) Gradation. One hundred percent of the RAP material shall pass the 1 1/2 in. sieve. The RAP material shall be reasonably well graded from coarse to fine. RAP material that is gap-graded or single sized will not be accepted.”

1031.09 Use of RAP in Porous Granular Embankment. The use of RAP in porous granular embankment, as outlined in the Illinois Tollway Special Provision “Subgrade Aggregate, Special” shall be as follows:

(a) Stockpiles and Testing. RAP stockpiles may be any of those listed in Article 1031.02, except “Conglomerate 5/8,” Conglomerate 3/8,” and “FRAP.” The testing requirements of Article 1031.03 shall not apply.

(b) Gradation. One hundred percent of the RAP material shall pass the 4 in. sieve. The RAP gradation shall be such that the “Crushed Concrete with Crushed RAP Materials” gradation requirements in the Illinois Tollway Special Provision “Subgrade Aggregate, Special” are achieved.

RECLAIMED ASPHALT SHINGLES (RAS) (ILLINOIS TOLLWAY)
Effective: November 6, 2011 Revised: April 1, 2016

Description. Reclaimed asphalt shingles (RAS) meeting Type 1 or Type 2 requirements used as an asphalt binder and fine aggregate source, may be included in both shoulder and mainline wearing surface course and non-wearing binder / leveling course asphalt mixtures produced in accordance with Section 406 of the Standard Specifications and applicable contract special provisions when shown on the plans and approved by the Engineer; however, the use of Type 1 RAS may be restricted when shown on the plans. Type 1 or Type 2 RAS used as a fiber reinforcement substitution, may be included in mainline surface and non-wearing binder course Stone Matrix Asphalt (SMA) mixtures. Type 1 or Type 2 RAS used as an asphalt binder source, may be used in Asphalt stabilized subbase produced in accordance with Section 312 of the Standard Specifications. Type 1 and Type 2 RAS shall not be blended in any asphalt mixture.

Definitions. RAS shall meet either Type 1 or Type 2 requirements as specified herein.

(a) Type 1. Type 1 RAS shall be processed, pre-consumer asphalt shingles salvaged from the manufacturer of asphalt roof shingles.

(b) Type 2. Type 2 RAS shall be processed post-consumer shingles only, salvaged from residential dwellings of four units or less, that are not subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP).

Materials. All RAS materials shall be processed by certified producers such that the following gradation requirements are met:

Gradation	
Sieve	Percent Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	93 - 100

The final product shall have no particle exceeding the maximum aggregate size allowed for the specific mixture as defined by contract specifications. To conduct the gradation testing, a 500 – 700 gram sample of processed shingle material is air dried and then dry sieved over the 3/8” and No. 4 sieves and weighed.

The RAS producer may mechanically blend sand (FM 01, FM 02, FM 20 or FM 22) or fine, processed reclaimed asphalt pavement (RAP) up to an equal weight of processed RAS will be permitted. The process and procedures to incorporate sand or RAP shall be included in the producers QC Plan. The sand shall be "B Quality" or better from an approved Aggregate Gradation Control System source.

RAS asphalt binder content is to be determined by chemical extraction in accordance with Illinois Method AASHTO T164.

Before a mix design containing RAS for a particular mixture is authorized, the following shall be submitted with the mix design for volumetric verification:

Certification by the IEPA permitted post-consumer or IDOT approved pre-consumer processor of the RAS material, as to the RAS content and source. Certification forms are located at the back of this special provision and also available from the Illinois Tollway Materials Office.

With approval of the Engineer, for asphalt plants using positive dust control, the mix designer may choose to develop the mix design with less than 1.0 percent mineral filler added in the laboratory.

Deleterious Materials. Processed Type 1 or Type 2 RAS materials shall not contain more than 0.5% deleterious materials. Deleterious materials including, but not limited to, asbestos, metals, glass, rubber, nails, soil, brick, tars, paper, wood, and plastics, shall not exceed 0.5% by weight as determined on material retained on the 4.75 mm (No. 4) sieve. To conduct deleterious material testing, a 500 – 700 gram sample of processed RAS material is sieved on the No. 4 sieve and any deleterious material is picked and weighed.

Type 2 RAS from post-consumer sources shall contain less than the maximum percentage of asbestos fibers based on testing procedures and frequencies established by the Illinois Tollway, state or federal environmental regulatory agencies.

QUALITY CONTROL REQUIREMENTS

RAS stockpiles shall be sampled and tested by the processor or their accredited lab for gradation, asphalt content, and deleterious material content as follows:

a. Sampling. Washed extraction samples for binder content and gradation, and dry gradation samples for deleterious content shall be obtained at the minimum frequency of one sample per 200 tons for the first 1000 tons and one sample per 1000 tons thereafter. A minimum of 5 sets of samples shall be required for stockpiles less than 1000 tons to establish an average gradation and asphalt cement content of the RAS for use in an asphalt mix design.

b. Extraction / Gradation. Before extraction, each field sample shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for agency use. The processor shall extract the other test sample according to Illinois Method AASHTO T164 for solvent extraction to determine binder content and gradation. With the approval of the Engineer, the ignition oven may be substituted for extractions according to the IDOT test procedure, "Calibration of the Ignition Oven for the Purpose of Characterizing Reclaimed Asphalt Pavement (RAP)". The agency reserves the right to test any sample (split or agency-taken) to verify the processors' test results.

c. Specific Gravity. For asphalt mix designs that contain RAS that has not been mechanically blended with any other product, a bulk specific gravity (G_{sb}) of 2.300 shall be used for RAS in the design. Blended RAS products may have other specific gravity values for use in asphalt mix design but shall be verified by the Illinois Tollway. When the blended RAS product is approved by the Illinois Tollway an approval letter will be sent to the supplier with the approved gradation and specific gravity assignment.

d. Deleterious Content. 500 to 700 grams of the RAS samples shall be air dried and dry sieved on the No. 4 sieve and any deleterious material shall be removed and weighed. The agency reserves the right to test any sample (split or agency-taken) to verify the processors' test results.

e. Evaluation of Results. All of the extraction and deleterious content results shall be compiled and averaged for asphalt binder content, gradation, and deleterious content. Individual extraction test results, when compared to the averages, will be accepted if within the tolerances listed below.

Parameter	RAS Sample
No. 8 (2.36 mm)	±5%
No. 16 (1.18 mm)	±5%
No. 30 (600 µm)	±4%
No. 200 (75 µm)	±2.0%
Asphalt Binder	±1.5%

If more than 20 percent of the individual sieves are out of the gradation tolerances, or if more than 20 percent of the asphalt binder content test results fall outside the appropriate tolerances, the RAS source will no longer be allowed for use in asphalt mixtures.

Processed RAS materials from Type 1 or Type 2 RAS sources shall be stockpiled separately from other recycled materials. Blending of RAS materials in a stockpile with other recycled materials from other sources is prohibited.

Use of RAS in asphalt mixtures. Type 1 or Type 2 RAS may be used in all asphalt mixtures as follows:

(a) SMA and N90 & N105 Surface Mixes:

(1) The maximum allowable RAS usage in SMA and in N90 or N105 surface mixtures (Mixes D & F) shall be as follows:

a. RAS shall not exceed 5.0 percent by weight of the total mix.

b. RAS shall not be used in conjunction with standard Reclaimed Asphalt Pavement (RAP) or Category 2 Fractionated Reclaimed Asphalt Pavement (FRAP).

c. If used in conjunction with Category 1 FRAP the contribution of asphalt binder from the RAS and FRAP combined in any HMA mixture shall not exceed 35 percent of the total asphalt binder content in the mix design, or in any WMA mixture shall not exceed 40 percent of the total asphalt binder content in the mix design.

(2) The virgin asphalt binder grade shall be as follows:

	Percent RAS/Category 1 FRAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 35%
SMA, and N90/N105 Surface Mixes	Reduce high temperature by one grade 1/	Reduce high & low temperature by one grade 1/

1/ One asphalt binder grade bump represents a change of 6°C.

(b) N70 Shoulder Surface Mixes:

(1) The maximum allowable RAS usage in N70 shoulder surface mixtures (Mix D) shall be as follows:

a. RAS shall not exceed 5.0 percent by weight of the total mix.

b. If used in conjunction with standard RAP the contribution of asphalt binder from the RAS and RAP combined shall not exceed 20 percent of the total asphalt binder content in the mix design.

c. If used in conjunction with Category 1 or 2 FRAP the contribution of asphalt binder from the RAS and FRAP combined shall not exceed 40 percent of the total asphalt binder content in the mix design.

(2) The virgin asphalt binder grade shall be as follows:

	Percent RAS/Standard RAP Asphalt Binder Replacement
Mix Type	< 20%
N70 Shoulder Surface Mixes	No grade bump 1/

	Percent RAS/FRAP Asphalt Binder Replacement	
Mix Type	< 20%	25 – 40%
N70 Shoulder Surface Mixes	No grade bump 1/	Reduce high & low temperature by one grade 1/

1/ One asphalt binder grade bump represents a change of 6°C.

(c) N70/N90/N105 Binder and Leveling Binder Mixes, and 4.75 mm Leveling Binder Mixes:

(1) The maximum allowable RAS usage in N90/N105 Binder and IL 4.75 or IL-19 Leveling Binder Mixes shall be as follows:

a. RAS shall not exceed 5.0 percent by weight of the total mix.

b. If used in conjunction with Standard RAP the contribution of asphalt binder from the RAS and RAP combined shall not exceed 30 percent of the total asphalt binder content in the mix design.

c. If used in conjunction with Category 1 FRAP the contribution of asphalt binder from the RAS and RAP combined shall not exceed 45 percent of the total asphalt binder content in the mix design.

d. If used in conjunction with Category 2 FRAP the contribution of asphalt binder from the RAS and RAP combined shall not exceed 35 percent of the total asphalt binder content in the mix design.

(2) Virgin asphalt binder grade shall be as follows:

	Percent RAS/Standard RAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 30%
N90/N105 Binder or Leveling Binder	No grade bump [1/]	Reduce high & low temperature by one grade [1/]

	Percent RAS/Category 1 FRAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 45%
N90/N105 Binder or Leveling Binder	No grade bump [1/]	Reduce high & low temperature by one grade [1/]

	Percent RAS/Category 2 FRAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 35%
N90/N105 Binder or Leveling Binder	No grade bump 1/	Reduce high & low temperature by one grade 1/

1/ One asphalt binder grade bump represents a change of 6°C.

(d) N50 Asphalt Shoulder Binder Mixes:

(1) The maximum allowable RAS usage in N50 Shoulder Binder Mixes shall be as follows:

a. RAS shall not exceed 5.0 percent by total weight of mix.

b. If used in conjunction with standard RAP the contribution of asphalt binder from the RAS and RAP combined shall not exceed 40 percent of the total asphalt binder content in the mix design.

c. If used in conjunction with Category 1 or 2 FRAP the contribution of asphalt binder from the RAS and FRAP combined shall not exceed 50 percent of the total asphalt binder content in the mix design.

(2) Virgin asphalt binder grade shall be as follows:

	Percent RAS/Standard RAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 40%
N50 Binder or Base Course	No grade bump 1/	Reduce high and low temperature by one grade 1/

	Percent RAS/ FRAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 50%
N50 Binder or Base Course	No grade bump 1/	Reduce high & low temperature by one grade 1/

1/ One asphalt binder grade bump represents a change of 6°C.

(e) Asphalt Stabilized Subbase Mixes:

(3) The maximum allowable RAS usage in Asphalt Stabilized Subbase Mixes shall be as follows:

a. RAS shall not exceed 5.0 percent by total weight of mix.

b. If used in conjunction with Category 1 or 2 FRAP the contribution of asphalt binder from the RAS and FRAP combined shall not exceed 65 percent of the total asphalt binder content in the mix design.

(4) Virgin asphalt binder grade shall be as follows:

	Percent RAS/Standard RAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 50%
Asphalt Stabilized Subbase	No grade bump 1/	Reduce high & low temperature by one grade 1/

	Percent RAS/ FRAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 65%
Asphalt Stabilized Subbase	No grade bump 1/	Reduce high & low temperature by one grade 1/

1/ One asphalt binder grade bump represents a change of 6°C.

Asphalt Mix Production. RAS shall be incorporated into the asphalt mixture either by a separate weight depletion system or by using the RAP weigh belt. Either feed system shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes. While an auger-feed system is preferred, any system must provide a consistent, even flow of material and be approved by the Illinois Tollway. The portion of RAS shall be controlled accurately to within ±0.5 percent of the amount of RAS utilized. When using the weight depletion system, flow indicators or sensing devices shall be provided and interlocked with the plant controls such that mixture production is halted when RAS flow is interrupted.

When producing asphalt mixtures containing RAS, a positive dust control system shall be utilized, and the incoming RAS material shall be sampled and tested weekly by chemical extraction in accordance with Illinois Method AASHTO T164, as a check for compliance with the RAS producer's master band.

Asphalt mixture plants utilizing RAS shall be capable of automatically recording and printing the following information:

(a) Dryer Drum Plants.

(1) Date, month, year, and time to the nearest minute for each print.

(2) Asphalt mix number assigned by the Agency.

(3) Accumulated weight of dry aggregate (combined or individual) in tons to the nearest 0.1 ton.

(4) Accumulated dry weight of RAS in tons to the nearest 0.1 ton.

(5) Accumulated mineral filler in revolutions, tons, etc. to the nearest 0.1 unit.

(6) Accumulated asphalt binder in gallons, tons, etc. to the nearest 0.1 unit.

(7) Residual asphalt binder in the RAS material as a percent of the total mix to the nearest 0.1 percent.

(8) Aggregate and RAS moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAS are printed in wet conditions).

(b) Batch Plants.

(1) Date, month, year, and time to the nearest minute for each print.

(2) Asphalt mix number assigned by the Agency.

(3) Individual virgin aggregate hot bin batch weights to the nearest pound.

(4) Mineral filler weight to the nearest pound.

(5) RAS weight to the nearest pound.

(6) Virgin asphalt binder weight to the nearest pound.

(7) Residual asphalt binder in the RAS material as a percent of the total mix to the nearest 0.1 percent.

The printouts shall be maintained in a file at the plant for a minimum of one year or as directed by the Engineer and shall be made available upon request. The printing system will be inspected by the Engineer prior to production and verified at the beginning of each construction season thereafter.

Approved Asphalt Shingle Recycling Facility
Quality Control / Quality Assurance Certification Form
Delivered Recycled Asphalt Shingles

Asphalt Shingle Recycling Facility:
Address:

Contact:
Phone:
Approved Facility No:

We the undersigned certify the delivered product meets the following specifications:

1. RAS is ground to 3/8" minus.
2. The material does not contain more than 1.5% deleterious material by weight.
3. ***Supply Certification Forms*** were completed and are on file at _____ (recycling facility).

Note: Deleterious material is defined as paper, plastic, wood or other material that is not part of the asphalt shingle (i.e. fibers, aggregate etc).

RAS Delivered to:

Company Name:
Address:

Contact:
Tonnage of RAS Delivered: _____

Record keeping: Copies of these forms shall be maintained by the Asphalt Shingle Recycling Facility and Hot Mix Asphalt Plant for a minimum period of 3 years, and made available to state agencies upon request.

_____ _____
Asphalt Shingle Recycling Facility (signature) **Date**

_____ _____
Hot Mix Asphalt Plant (signature) **Date**

COARSE AGGREGATE FOR PORTLAND CEMENT CONCRETE PAVEMENT MIXTURES (ILLINOIS TOLLWAY)

Effective: October 9, 2013 Revised: April 1, 2016

Coarse aggregate for portland cement concrete pavement mixtures shall be in accordance with Section 1004 of the Standard Specifications except as modified below.

Revise footnote 6/ of Article 1004.01(b) of the Standard Specifications to read as follows:

"6/ For crushed aggregate, if the material finer than the No. 200 sieve consists of the dust from fracture, essentially free from clay or silt, this percentage may be increased to 3.5."

Add the following to Article 1004.02 of the Standard Specifications:

"(h) Recycled Coarse Aggregate. If recycled coarse aggregate is specified for use in a concrete mix design, the recycled coarse aggregate will be generated from an Illinois Tollway approved source of existing concrete pavement. The recycled coarse aggregate may be processed from a non-AGCS certified location. The processing of recycled coarse aggregates for reuse in hydraulic cement concrete shall be as follows:

(1) Recycled Concrete Aggregate (RCA). Coarse RCA used in Class TL concrete mixes. Concrete pavement or structural concrete for recycled coarse aggregate from an approved source shall be broken with a guillotine (or similar) crusher, removed, and transported to a crushing location at a central recycling plant and be processed in accordance with IDOT's policy memo for Recycling Portland Cement concrete into Aggregate except as follows.

a. Removed concrete shall be crushed with an impact type crusher operating at less than full capacity to minimize the production of fines. Up to 5 percent of the recycled coarse aggregate from Portland cement concrete pavement sources may consist of asphalt containing particles.

b. Washing of the crushed concrete coarse aggregate is required. The extra absorptivity of the recycled concrete aggregates shall be accommodated by keeping the stockpiled aggregates wet and at the batching plant by controlling the appropriate amount of water to the concrete mix to achieve the desired water to cement ratio.

Processed RCA taken from unknown sources can only be considered for approval by the Engineer for reuse in concrete if the coarse aggregate has been processed and all physical properties are in compliance with AASHTO Standard MP 16.

PERFORMANCE RELATED SPECIAL PROVISION FOR TERNARY CONCRETE MIX DESIGNS FOR COMPOSITE PAVEMENTS (ILLINOIS TOLLWAY)

Effective: July 15, 2014 Revised: April 1, 2016

DESCRIPTION

This work consists of designing and furnishing ternary Illinois Tollway Class TL portland cement concrete for concrete pavements. The objective of this performance related special provision is to provide the Illinois Tollway with a methodology to assure high quality concrete, while simultaneously allowing the Contractor the maximum freedom in deciding how to develop the mix design and place the concrete.

Ternary concrete incorporates hydraulic portland cement, GGBF slag, fly ash and other supplementary cementitious materials (SCM) to produce a mix with three cementitious constituent materials. A Type IT blended cement in accordance with AASHTO M 240 shall be acceptable. A Type IP or IS blended cement in accordance with AASHTO M 240 may be used with ternary mixes when an SCM is combined as a third constituent material to produce a ternary mix. Slag, fly ash, and any other SCM's combined as constituent materials in a ternary mix or as part of a blended cement may consist of no less than 35% and no more than 50% of the total cementitious material.

Reference Standards

Except where modified by the Illinois Department of Transportation or the Illinois Tollway, the following Standards shall apply:

Illinois Department of Transportation (IDOT)

- Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016.
- Supplemental Specifications and Recurring Special Provisions, Current Edition.
- Illinois Tollway Supplemental Specifications to the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, Current Edition.
- Test Procedures referenced herein, as described in the current edition of the Manual of Test Procedures for Materials, as well these test procedures:
  - AASHTO T 105 Chemical Analysis of Hydraulic Cement
  - AASHTO T 196 Air Content of Freshly Mixed Concrete by the Volumetric Method
  - ASTM C 457 Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
  - ASTM C 856 Petrographic Examination of Hardened Concrete
  - ASTM C 1293 Determination of Length Change of Concrete Due to Alkali-Silica Reaction
  - AASHTO T 161 Procedure A Modified Resistance of Concrete to Rapid Freezing and Thawing

REQUIREMENTS FOR ILLINOIS TOLLWAY CLASS TL MIX DESIGNS

Contractor shall provide a concrete mix design according to the following performance requirements for Illinois Tollway Class TL concrete. The testing shall be performed by an AASHTO-accredited laboratory.
Laboratory trials shall initially be performed by the Contractor to determine the basic strength, slump and air content properties of a mix. Once mixture proportions are determined through laboratory trials, a plant trial batch of the proposed mix design shall be required, and the trial mix shall be sampled and tested to confirm that the required properties listed below are obtained. The Contractor is required to contact the Engineer a minimum of 2 days prior to any plant trial batch mixing so that a Illinois Tollway representative can observe the process. The same 2-day notification is required prior to any physical testing on hardened concrete samples.

Compressive Strength

Interim compressive strength for Illinois Tollway Class TL concrete shall be a minimum of 2,500 psi (425 psi flexural) as tested in accordance with AASHTO T22 at no less than 3 days age for all construction traffic. No construction traffic shall travel within a 1 foot distance of any free edge of pavement until a 5 day age.

Interim compressive strength for Illinois Tollway Class TL concrete to public traffic shall be a minimum of 3,500 psi at no less than 7 days age.

Ultimate compressive strength shall not be less than 3,500 psi at 14 days and when the Illinois Tollway Class TL mix design is for application to pavements to be constructed in accordance with the special provision for Performance Related Portland Cement Concrete Pavement, Jointed, then the compressive strengths greater than a specified maximum quality level (MQL) at 28 days are not desired, and therefore strengths greater than the specified MQL level at 28 days may reduce the quality pay factors. Test cylinders shall be made and cured in accordance with AASHTO T 23. Test results will also be presented at 7 and 14 days.

Flexural Strength

Ultimate flexural strength using AASHTO T 97 for third point loading shall be a minimum of 650 psi at 14 days.

Plastic Air Content

Plastic Air Content determined using AASHTO T 152 test method shall be from 5.5 to 8.0 percent for slip form placements, and 5.0 to 8.0 percent for manual placement.

Hardened Air Content

Air-void system having the following characteristics as determined by ASTM C 457:

- Spacing factor not exceeding 0.008-in.
- Specific surface not less than 600 in^2/in^3
- Total air content not less than 4.0 percent

Slump

For slipform concrete pavement placement, place the concrete with a slump value that optimizes placement, except ensure the concrete does not slough or slump and is adequately consolidated and meets all other requirements. Maintain the concrete at a uniform consistency.
Slump range for formed or manual placement shall be 2 to 4 inch.

Alkali – Silica Reaction

Concrete shall be proportioned such that the maximum total alkali content contributed by Portland cement (as determined in accordance with AASHTO T 105) shall not exceed 5 lb/yd^3.

Materials

(a) **Portland Cement.** The portland cement used in any mix or as a part of any blended cement shall conform to the requirements of Section 1001 of the Standard Specifications.

(b) **Supplementary Cementitious Materials.** Fly ash and GGBF Slag used in any mix shall conform to the requirements of Section 1010 of the Standard Specifications. Blended cements with a percentage of supplementary cementitious materials differing by more than 5% shall be considered different cementitious materials. If a blended cement is used in a mix, a certification of compliance shall be provided and include a statement signed by the blended cement supplier that indicates the actual percentage by weight of supplementary cementitious materials in the blend. No more than 15% by weight of a cement shall consist of any processing addition. No more than 15% by weight of a cement shall consist of ground limestone. Limestone is classified as a processing addition, not as supplementary cement.

(c) **Fine Aggregates.** The fine aggregate shall be in accordance with the Illinois Tollway special provision for Fine Aggregate for Portland Cement Concrete Pavement Mixtures.

(d) **Coarse Aggregates.** The coarse aggregate for Illinois Tollway Class TL concrete shall be in accordance with Section 1004 of the Standard Specifications in addition to the following:
All Coarse Aggregate shall be in accordance with the Illinois Tollway special provisions for Coarse Aggregate for Portland Concrete Pavement Mixtures. All virgin coarse aggregate used in the mix design shall be from sources that are certified by IDOT as 30 year life aggregates

(e) **Mixing Water.** Water used with cement in concrete shall be in accordance with Section 1002 of the Standard Specifications and the Illinois Tollway special provision for Reclaimed Concrete Production Water.

(f) **Concrete Admixtures.** Concrete admixtures for Illinois Tollway Class TL concrete shall be in accordance with Section 1021 of the Standard Specifications.

(g) **Fiber Reinforcement.** Fibrous reinforcement shall be permitted provided the material is used in accordance with the product manufacturer's recommendations and it is demonstrated that the concrete complies with the herein established performance requirements.

MIX GRADATION

Virgin fine aggregate sources used in the mix shall be in accordance with the Illinois Tollway special provision for Fine Aggregate for Portland Cement Concrete Pavement Mixtures. Any blending of fine aggregates shall be by interlocked mechanical feeders at the aggregate source or concrete plant. As much as 75% of the fine aggregate may be from an unprocessed stone sand source as approved by the Engineer if proportions and admixtures in the mix can maintain sufficient workability and finishing capabilities of the placed pavement.

Virgin coarse aggregate sources used in the mix shall be in accordance with the Illinois Tollway special provision for Coarse Aggregate for Portland Cement Concrete Pavement Mixtures, and shall be a combination of any two or more gradations specified in Article 1004.1(c) of the Standard Specifications needed to obtain the desired blended aggregate gradation. The coarse aggregates shall be blended at the concrete plant to produce a combined coarse aggregate gradation.

The total aggregates used in the Illinois Tollway Class TL mixture shall be blended at the concrete plant to produce a combined optimized aggregate gradation that complies with the following:

AGGREGATE BLEND FOR THE ILLINOIS TOLLWAY CLASS TL MIX
Percent by weight passing

Sieve Size	% Passing
1 in.	**100**
¾ in.	**85-98**
½ in.	**65-85**
⅜ in.	**55-77**
# 4	**40-60**
# 8	**28-45**
# 16	**18-35**
# 30	**10-25**
# 50	**5-17**
#100	**1-12**
#200	**0-8**

MIX SUBMITTAL

Submittal for any Illinois Tollway Class TL mix design shall include:

1. Mix design, showing:
    a. Quantities, description, sources and mill certifications of all mix ingredients
    b. Design water-cementitious materials ratio (w/cm)
    c. Design Slump
    d. Design Air content
    e. Gradation and absorption of all aggregates
    f. Bulk specific gravity (SSD) of all cementitious materials and aggregates
    g. Theoretical mass and fresh density
    h. Admixture dosage
2. A trial batch report demonstrating that the concrete complies with the performance requirements herein specified.
3.

The proportions of any Illinois Tollway Class TL mix design previously approved for use with the Illinois Tollway special provision for Performance Related Portland Cement Concrete, Jointed may be adjusted through a Illinois Tollway witnessed trial batch that verifies that the specified plastic properties are met, with 3 and 7 day lab cured and 3 day field cured test specimen compressive strengths obtained that suggest that the minimum interim, ultimate, and possible target quality strengths will be obtained after the adjustments. The adjusted mix design shall then be approved as a new mix design.

Material Tolerances

Portland Cement
No re-submittal shall be required under the condition that the Portland cement (AASHTO M 85 and M 240) source complies with the following tolerances:
Acceptable tolerance for alkali content (Na_2O_{eq}): ± 0.10 percent.
Acceptable tolerance for tri-calcium aluminate content: - 2.0 percent, + 1.0 percent.
Acceptable tolerance for supplementary cementitious materials in a blended cement: ± 2%.

Fine Aggregate
Substitution of fine aggregates from different sources shall not be permitted without re-submittal.
Acceptable tolerance for fineness modulus: ± 0.20.

Coarse Aggregate
Substitution of coarse aggregate from different sources or different size classification shall not be permitted without re-submittal.

Supplementary Cementitious Materials
No change in type or classification shall be permitted without resubmittal.

Concrete Admixtures
Contractor may change between Type A and Type D admixtures as seasonal conditions warrant. With cold weather placements, the use of an accelerating admixture conforming to ASTM C 494, Type C or E will be allowed without the need for a re-submittal.

Other Materials
No change in brand or type shall be permitted without re-submittal.

TEMPERATURE CONTROL FOR PLACEMENT

The ambient air temperature during concrete placement and the temperature of surfaces to receive ternary concrete shall not be less than 40°F. The concrete temperature when placed shall not be less than 60°F for ternary mixtures of any concrete with more than 20% fly ash or 35% slag replacement of Portland cement. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature with cold weather placements. The use of accelerating admixtures conforming to ASTM C 494, Type C or E is allowed.

QUALITY MANAGEMENT PLAN

At least 14 days prior to the first concrete placement, the Contractor shall submit a Quality Management Plan (QMP), for materials and construction in accordance with the Illinois Tollway special provision for Contractor's Quality Program.

Production Facility and Transportation Equipment

The production facility and transportation equipment shall conform to the certification requirements of the Illinois Department of Transportation.

Field Acceptance
Acceptance to this specification shall be based on the following key characteristics:

- Compressive Strength
  - Interim
  - Ultimate
- Plastic air content – 5.0 to 8.0 percent (5.5 to 8.0 percent for slipform placement)
- Slump (Formed Placement) – 2 to 4 inches
- Slump (Slipform Placement) - Maintain the concrete at a uniform consistency. The Engineer will not allow an edge slump greater than ½ inch where no additional concrete work is to be constructed immediately adjacent to the pavement being placed. The Engineer will not allow an edge slump greater than ¼ inch where additional concrete work is to be constructed immediately adjacent to the pavement being placed.
- Water / cementitious materials ratio – Design -0.03, +0.00

TRAFFIC BARRIER TERMINAL, TYPE T6B (ILLINOIS TOLLWAY RECURRING)
Effective: October 1, 2009 Revised: April 1, 2016

Description: This work shall consist of furnishing and erecting traffic barrier terminal as shown in the Plans and/or directed by the Engineer.

Materials: Materials shall be in accordance with Article 631.02 of the Standard Specifications

Construction Requirements.

General. General requirements for traffic barrier terminal shall be according to the following Article 631.03 of the Standard Specifications, except as modified herein:

Add the following to Article 631.03 of the Standard Specifications. The rail elements shall be of uniform section. Warped or deformed elements will be rejected. The edges of the elements shall be rolled or rounded so that they present no sharp edges. All connections and splices shall be made with button head bolts with oval shoulders in such a manner that there will be no appreciable projection on the road side of the guard rail.

Traffic Barrier Terminal, Type T6B. The terminal shall include all necessary transitions between the terminal and the item to which it is attached.

When attaching the end shoe to concrete, constructed with forms and with a thickness of 12 in. or less, the holes may be formed, core drilled, or an approved 3/4 in. cast-in-place insert may be used.

When attaching the end shoe to concrete, constructed with forms and with a thickness greater than 12 in. an approved 3/4 in. bolt shall be anchored into core drilled or formed holes using a chemical adhesive.

When attaching the end shoe to concrete constructed by slipforming, the holes shall be core drilled.

Fabrication. The plates for the rail element shall be blanked to proper shape, fabricated, and ready for assembly when received. No punching, drilling, cutting, or welding will be permitted in the field.

Plates in lap splices shall make contact throughout the entire area of the splice.

Erection. Materials or hardware, on which the galvanizing has been damaged shall be replaced with new materials having properly galvanized surfaces, except that, subject to the approval of the Engineer, minor damage to galvanized surfaces may be repaired by field galvanizing in accordance with the recommendations of the American Hot Dip Galvanizers Association.

The rail and post elements shall be erected to the required elevation. The top of the rail shall be visually straight in horizontal alignment and shall be continuously parallel to the roadway profile grade in vertical alignment. If insufficient adjustment is available in the holes, posts shall be reset, at no additional cost to the Illinois Tollway, until the traffic barrier terminal is properly aligned. The brackets may be loosely bolted to the posts and, after erection of rail elements, the rail shall be carefully aligned and the bolts then fully tightened. Nuts shall be drawn up tight on all bolts.

Posts. Posts shall be steel. Steel posts may be driven by hand or mechanical methods provided they are protected by a suitable driving cap and the earth around the posts compacted, if necessary, after driving. When steel posts are driven to incorrect alignment or grade, they shall be removed and set according to Article 634.05 of the Standard Specifications.

Block-outs. All block-outs shall be wooden, either southern pine or Douglas fir (coast region), Grade No. 1 structural. Plastic and/or steel block-outs shall not be permitted.

Contractor's Responsibility For Underground Facilities. It shall be the Contractor's responsibility to ascertain in advance of any work, by any and all possible means, the presence of underground electrical or telecommunications cables in or near the vicinity of the work. It shall be the Contractor's further responsibility to notify the Engineer at least ten days in advance of setting new posts when working near underground electrical or telecommunications cables. The Illinois Tollway or its representative will then locate any such cables which may be in jeopardy. It shall be the Contractor's responsibility to preserve cable location markings and all information relating thereto given to him/her, and to effectively communicate such information to his/her workers. If the Contractor cuts or damages any such cables, either through carelessness or failure to follow the foregoing procedures, he/she shall be responsible for repairing all damages or replacing the cable without splicing, at the Illinois Tollway's option, and all at no additional cost to the Illinois Tollway and without cause for the Contractor claiming delay.

Such repair or replacement shall include the immediate installation by the Contractor, without further notice to him/her, of temporary cables satisfactory to the Engineer, the temporary cables to remain in service until the directed repairs or replacements are made. Stringing temporary cables on the ground shall not be allowed in any circumstances. Temporary cables shall be:
(a) Suitable for direct burial installation, acceptable to the Engineer, and shall be buried to a depth not less than 12 inches;
or
(b) Weather-proof cable, acceptable to the Engineer, and shall be suspended not less than 8 feet above the highest point of terrain between supports, unless otherwise directed by the Engineer. Suspended temporary cables may be attached to existing poles, or, in their absence, shall be attached to supports acceptable to the Engineer, furnished and installed by the Contractor.

Any posts that are to be located near or over any buried cable shall be installed by first digging a hole by hand, and then installing the post and backfilling the hole. No posts shall be driven under such conditions. Care shall be taken while digging by hand so as not to damage the cable.

All efforts on the Illinois Tollway's part to advise the Contractor as to the locations of underground cables notwithstanding, it shall be understood that such locations are at best approximate, may be in error, and that such efforts by the Illinois Tollway shall not relieve the Contractor of any responsibility for restoring damage resulting from the activities of any employee, Subcontractor, agent, or representative of the Contractor.

The Contractor shall also be responsible for notifying owners of other cables and underground facilities which may be jeopardized by the Contractor's operations in the same manner as required for notice to the Illinois Tollway.

Method of Measurement: This work will be measured for payment, complete in place, in units of each.

The pay limits between the traffic barrier terminal and the adjacent guardrail shall be as shown on Illinois Tollway Standard Drawing C10.

Basis of Payment: This work will be paid for at the contract unit price per each, for TRAFFIC BARRIER TERMINAL, TYPE T6B.

Pay Item Number	Designation	Unit of Measure
JI631135	TRAFFIC BARRIER TERMINAL, TYPE T6B	EACH

SURFACE SMOOTHNESS TESTING FOR PAVEMENT (ILLINOIS TOLLWAY)
Effective: August 22, 2014 Revised: April 1, 2016

Description. This work consists of measuring the smoothness of a final concrete or asphalt pavement surface. The Illinois Tollway shall be responsible to perform the work when measurement is of concrete pavements constructed in accordance with the Illinois Tollway special provision Performance Related Special Provision for Portland Cement Concrete Pavement, Jointed. The Contractor shall be responsible to perform the work when pavements are constructed using other specifications or concrete pavement is rehabilitated using diamond grinding.

Definitions.

1. Smoothness. Pavement smoothness shall mean the average International Roughness Index (IRI) value of the pavement wheel paths per 0.1 mi (0.16 km) lane segment.

References

Except where modified by the Illinois Department of Transportation or the Illinois Tollway, the following Standards shall apply:

American Society of Testing and Materials (ASTM) Standards

- ASTM E950 – Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference.
- ASTM E1926 – Standard Practice for Computing International Roughness Index of Roads from Longitudinal Profile Measurements.

National Cooperative Highway Research Program (NCHRP))

NCHRP Report 228 – Roughness Measurement and Analysis.

EQUIPMENT REQUIREMENTS

1. Inertial Profiler (IP)

The responsible party for smoothness measurement shall furnish a properly certified, calibrated and documented IP. The IP shall conform to the Class I requirements of the most recent revision of ASTM E950. The IP shall be outfitted with Wide Spot or RoLine lasers. The Contractor shall provide equipment certification documentation to the Engineer prior to the IP being used on the project. (Certification shall be obtained through the IDOT Profile Equipment Verification (PEV) process).

Daily calibration and verification of the IP shall be performed according to the manufacturer's recommendations. In addition, the accuracy and precision of the smoothness values and distance measurements need to be verified. The IP shall be calibrated in advance at a location established by the Engineer. If the Engineer requests, arrangements shall be made to have the Engineer observe the calibration and operation of the IP. The responsible party shall maintain records of all calibration activities, and provide the records to the Engineer upon request.

The responsible party for measurement shall furnish an operator trained in the operation of the particular IP to be used on the project. The operator shall be knowledgeable in the use of an industry-accepted software platform that performs analysis of profile data. Documentation of operator training/certification shall be submitted to the Engineer.

2. IRI Calculation Software

Any computer software package used to calculate the IRI statistic shall follow the procedure developed by the World Bank as described in ASTM E1926. The software shall report the IRI values in units of inches per mile rounded to one decimal place. The preferred software program for IRI calculation is the FHWA's Profile Viewing and Analysis (ProVAL) software.

Pavement surface testing

The smoothness data for each lane will be computed by obtaining the IRI values for the left and right wheel paths in each tested lane after any corrective work is performed that the Contractor feels is necessary based on the contractor's initial measurements. The calculated IRI value reported to the Engineer shall be the average IRI for both wheel paths. During collection high-pass and low-pass filters shall be set to zero.

Collection of profile data used to calculate IRI values will occur after the Contractor elects to perform any corrective work on measured pavements and not less than 7 days prior to opening a concrete pavement to traffic or not less than 24 hours prior to opening an asphalt pavement or diamond grinded pavement to traffic. In the event that more than one set of profile data are collected, the latest data will be considered the smoothness value for the pavement section.

Run the IP in the direction of traffic. Make each pass continuously, regardless of length. Measure profiles in the left and right wheel paths of each lane. Test and evaluate each lane separately. The Engineer will determine the length in miles (kilometers) of each mainline traffic lane. Operate the IP at the optimum speed as recommended by the manufacturer. Avoid harsh braking or large speed variations to maintain the optimum speed. Separate each mainline lane into segments 0.1 mi [0.16 km] in length. Evaluate the remainder segment less than 0.1 mi [0.16 km] in each mainline lane as an independent segment. The testing length for ramp paving shall be the length of each continuous individual paving lane not exceeding 0.2 miles. Ramp paving lanes exceeding 0.2 miles shall be reported in 0.1 mile segments. Any remaining paving lane length following 0.1 mile segmentation shall be reported as a separate segment. Toll plaza paving, and the associated pavement 50 feet prior to and following toll plaza paving, shall be considered as individual paving segments for either mainline or ramp paving.

CALCULATION

Obtain Smoothness values in an individual lane using the ProVAL “Smoothness Assurance” analysis with the 250 mm filter or equivalent method demonstrated to provide the same result.

REPORTING

Prior to performing any smoothness testing, the responsible party for measurement will submit all documentation of IP calibration. All smoothness testing results shall be reported to the Engineer within two working days of completing testing, or the Engineer may require re-profiling of the tested pavement section.

All files shall be saved in separate directories for each day. Produce filenames in the format shown below:

File Naming Convention for IRI Reporting	
YYMMDD-N-D-L-Q-B-E	
Abr.	Definition
YY	Year (two digit)
MM	Month (two digit)
DD	Day (two digit)
N	Route Name
D	Direction of travel
L	Lane Number
Q	Unique identifier for the particular stretch of road in a lane and direction
B	Begin Station
E	End Station

PERFORMANCE RELATED SPECIAL PROVISION FOR TERNARY CONCRETE MIX DESIGNS FOR PORTLAND CEMENT CONCRETE PAVEMENTS (ILLINOIS TOLLWAY)

Effective: July 15, 2014 Revised: April 1, 2016

DESCRIPTION

This work consists of designing and furnishing ternary Illinois Tollway Class TL portland cement concrete for concrete pavements. The objective of this performance related special provision is to provide the Illinois Tollway with a methodology to assure high quality concrete, while simultaneously allowing the Contractor the maximum freedom in deciding how to develop the mix design and place the concrete.

Ternary concrete incorporates hydraulic portland cement, GGBF slag, fly ash and other supplementary cementitious materials (SCM) to produce a mix with three cementitious constituent materials. A Type IT blended cement in accordance with AASHTO M 240 shall be acceptable. A Type IP or IS blended cement in accordance with AASHTO M 240 may be used with ternary mixes when an SCM is combined as a third constituent material to produce a ternary mix. Slag, fly ash, and any other SCM's combined as constituent materials in a ternary mix or as part of a blended cement may consist of no less than 35% and no more than 50% of the total cementitious material.

Reference Standards

Except where modified by the Illinois Department of Transportation or the Illinois Tollway, the following Standards shall apply:

Illinois Department of Transportation (IDOT)

- Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016.
- Supplemental Specifications and Recurring Special Provisions, Current Edition.
- Illinois Tollway Supplemental Specifications to the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, Current Edition.
- Test Procedures referenced herein, as described in the current edition of the Manual of Test Procedures for Materials, as well these test procedures:

    - AASHTO T 105 Chemical Analysis of Hydraulic Cement
    - AASHTO T 196 Air Content of Freshly Mixed Concrete by the Volumetric Method
    - ASTM C 457 Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
    - ASTM C 856 Petrographic Examination of Hardened Concrete
    - ASTM C 1293 Determination of Length Change of Concrete Due to Alkali-Silica Reaction
    - AASHTO T 161 Procedure A Modified Resistance of Concrete to Rapid Freezing and Thawing

REQUIREMENTS FOR ILLINOIS TOLLWAY CLASS TL MIX DESIGNS

Contractor shall provide a concrete mix design according to the following performance requirements for Illinois Tollway Class TL concrete. The testing shall be performed by an AASHTO-accredited laboratory.

Laboratory trials shall initially be performed by the Contractor to determine the basic strength, slump and air content properties of a mix. Once mixture proportions are determined through laboratory trials, a plant trial batch of the proposed mix design shall be required, and the trial mix shall be sampled and tested to confirm that the required properties listed below are obtained. The Contractor is required to contact the Engineer a minimum of 2 days prior to any plant trial batch mixing so that a Illinois Tollway representative can observe the process. The same 2-day notification is required prior to any physical testing on hardened concrete samples.

Compressive Strength

Interim compressive strength for Illinois Tollway Class TL concrete shall be a minimum of 2,500 psi (425 psi flexural) as tested in accordance with AASHTO T22 at no less than 3 days age for all construction traffic. No construction traffic shall travel within a 1 foot distance of any free edge of pavement until a 5 day age.

Interim compressive strength for Illinois Tollway Class TL concrete to public traffic shall be a minimum of 3,500 psi at no less than 7 days age.

Ultimate compressive strength shall not be less than 3,500 psi at 14 days and when the Illinois Tollway Class TL mix design is for application to pavements to be constructed in accordance with the special provision for Performance Related Portland Cement Concrete Pavement, Jointed, then the compressive strengths greater than a specified maximum quality level (MQL) at 28 days are not desired, and therefore strengths greater than the specified MQL level at 28 days may reduce the quality pay factors. Test cylinders shall be made and cured in accordance with AASHTO T 23. Test results will also be presented at 7 and 14 days.

Flexural Strength

Ultimate flexural strength using AASHTO T 97 for third point loading shall be a minimum of 650 psi at 14 days.

Plastic Air Content

Plastic Air Content determined using AASHTO T 152 test method shall be from 5.5 to 8.0 percent for slip form placements, and 5.0 to 8.0 percent for manual placement.

Hardened Air Content

Air-void system having the following characteristics as determined by ASTM C 457:

- Spacing factor not exceeding 0.008-in.
- Specific surface not less than 600 in^2/in^3
- Total air content not less than 4.0 percent

Slump

For slipform concrete pavement placement, place the concrete with a slump value that optimizes placement, except ensure the concrete does not slough or slump and is adequately consolidated and meets all other requirements. Maintain the concrete at a uniform consistency.

Slump range for formed or manual placement shall be 2 to 4 inch.

Alkali – Silica Reaction

Concrete shall be proportioned such that the maximum total alkali content contributed by Portland cement (as determined in accordance with AASHTO T 105) shall not exceed 5 lb/yd^3.

MATERIALS

(b) Portland Cement. The portland cement used in any mix or as a part of any blended cement shall conform to the requirements of Section 1001 of the Standard Specifications.

(b) Supplementary Cementitious Materials. Fly ash and GGBF Slag used in any mix shall conform to the requirements of Section 1010 of the Standard Specifications. Blended cements with a percentage of supplementary cementitious materials differing by more than 5% shall be considered different cementitious materials. If a blended cement is used in a mix, a certification of compliance shall be provided and include a statement signed by the blended cement supplier that indicates the actual percentage by weight of supplementary cementitious materials in the blend. No more than 15% by weight of a cement shall consist of any processing addition. No more than 15% by weight of a cement shall consist of ground limestone. Limestone is classified as a processing addition, not as supplementary cement.

(c) Fine Aggregates. The fine aggregate shall be in accordance with the Illinois Tollway special provision for Fine Aggregate for Portland Cement Concrete Pavement Mixtures.

(d) Coarse Aggregates. The coarse aggregate for Illinois Tollway Class TL concrete shall be in accordance with Section 1004 of the Standard Specifications in addition to the following:

All Coarse Aggregate shall be in accordance with the Illinois Tollway special provisions for Coarse Aggregate for Portland Concrete Pavement Mixtures. All virgin coarse aggregate used in the mix design shall be from sources that are certified by IDOT as 30 year life aggregates

(e) Mixing Water. Water used with cement in concrete shall be in accordance with Section 1002 of the Standard Specifications and the Illinois Tollway special provision for Reclaimed Concrete Production Water.

(f) Concrete Admixtures. Concrete admixtures for Illinois Tollway Class TL concrete shall be in accordance with Section 1021 of the Standard Specifications.

(g) Fiber Reinforcement. Fibrous reinforcement shall be permitted provided the material is used in accordance with the product manufacturer's recommendations and it is demonstrated that the concrete complies with the herein established performance requirements.

MIX GRADATION

Virgin fine aggregate sources used in the mix shall be in accordance with the Illinois Tollway special provision for Fine Aggregate for Portland Cement Concrete Pavement Mixtures. Any blending of fine aggregates shall be by interlocked mechanical feeders at the aggregate source or concrete plant. As much as 75% of the fine aggregate may be from an unprocessed stone sand source as approved by the Engineer if proportions and admixtures in the mix can maintain sufficient workability and finishing capabilities of the placed pavement.

Virgin coarse aggregate sources used in the mix shall be in accordance with the Illinois Tollway special provision for Coarse Aggregate for Portland Cement Concrete Pavement Mixtures, and shall be a combination of any two or more gradations specified in Article 1004.1(c) of the Standard Specifications needed to obtain the desired blended aggregate gradation. The coarse aggregates shall be blended at the concrete plant to produce a combined coarse aggregate gradation.

The total aggregates used in the Illinois Tollway Class TL mixture shall be blended at the concrete plant to produce a combined optimized aggregate gradation that complies with the following:

AGGREGATE BLEND FOR THE ILLINOIS TOLLWAY CLASS TL MIX
Percent by weight passing

Sieve Size	% Passing
1 in.	**100**
¾ in.	**85-98**
½ in.	**65-85**
⅜ in.	**55-77**
# 4	**40-60**
# 8	**28-45**
# 16	**18-35**
# 30	**10-25**
# 50	**5-17**
#100	**1-12**
#200	**0-8**

MIX SUBMITTAL

Submittal for any Illinois Tollway Class TL mix design shall include:

4. Mix design, showing:
    a. Quantities, description, sources and mill certifications of all mix ingredients
    b. Design water-cementitious materials ratio (w/cm)
    c. Design Slump
    d. Design Air content
    e. Gradation and absorption of all aggregates
    f. Bulk specific gravity (SSD) of all cementitious materials and aggregates
    g. Theoretical mass and fresh density
    h. Admixture dosage
5. A trial batch report demonstrating that the concrete complies with the performance requirements herein specified.

The proportions of any Illinois Tollway Class TL mix design previously approved for use with the Illinois Tollway special provision for Performance Related Portland Cement Concrete, Jointed may be adjusted through a Illinois Tollway witnessed trial batch that verifies that the specified plastic properties are met, with 3 and 7 day lab cured and 3 day field cured test specimen compressive strengths obtained that suggest that the minimum interim, ultimate, and possible target quality strengths will be obtained after the adjustments. The adjusted mix design shall then be approved as a new mix design.

MATERIAL TOLERANCES

Portland Cement

No re-submittal shall be required under the condition that the Portland cement (AASHTO M 85 and M 240) source complies with the following tolerances:

Acceptable tolerance for alkali content (Na_2O_{eq}): ± 0.10 percent.

Acceptable tolerance for tri-calcium aluminate content: - 2.0 percent, + 1.0 percent.

Acceptable tolerance for supplementary cementitious materials in a blended cement: ± 2%.

Fine Aggregate

Substitution of fine aggregates from different sources shall not be permitted without re-submittal.

Acceptable tolerance for fineness modulus: ± 0.20.

Coarse Aggregate

Substitution of coarse aggregate from different sources or different size classification shall not be permitted without re-submittal.

Supplementary Cementitious Materials

No change in type or classification shall be permitted without resubmittal.

Concrete Admixtures

Contractor may change between Type A and Type D admixtures as seasonal conditions warrant. With cold weather placements, the use of an accelerating admixture conforming to ASTM C 494, Type C or E will be allowed without the need for a re-submittal.

Other Materials

No change in brand or type shall be permitted without re-submittal.

TEMPERATURE CONTROL FOR PLACEMENT
The ambient air temperature during concrete placement and the temperature of surfaces to receive ternary concrete shall not be less than 40°F. The concrete temperature when placed shall not be less than 60°F for ternary mixtures of any concrete with more than 20% fly ash or 35% slag replacement of Portland cement. Heating of the mixing water or aggregates will be required to regulate the concrete placing temperature with cold weather placements. The use of accelerating admixtures conforming to ASTM C 494, Type C or E is allowed.
QUALITY MANAGEMENT PLAN

At least 14 days prior to the first concrete placement, the Contractor shall submit a Quality Management Plan (QMP), for materials and construction in accordance with the Illinois Tollway special provision for Contractor's Quality Program.

Production Facility and Transportation Equipment

The production facility and transportation equipment shall conform to the certification requirements of the Illinois Department of Transportation.

FIELD ACCEPTANCE

Acceptance to this specification shall be based on the following key characteristics:

- Compressive Strength
  - Interim
  - Ultimate
- Plastic air content – 5.0 to 8.0 percent (5.5 to 8.0 percent for slipform placement)
- Slump (Formed Placement) – 2 to 4 inches
- Slump (Slipform Placement) - Maintain the concrete at a uniform consistency. The Engineer will not allow an edge slump greater than ½ inch where no additional concrete work is to be constructed immediately adjacent to the pavement being placed. The Engineer will not allow an edge slump greater than ¼ inch where additional concrete work is to be constructed immediately adjacent to the pavement being placed.

- Water / cementitious materials ratio – Design -0.03, +0.00

TRAFFIC BARRIER TERMINAL, TYPE T1-A (SPECIAL) (ILLINOIS TOLLWAY)
EfFective: June 14, 2010 Revised: April 1, 2016

Description: This work shall consist of furnishing and erecting traffic barrier terminal as shown in the Plans and/or directed by the Engineer. The Type T1-A (Special) terminal is used to shield the upstream end of a galvanized steel plate beam guardrail barrier system on ramps with design speed of 40 mph or less.

Materials: Materials shall be in accordance with Article 631.02 of the Standard Specifications.

Construction Requirements.

General. General requirements for traffic barrier terminal shall be according to the following Article 631.03 of the Standard Specifications, except as modified herein:

Add the following to Article 631.03 of the Standard Specifications. The rail elements shall be of uniform section. Warped or deformed elements will be rejected. The edges of the elements shall be rolled or rounded so that they present no sharp edges. All connections and splices shall be made with button head bolts with oval shoulders in such a manner that there will be no appreciable projection on the road side of the guard rail.

Traffic Barrier Terminal, Type T1-A (Special). This terminal shall meet the testing criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350 or MASH and in addition to meeting the criteria in one or both of these references , the terminal shall be approved by the Illinois Tollway.

The terminal shall conform to the individual manufacturer's specifications and shall be installed according to the manufacturer's instructions. The terminal shall be installed at the taper rate shown on Illinois Tollway Standard Drawing C12.

The terminal shall be delineated with a terminal marker direct applied. No other guardrail delineation shall be attached to the terminal section.

The traffic barrier terminals shall be as described in the following table.

Terminal	NCHRP 350 Test Level	Model No.	Manufacturer
Traffic Barrier Terminal, Type T1-A (Special)	2	SKT-SP-MGS TL-2	Road Systems, Inc.

Fabrication. The plates for the rail element shall be blanked to proper shape, fabricated, and ready for assembly when received. No punching, drilling, cutting, or welding will be permitted in the field.

Plates in lap splices shall make contact throughout the entire area of the splice.
Erection. Materials or hardware, on which the galvanizing has been damaged shall be replaced with new materials having properly galvanized surfaces, except that, subject to the approval of the Engineer, minor damage to galvanized surfaces may be repaired by field galvanizing in accordance with the recommendations of the American Hot Dip Galvanizers Association.

The rail and post elements shall be erected to the required elevation. The top of the rail shall be visually straight in horizontal alignment and shall be continuously parallel to the roadway profile grade in vertical alignment. If insufficient adjustment is available in the holes, posts shall be reset, at no additional cost to the Illinois Tollway, until the traffic barrier terminal is properly aligned. The brackets may be loosely bolted to the posts and, after erection of rail elements, the rail shall be carefully aligned and the bolts then fully tightened. Nuts shall be drawn up tight on all bolts.

Posts. Terminal posts (end and line) shall be a steel system. Wood posts shall not be permitted. Posts Number 3 thru downstream terminal limit shall be standard line posts. Posts shall be erected according to Article 634.05 of the Standard Specifications.

Block-outs. All block-outs shall be wooden, either southern pine or Douglas fir (coast region), Grade No. 1 structural. Plastic and/or steel block-outs shall not be permitted.

Contractor's Responsibility For Underground Facilities. It shall be the Contractor's responsibility to ascertain in advance of any work, by any and all possible means, the presence of underground electrical or telecommunications cables in or near the vicinity of the work. It shall be the Contractor's further responsibility to notify the Engineer at least ten days in advance of setting new posts when working near underground electrical or telecommunications cables. The Illinois Tollway or its representative will then locate any such cables which may be in jeopardy. It shall be the Contractor's responsibility to preserve cable location markings and all information relating thereto given to him/her, and to effectively communicate such information to his/her workers. If the Contractor cuts or damages any such cables, either through carelessness or failure to follow the foregoing procedures, he/she shall be responsible for repairing all damages or replacing the cable without splicing, at the Illinois Tollway's option, and all at no additional cost to the Illinois Tollway and without cause for the Contractor claiming delay.

Such repair or replacement shall include the immediate installation by the Contractor, without further notice to him/her, of temporary cables satisfactory to the Engineer, the temporary cables to remain in service until the directed repairs or replacements are made. Stringing temporary cables on the ground shall not be allowed in any circumstances. Temporary cables shall be:

(a) Suitable for direct burial installation, acceptable to the Engineer, and shall be buried to a depth not less than 12 inches;

or

(b) Weather-proof cable, acceptable to the Engineer, and shall be suspended not less than 8 feet above the highest point of terrain between supports, unless otherwise directed by the Engineer. Suspended temporary cables may be attached to existing poles, or, in their absence, shall be attached to supports acceptable to the Engineer, furnished and installed by the Contractor.

Any posts that are to be located near or over any buried cable shall be installed by first digging a hole by hand, and then installing the post and backfilling the hole. No posts shall be driven under such conditions. Care shall be taken while digging by hand so as not to damage the cable.

All efforts on the Illinois Tollway's part to advise the Contractor as to the locations of underground cables notwithstanding, it shall be understood that such locations are at best approximate, may be in error, and that such efforts by the Illinois Tollway shall not relieve the Contractor of any responsibility for restoring damage resulting from the activities of any employee, Subcontractor, agent, or representative of the Contractor.

The Contractor shall also be responsible for notifying owners of other cables and underground facilities which may be jeopardized by the Contractor's operations in the same manner as required for notice to the Illinois Tollway.

Method of Measurement: This work will be measured for payment, complete in place, in units of each.

The pay limits between the traffic barrier terminal and the adjacent guardrail shall be as shown on Illinois Tollway Standard Drawing C12.

Basis of Payment: This work will be paid for at the contract unit price per each, for TRAFFIC BARRIER TERMINAL, TYPE T1-A (SPECIAL).

Terminal markers-direct applied will be paid for separately.

Pay Item Number	Designation	Unit of Measure
JI631112	TRAFFIC BARRIER TERMINAL, TYPE T1-A (SPECIAL)	EACH

AGGREGATE SUBBASE, SPECIAL (ILLINOIS TOLLWAY)
Effective: December 18, 2013

DESCRIPTION

This item shall consist of the construction of a compacted subbase of open graded granular material on the prepared subgrade in accordance with the lines, dimensions and cross-sections shown on the Plans or as directed by the Engineer. The open graded granular material will be placed under thinner asphalt shoulders at the minimum designated thickness over the finished subgrade. Additional thicknesses of fill required immediately under the thinner asphalt shoulders may be filled with the same open graded granular material or a dense graded aggregate.

MATERIALS

The Materials used for AGGREGATE SUBBASE SPECIAL shall consist of coarse aggregate for aggregate subbase in accordance with Article 1004.04 except as follows:

The open graded aggregate for AGGREGATE SUBBASE, SPECIAL shall be crushed stone, crushed gravel, or crushed concrete of "B" quality or better. The aggregate shall be mixed uniformly, shall be well graded from the maximum to the minimum size between the limits specified and the gradation shall conform to the requirements below.

Sieve Size	Percent Passing
1½ inches (37.5 mm)	100
1 inches (25 mm)	95 ± 5
½ inches (12.5 mm)	75 ± 15
#4 (4.75 mm)	50 ± 20
#16 (1.18 mm)	23.5 ± 16.5
#40 (425 µm)	12.5 ± 8.5
#200 (75 µm)	6 ± 2

* Production of crushed concrete shall be through stationary crushers that comply with the current IDOT Bureau of Materials and Physical Research Policy Memorandum, "Recycling Portland Cement Concrete Into Aggregate", or with a mobile crusher that complies with the Tollway's current Construction Bulletin 12-02 for "The Production of Certified Aggregate From Reclaimed Pavements and Structures Using Mobile Crushers". The Engineer shall approve the concrete removal method or stockpiled reclaimed material prior to crushing. With stationary crushers stockpile pads shall be provided at the crushing location to assure that acceptable material is not contaminated prior to use. Existing subbase aggregates shall not be intermixed with the recycled concrete either when picking up the broken concrete, feeding the concrete into the crusher, or when stockpiling the recycled aggregate.

The coarse dense graded aggregate of varied thickness that may be used to cap the open graded aggregate only under shoulders shall consist of sound durable particles reasonably free of objectionable deleterious material with a gradation of CA-6 for processed material from an approved source with the Contractor having the option to use screened Reclaimed Asphalt Pavement (RAP) from an approved source. The RAP shall meet the requirements of the Tollway special provision for Reclaimed Asphalt Pavement and have 100% passing the 1.5 inch sieve and be well graded down through fines.

EQUIPMENT

Equipment used for spreading and compacting the granular subbase shall conform to Article 1101, shall be adequate to place and compact the material as specified, and shall be subject to the approval of the Engineer.

CONSTRUCTION

The granular material, as deposited on the roadbed shall contain sufficient uniformly distributed moisture to minimize segregation. No aggregate subbase shall be placed on other materials which contain frost.

The aggregate subbase consisting of the open graded aggregate shall be constructed in layers not more than 4 inches in compacted thickness, except that thicker layers may be used when compacted by vibratory methods when the Contractor can consistently obtain the required density to the satisfaction of the Engineer. The open graded granular material shall be deposited directly on the prepared subgrade or on the preceding layer of compacted subbase in a manner approved by the Engineer. The open graded granular material, in place, shall be free of segregation. Blading or other manipulation of the material shall be the minimum required to place and uniformly distribute the material before compaction. Each layer of the open graded aggregate material shall be compacted with a vibratory roller, multiple vibratory compactor, pneumatic-tired roller, tandem roller, or combination thereof, to not less than 95% of the maximum dry density as determined by AASHTO T-180, Method C.

If used under shoulders, the dense graded aggregate shall be placed in a single layer and compacted with a vibratory roller meeting the requirements of Article 1101.01(g) of the IDOT Standard Specifications to obtain the desired keying or interlock and necessary compaction. The Engineer will verify that adequate keying has been obtained.

Moisture shall be added to the material during compaction when it is necessary to obtain the specified density.

If any subgrade material is mixed into the aggregate subbase material or any filter fabric over the soil subgrade is severely damaged during the compacting or finishing operations, the subgrade shall be repaired as required by the Engineer and all of the affected aggregate subbase materials shall be removed and replaced with new material. No construction-related traffic shall be allowed over the completed or partially completed work, and the Contractor shall plan his operation in such a manner as to comply with this requirement. The Engineer may also restrict hauling during or after inclement weather or at any time when the subgrade is soft and there is a tendency for the subgrade material to infiltrate the subbase material.

SURFACE TOLERANCES

The finished surface shall be such that it will not vary more than ¼ inch in 10 feet from the Plan profile and cross-section, as determined by a 10 foot straightedge and from a taut stringline drawn between accurately set grade stakes at 50 foot intervals. Deviations shall be corrected by redistributing and recompacting the material at the surface.

METHOD OF MEASUREMENT

AGGREGATE SUBBASE SPECIAL will not be measured for payment, but will be computed in cubic yards for the various thicknesses from the Plan cross-sections and dimensions when completed essentially to the lines and dimensions shown in the Plans.

Should the Engineer direct a change in the Plan limits, that volume of material involved in the change shall be measured for adjustment to the calculated quantity. The volumes involved in the change shall be computed in cubic yards from cross-sections taken before and after placement and compaction of the material to the revised limits.

BASIS OF PAYMENT

Payment for AGGREGATE SUBBASE SPECIAL, measured as specified, will be made at the Contract unit price per cubic yard, which payment shall constitute full compensation for furnishing, transporting, placing, compacting and finishing the aggregate subbase as specified or as directed by the Engineer.

Pay Item Number	Designation	Unit of Measure
JT311030	AGGREGATE SUBBASE SPECIAL, 8 IN..	CU YD

OVERHEAD SIGN STRUCTURE - BRIDGE MOUNTED (SPECIAL)

Description: This work shall consist of erection of overhead sign structures mounted on bridges as at the locations shown on the plans in accordance with Section 733 of the Standard Specifications and noted in special plan design details.

Method of Measurement: This item will be measured for payment in feet of the overall width of the sign panel or total width of adjacent sign panels, including spacing between adjacent sign panels, to be installed on the sign structure.

Basis of Payment: This work will be paid for at the contract unit price per foot for OVERHEAD SIGN STRUCTURE – BRIDGE MOUNTED (SPECIAL)

CCTV CAMERA STRUCTURE, 80 FT. M.H.
Effective: May 1, 2017

Description.

This work shall consist of furnishing a CCTV camera structure complete with camera lowering device. The structure shall be a galvanized steel structure. The lowering device shall be configured to support a **high definition camera** with the appropriate power and Ethernet cable connections.

Definitions.

CCTV Camera Structure: The complete camera structure and lowering device as one integral working system.
Shaft: The camera structure shaft.
Lowering Device: The components involved with the mounting, operation, and raising and lowering of the CCTV camera.
Structure Height: The height of the structure shall be measured as indicated on the detail drawings

Materials.

Materials shall be as specified elsewhere herein.

Deflection.

The design of the structure shaft shall achieve a maximum, fully loaded deflection at the top of the structure, which is not greater than 1-inch

Submittals and Certifications.

The design shall be based upon AASHTO “Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals” current at the time the project is advertised with the following exception; the Illinois Department of Transportation waives the requirements of Chapter 5, Section 5.14.6.2 – Reinforced Holes and Cutouts for high mast lighting towers. The pole shall be designed for use with a single or dual arm camera lowering device with a total effective area of 2 square feet and total weight of 95 lbs. The structure shall not exceed 1” deflection in a 30 mph (non-gust) wind.

The camera structure shall be designed and constructed so no structural member or other component is applied in excess of the manufacturer's recommended rating (when applicable) or the published rating, whichever is lower

Shop drawings, product data and certifications shall be submitted. The submitted information shall be complete and shall include information relative to all specified requirements suitable for verification of compliance.

THE SUBMITTALS SHALL BE ARRANGED AND CROSS-REFERENCED TO THE SPECIAL PROVISIONS AND STANDARD SPECIFICATIONS. FAILURE TO CROSS-REFERENCE THE SUBMITTAL INFORMATION WITH THE SPECIAL PROVISIONS WILL RESULT IN THE SUBMITTAL BEING RETURNED WITHOUT REVIEW.

The submittal information shall be dated, current, project specific, identified as to the project, and shall also include the following calculations and certifications as applicable to the material utilized:

- Shaft design calculations, including Registered Engineer Certification.
- Certification of intent to provide domestic steel in accordance with Article 106.01 of the Standard Specifications.
- Welding details and procedures.
- Letter of intent to provide specified weld inspection reports.
- Confirmation of coordination between anchor rod supplier and the structure manufacturer for adequacy of anchor rod assembly.
- Manufacturer's recommended installation procedures.
- Letter of intent to provide manufacturer's representative during installation and to provide specified installation certification.

All certifications shall be notarized.

Shaft.

The pole shall be a maximum of three sections for field assembly. The pole shafts shall be a round cross section and meet the requirements of ASTM A572 or A1011 with a minimum yield strength of 50,000 psi. The bottom section shall have a minimum .3125 wall thickness and a minimum diameter of 23". The three shafts sections shall taper at a rate of .14" per foot and have an overall height of 80'. The pole base plate shall meet the requirements of ASTM A572 or A1011 and be arranged to accommodate four (4) 1 ½" x 54" x 6" anchor bolts on a 27" bolt circle. Anchor rods shall conform to ASTM F1554 gr. 55

The pole assembly shall be equipped with a 6" x 27" reinforced hand hole opening with a 3 gauge cover and shall be attached with four (4) ¼"-20 hex hd s.s. screws. There shall be a 3/8" diameter rod for wire tie off located at the top of the opening and 1 ¾" from the front of the hand hole frame and also a ½" tapped hole located 1 ¾" from the front of the frame at the bottom of the opening as shown on the drawing.

Six (6) 1" i.d. eye rings for power and communication cables are required as shown on the drawing. Two (2) shall be located 38" up from the bottom, two (2) located 6" below the top of the bottom shaft and two (2) 6" below the top of the center shaft.

There shall be a 3 ½" schedule 40 (4" od) pipe tenon 11 ¾" tall on a 3/8" thick plate welded to the top of the pole. The pipe tenon shall include a 1 ¾" x 5 ¼" slot and two (2) 5/8" holes as shown on the drawing to accommodate the Camera Lowering System arm assembly. A J-hook shall be included inside the top of the tenon assembly and shall include a removable cast aluminum pole top.

Camera Lowering Device

General.

The camera lowering system shall be designed to support and lower a **high definition** closed circuit television camera, lens, housing, PTZ mechanism, cabling, connectors and other supporting field components without damage or causing degradation of camera operations. The camera lowering system device and the pole are interdependent; and thus, must be considered a single unit or system. The lowering system shall consist of a pole, suspension contact unit, divided support arm, and a pole adapter for attachment to a pole top tenon, pole top junction box, conduit mount adapter and camera connection box. The divided support arm and receiver brackets shall be designed to self-align the contact unit with the pole center line during installation and insure the contact unit cannot twist under high wind conditions. For maximum arm strength, round support arms are not acceptable. The camera-lowering device shall withstand wind forces of 100mph with a 30 percent gust factor using a 1.65 safety factor. The lowering device manufacturer, upon request, shall furnish independent laboratory testing documents certifying adherence to the stated wind force criteria utilizing, as a minimum effective projected area, the actual EPA or an EPA greater than that of the camera system to be attached. The camera-lowering device to be furnished shall be the product of manufacturers with a minimum of 3 years of experience in the successful manufacturing of camera lowering systems. The lowering device provider shall be able to identify a minimum of 3 previous projects where the purposed system has been installed successfully for over a one-year period of time each.

The lowering device manufacturer shall furnish a factory representative to assist the electrical contractor with the assembly and testing of the first lowering system onto the pole assembly. The manufacturer shall furnish the applicable DOT engineer documentation certifying that the electrical contractor has been instructed on the installation, operation and safety features of the lowering device. The contractor shall be responsible for providing applicable maintenance personnel “on site" operational instructions.

Suspension Contact Unit.

The suspension contact unit shall have a load capacity 200 lbs. with a 4 to 1 safety factor. There shall be a locking mechanism between the fixed and moveable components of the lowering device. The movable assembly shall have a minimum of 2 latches. This latching mechanism shall securely hold the device and its mounted equipment. The latching mechanism shall operate by alternately raising and lowering the assembly using the winch and lowering cable. When latched, all weight shall be removed from the lowering cable. The fixed unit shall have a heavy duty cast tracking guide and means to allow latching in the same position each time. The contact unit housing shall be weatherproof with a gasket provided to seal the interior from dust and moisture.

The prefabricated components of the lift unit support system shall be designed to preclude the lifting cable from contacting the power or video/Ethernet cabling. The lowering device manufacturer shall provide a conduit mount adapter for housing the lowering cable. This adapter shall have an interface to allow the connection of a contractor provided 1.25 inch PVC conduit and be located just below the cable stop block at the back of the lowering device. The Contractor shall supply internal conduit in the pole as directed by the Lowering Device provider. The only cable permitted to move within the pole or lowering device during lowering or raising shall be the stainless steel lowering cable. All other cables must remain stable and secure during lowering and raising operations.

The female and male socket contact halves of the connector block shall be made of Hypalon. The female brass socket contacts and the male high conductivity brass pin contacts shall be permanently molded into the polymer body.

The current carrying male contacts shall be 1/8 inches in diameter. There shall be two male contacts that are longer than the rest which will make first and break last providing optimum grounding performance. The contacts shall be shall be fully coordinated with the **high definition** camera specified elsewhere herein.

The current carrying female contacts shall be 1/8 inches I.D. All of the contacts shall be recessed 0.125” from the face of the connector. Cored holes in the socket measuring 0.25” in diameter and 0.125” deep molded into the connector body are centered on each contact on the face of the connector to create rain-tight seals when mated with the male connector.

The wire leads from both the male and female contacts shall be permanently and integrally molded in the Hypalon body. The current carrying and signal wires molded to the connector body shall be constructed of #18/1 AWG Hypalon jacketed wire.

The contacts shall be self-wiping with a shoulder at the base of each male contact so that it will recess into the female block, thereby giving a rain-tight seal when mated. The facility manufacturing the electrical contact connector must comply with Mil Spec Q-9858 and Mil Spec I-45208.

Lowering Tool.

The camera-lowering device shall be operated by use of a portable lowering tool. The tool shall consist of a lightweight metal frame and winch assembly with cable as described herein, a quick release cable connector, an adjustable safety clutch and a variable speed industrial duty electric drill motor. This tool shall be compatible with accessing the support cable through the hand hole of the pole. The lowering tool shall attach to the pole with one single bolt. The tool will support itself and the load assuring lowering operations and provide a means to prevent freewheeling when loaded. The lowering tool shall be delivered to the State upon project completion. The lowering tool shall have a reduction gear to reduce the manual effort required to operate the lifting handle to raise and lower a capacity load. The lowering tool shall be provided with an adapter for operating the lowering device by a portable drill using a clutch mechanism. The lowering tool shall be equipped with a positive breaking mechanism to secure the cable reel during raising and lowering operations and prevent freewheeling. The manufacturer shall provide a variable speed, heavy-duty reversible drill motor and a minimum of two complete lowering tools plus any additional tools required by plan notes. The lowering tool shall be made of durable and corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

Camera Junction Box

The camera junction box shall be of two piece clamshell design with one hinge side and one latch side to facilitate easy opening. The general shape of the box shall be cylindrical to minimize the EPA. The Camera Junction Box shall be cast aluminum with stabilizing weights on the outside of the box to increase room on the interior. The box shall be capable of having up to 40 pounds of stabilizing weights. The bottom of the Camera Junction Box shall be drilled and tapped with a 1-1/2” NPT thread to accept industry standard dome housings and be able to be modified to accept a wide variety of other camera mountings. The junction box shall be gasketed to prevent water intrusion. The bottom of the box shall incorporate a screened and vented hole to allow airflow and reduce internal condensation.

Materials

All pulleys for the camera lowering device and portable lowering tool shall have sealed, self lubricated bearings, oil tight bronze bearings, or sintered- oil impregnated, bronze bushings. The lowering cable shall be a minimum 1/8-inch diameter stainless steel aircraft cable with a minimum breaking strength of 1740 pounds with (7) strands of 19 wire each.

All electrical connections between the fixed and lowerable portion of the contact block shall be protected from exposure to the weather by a waterproof seal to prevent degradation of the electrical contacts. The electrical connections between the fixed and movable lowering device components shall be designed to conduct high frequency data bits as well as the power requirements for operation of dome environmental controls.

The interface and locking components shall be made of stainless steel and or aluminum. All external components of the lowering device shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

The Manufacturer shall provide weights and /or counterweights as necessary to assure that the alignment of pins and connectors are proper for the camera support to be raised into position without binding. The lowering unit will have sufficient weight to disengage the camera and its control components in order that it can be lowered properly

Shipment and Installation.

The structure, camera lowering device, etc., and hardware shall be packaged during shipment to protect all surfaces from being scratched, marred, chipped, or damaged in any way. Prior to installation, the structure and all its components will be inspected by the Engineer and any parts found to be damaged or defective shall be replaced. Any minor damage shall be touched up in a professional manner as approved by the structure manufacturer.

The structure shall be set plumb on the foundation and fastened to the anchor rods with double nuts and washers. Flat washers shall be installed below and above the base plate of the pole. Locknuts with nylon or steel inserts shall be installed on top of the top nut. The nuts shall be tightened in compliance with torque specifications recommended by the manufacturer of the structure.

The space between the finished top of the foundation and the bottom of the base plate of the structure shall be enclosed with an expanded metal screen made of stainless steel. The size of the mesh of the screen shall be 1/4 in. (6 mm) or less and #18 gauge (1.22 mm) thick, or heavier as approved by the Engineer. The screen shall be held in place with a stainless steel band installed around the tower base plate. The band shall be held tight by a ratchet-type device. Grouting shall not be used to enclose the above described space.

The structure shall be straight and centered on its longitudinal axis, under no-wind conditions, so, when examined with a transit from any direction, the deviation from the normal shall not exceed 1/8 in. in 3 ft (3 mm in 1 m) within any 5 ft (1.5 m) of height, with total deviation not to exceed 3 in. (75 mm) from the vertical axis through the center of the structure base.

The camera position and orientation shall be confirmed and approved by the Engineer. In general the camera shall be oriented perpendicular to the main roadway.

Installation of the lowering device and camera shall be included as a part of this item and shall not be paid for separately.

Method Of Measurement. CCTV camera structures shall be counted, each with all appurtenances installed.

Basis Of Payment. This item shall be paid at the contract unit each for **CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, GALVANIZED STEEL, 80 FT. M.H.**

DETECTABLE WARNINGS (SPECIAL) IN CITY OF CHICAGO (D-1)
Effective: July 20, 2017

Description:
Work under this item shall consist of installing cast iron detectable warning tiles on ADA curb ramps as shown on the plans and according to IDOT District Detail BD-58. Work shall be performed according to Section 424 of the Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, except as herein modified.

Materials:
Detectable warning tiles shall be cast iron. The color of the detectable warning tiles is to be approved by the Engineer.

The cast iron detectable warnings shall be of uniform quality and free of surface defects.

The detectable warnings shall meet requirements of ASTM A 48 Class 30 or better.

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

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

GROOVING FOR RECESSED PAVEMENT MARKING (ILLINOIS TOLLWAY)
Effective: May 18, 2006 Revised: April 1, 2016

Description. This work shall consist of initial grooving of the existing pavements in preparation to furnishing and applying recessed pavement marking lines.

Equipment. The grooving equipment shall be equipped with a free-floating cutting or grinding head to provide a consistent groove depth over irregular pavement surfaces. The grinding or cutting head shall be equipped with diamond saw blades, steel star cutters and/or carbide tipped star cutters. A grinder head configuration shall be used on bituminous asphalt surfaces to achieve a rough surface texture in the bottom of the groove. Diamond saw blades shall be used on the cutting head when a smooth surface in the bottom of the groove is specified by the Engineer or specifications.

CONSTRUCTION REQUIREMENTS

a) Pavement Grooving Methods. Using the specified grooving equipment, the grooves for recessed pavement markings shall be constructed using the following methods:

1) Wet Saw Blade Operation. When water is required or used to cool the saw blades, such as during a continuous edge line grooving operation, the groove shall be flushed with high pressure water immediately following the cut to avoid build up and hardening of slurry in the groove. The pavement surface shall be allowed to dry for 24 hours prior to the application of the pavement markings following a wet saw blade operation.

2) Dry Saw Blade Operation. If the grooving is done with dry saw blades, the groove shall be flushed with high-pressure air to remove debris and dust generated during the cutting operation.

b) Pavement Grooving. Grooves shall be cut into the pavement prior to the application of the lane and edge pavement marking. The grooves shall be cut such that the width is 1 inch wider than that of the line to be placed. The position of the edge of the grooves shall be a minimum of 2 in. from the edge of concrete joints or asphalt paving seams along edge or centerlines. The depth of the groove shall be 50 mils, plus/minus 5 mils

On new bituminous concrete surfaces the Engineer shall determine if the new asphalt has achieved the necessary strength and hardness to support grooving prior to the start of a grooving operation. Some asphalt mixes may require 14 or more days to achieve adequate hardness to support a grooving operation. On existing bituminous concrete surfaces some existing asphalt pavements may not be strong enough to support a grooving operation. For all existing asphalt pavements the Engineer shall determine if the existing asphalt has the necessary strength and hardness to support grooving prior to the start of a grooving operation.

All waste materials resulting from grooving operations shall be disposed of in accordance with Article 202.03 of the Standard Specifications.

c) Cleaning. When water has been used to cool the saw blades during the grooving operation, the Contractor shall allow 24 hours for the pavement to dry prior to theapplication of the markings. Immediately prior to the application of the pavement markings the groove shall be cleaned with high-pressure air blast.

Method of Measurement. This work will be measured for payment in place, in feet of the pavement marking lines applied and accepted, for the groove width specified.

Basis of Payment. This work will be paid at the contract unit price per foot for GROOVING FOR RECESSED PAVEMENT MARKING LINES of the groove width specified.

Pay Item Number	Designation	Unit of Measure
JT780JA1	GROOVING FOR RECESSED PAVEMENT MARKING LINES, 5" GROOVE	FOOT
JT780JC1	GROOVING FOR RECESSED PAVEMENT MARKING LINES, 7" GROOVE	FOOT
JT780JE1	GROOVING FOR RECESSED PAVEMENT MARKING LINES, 11" GROOVE	FOOT
JT780JF1	GROOVING FOR RECESSED PAVEMENT MARKING LINES, 13" GROOVE	FOOT

MULTI-POLYMER PAVEMENT MARKINGS (Illinois Tollway)
Effective: October 20, 2008 Revised: April 1, 2016

Description. This work shall consist of the furnishing and application of a durable, long life multi-polymer pavement marking system. The binder portion of the system is to be applied to the road surface at 20 mils $\pm$ 1 mil in thickness on concrete/asphalt pavements and 25 mils $\pm$ 1 mil on open grade pavement (or according to Engineers and manufacturers recommendation); and into which reflective media is applied by means of pressurized applicator in accordance with the requirements stated in this specification.

Materials. All materials used to formulate a system for hot-spray applications of permanent multi-polymer pavement markings shall conform to the requirements specified herein.

Multi-Polymer Resins

Physical Properties of the Mixed Compound:

The multi-polymer pavement marking material shall consist of a 100 percent solid two part system formulated and designed to provide a simple volumetric mixing ratio of two components (must be two volume(s) of Component A and one volume(s) of Component B). No volatile solvents or fillers will be allowed. The multi-polymer resin shall be as follows:

- **Multi-Polymer Content (Component A).** The multi-polymer content of the multi-polymer resin shall be tested according to ASTM D 1652 and calculated as the weight per multi-polymer equivalent (WPE) for both white and yellow. The multi-polymer content shall be determined on a pigment free basis and shall meet the target value provided by the manufacturer's certification and approved by the Illinois Tollway Materials Group. A tolerance of plus or minus 50 of WPE will be applied to the target value to establish the acceptance range.

- **Amine Value (Component B).** The amine value of the curing agent shall be determined according to ERF-25-68. The total amine value shall be less than 530.

The system shall be formulated as a Long Life Pavement Marking System capable of providing an average of 6 years performance. The Long Life Pavement Marking System shall be free of TMPTA (trimethylolpropane- triacrylate), free of toxic heavy metal (lead, chromium, cadmium, and other toxic heavy metals as defined by the U.S. EPA), and free of other such multi functional monomers.

Material composition of the mixed compound shall be as follows:

Material Requirements	
Tests	Requirements
Density (Gallon Weight)	±0.10 lb./gal
Viscosity (Krebs-Stormer)	±7 KU
Viscosity (Cone & Plate)	±0.5 Poises
Grind	Not Less than the Standard
% Non-Volatile Matter	±1.0%
% Pigment (white)	±3.0%
% Volume Non-Volatile Matter	±3.0%
Infrared Spectrum	Both component A and component B shall be analyzed to verify for control purposes that materials submitted for use are of an identical formulation as originally approved. Deviations as determined by comparison with the original sample shall be cause for rejection.
Trifunctional or Multifunctional Monomers	0%
Isocyanate	0%

b) Pigmentation:

The pigment composition shall be as follows:

Pigment Composition	**Percent by Weight**	
	Minimum	**Maximum**
White:		
Titanium Dioxide Rutile (94% minimum purity, ASTM D 476, Type III)	18.0	25.0
Multi-Polymer Resin	75.0	86.0
Yellow:		
Organic Non-Lead Yellow	10.0	15.0
Titanium Dioxide (ASTM D 476, Type III)	4.0	9.0
Multi-Polymer Resin	75.0	86.0

The entire pigment composition shall consist of titanium dioxide.

c) Toxicity:

Upon heating to application temperature, the material shall not exude fumes which are toxic or injurious to persons or property. Upon curing the materials should be completely inert with all components fully reacted and environmentally safe.

d) Daylight Reflectance:

Chromaticity and reflectance requirements shall be as follows:

Federal 595 Color		Chromaticity Coordinates								Daylight directional reflectance (Y)
		1		2		3		4		
		x	y	x	y	x	y	x	y	
White	17855	.302	.344	.325	.344	.302	.320	.325	.320	80 min.
Yellow	33538	.543	.472	.475	.472	.543	.425	.475	.425	50 min.

e) Weathering Resistance:

The multi-polymer compound, both white and yellow, must be applied to 2 sets of 3"x 6" aluminum panels at 20 ± 1 mil in thickness, one set with no glass spheres and one set with glass spheres as specified herein (must ensure 50/50 distribution of Type A and Type B beads for this will impact the results of this test) and expose the prepared samples in a Q.U.V. Environmental Testing Chamber, as described in ASTM G-53, and they shall conform to the following requirements. (The test shall be conducted for 75 hours at 122°F, 4 hours humidity and 4 hours U.V., in alternating cycles. The prepared panels shall be cured at 77°F for 72 hours prior to exposure.) The color of the white multi- polymer material shall not be darker than Federal Standard No. 595A-17855. The color of the yellow multi-polymer material shall be reasonably close to Federal Standard No. 595A-13415.

f) Dry Time:

The multi-polymer resin compounds, when properly applied with the required gradations and bead application rates per gallon, shall cure to a no-track condition, when tested in accordance with ASTM D 711, within 240 minutes at 40 degrees F and not more than 35 minutes at temperature 70 degrees F.

g) Adhesion to Pavement (Concrete and Asphalt):

The multi-polymer system markings must perform for an average of 6 years. The cured pavement marking materials, when tested according to ACI Method 503, shall have such a higher degree of adhesion to the specified concrete (compressive strength, 4,000 psi minimum) or asphalt surface such that there shall be a 100% substrate failure in the performance of this test. The prepared specimens shall be conditioned at room temperature (75°F ± 2°F) for a minimum of 24 hours and a maximum of 72 hours prior to the performance of the tests indicated.

h) Hardness:

The multi-polymer paint pavement marking material, when tested according to ASTM D 2240, shall have a Shore D Hardness from 75 to 95. The samples shall be allowed to cure at room temperature (75 ±2 degrees F) for a minimum of 24 hours and a maximum of 72 hours prior to performing the indicated tests.

i) Abrasion:

The abrasion resistance shall be evaluated on a Taber Abrader with a 1,000 gram load and CS-17 wheels. The duration of the test shall be 1,000 cycles. The wear index shall be calculated based on ASTM C 501, and the wear index for the dual component material shall not be more than 100 milligrams. The test shall be performed on cured samples of material which have been applied, without glass beads, at a film thickness of 0.020 ± 0.0005 inches to code S-16 stainless steel plates. The samples shall be allowed to cure at room temperature (75 ± 2 degrees F) for a minimum of 24 hours and a maximum of 72 hours prior to performing the indicated tests.

j) Accelerated Life-Cycle Aging Test: The material must not show any evidence of blistering, bubbling, or delaminating when submitted to test method ATR-931. Results of the test shall be provided by the manufacturer during the approval process.

k) Thermal compatibility:
The mixed hybridized polymer system must have thermal compatibility and tensile strength requirements of 4500-6500 psi, such that, it is compatible with asphalt and Portland cement concrete under all weather conditions.

l) Delineation profile:

To enhance better profile of the marking by minimizing splattering and improved bead embedment the viscosity of the mixed Component A and Component B of the hybridized polymer system shall be greater than 4500cP at 75°F.

m) Reflective Media. The reflective media shall meet the following requirements:

1) Type A – The glass beads shall meet the requirements of Article 1095.07 of the Standard Specifications and the following requirements:

i) First Drop Glass Beads. The first drop glass beads shall be tested by the standard visual method of large glass spheres adopted by the Illinois Department of Transportation. The beads shall have a silane coating and meet the following sieve requirements:

U.S. Standard Sieve Number	Sieve Size	% Passing By Weight (mass)
12	1.70 mm	95-100
14	1.40 mm	75-95
16	1.18 mm	10-47
18	1.00 mm	0-7
20	850 µm	0-5

ii) Second Drop Glass Beads. The second drop glass beads shall meet the requirements of Article 1095.07 of the Standard Specifications for Type B.

n) Packaging:

Glass beads shall be delivered in approved moisture proof bags or weather resistant bulk boxes. Each carton shall be legibly marked with the manufacturer, specifications and type, lot number, and the month and year the glass beads were packaged. The letters and numbers used in the stencils shall be a minimum of ½ in. in height.

a. Moisture Proof Bags. Moisture proof bags shall consist of at least five ply paper construction unless otherwise specified. Each bag shall contain 50 lb. net.
b. Bulk Weather Resistance Boxes. Bulk weather resistance boxes shall conform to the Federal Specification PPP-8-640D Class II or latest revision. Boxes are to be weather resistant, triple wall, fluted, corrugated-fiber board. Cartons shall be strapped with two metal straps. Straps shall surround the outside perimeter of the carton. The first strap shall be located approximately 2 in. from the bottom of the carton and the second strap shall be placed approximately in the middle of the carton. All cartons shall be shrink wrapped for protection from moisture. Cartons shall be lined with a minimum 4 mil polyester bag and meet Interstate Commerce Commission requirements. Cartons shall be approximately 38 x 38 in., contain 2000 lb of glass beads and be supported on a wooden pallet with fiber straps.

The material shall be shipped to the job site in substantial containers and shall be plainly marked with the manufacturer's name and address, the name and color of the material, date of manufacture, and batch number.

o) Verification:

Prior to approval and use of the multi-polymer pavement marking materials, the manufacturer shall submit 1 – quart samples and/or a notarized certification of an independent laboratory, together with the results of all tests, stating these materials meet the requirements as set forth herein. The certification test report shall state the lot tested, manufacturer's name, brand name of the multi-polymer and date of manufacture. In addition, all multi-polymer components shall be pre- approved for use on the project under the following conditions:

- Documentation of acceptable performance as certified by a Department of Transportation of surface-applied field performance of 100,000 ADT for 6 consecutive years to the standards of this specification.
- Any changes in formulation, physical or chemical properties of the approved multi-polymer resin needed to be explained in writing and submit to the Illinois Tollway within 30 days for reevaluation and approval process. The documentation shall include the Material Safety Data Sheets (MSDS).

Equipment. Application crew and equipment for the placement of reflectorized pavement marking shall be approved by the Pavement Marking Material Manufacturer to perform such operations.

In general, the applicating equipment shall be mobile, truck mounted and self contained pavement marking machine, specifically designed to apply resin materials and reflective glass spheres in continuous and skip line patterns. The applicating equipment shall be maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. In addition, the truck mounted unit shall be provided with accessories to allow for the marking of legends, symbols, crosswalks and other special patterns.

The mobile applicator shall include the following features:

1. The mobile applicator shall provide individual material reservoirs, or space, for the storage of Component A and Component B of the resin composition.

2. The applicator shall be equipped with heating equipment of sufficient capacity to Maintain the individual resin components at the manufacturer's recommended temperature and produce the required amount of heat at the mixing head & gun tip and maintain those temperatures with the tolerances recommended by the resin manufacturer for spray application.

3. The applicator shall be equipped with adequate individual tanks for the storage and dispensing of Size I and Size II glass spheres and black aggregate.

4. The applicator shall be equipped with individual dispensers for the simultaneous application of Type A and Type B glass beads respectively. Each dispenser shall be capable of applying beads at a minimum rate of 20 pounds per gallon of the resin composition. The applied combined total of both types of beads should be a maximum of 25 lbs./gal. (12 to 13 lbs. of each type).

5. The applicator shall be equipped with individual metering devices or pressure gauges, on the proportioning pumps (one indicator per pump) as well as stroke counters to monitor gallon usage. All such devices shall be visible to the Engineer.

6. The applicator shall be equipped with all the necessary spray equipment, mixers, compressors and other appurtenances to allow for the placement of reflectorized pavement marking system in a simultaneous sequence of operations.

7. Each application equipment must have a proven mixing system for proper mixing of the two components.

8. Each mobile applicator must be equipped with a completely enclosed flush and purge system to clean the lines and the guns without exuding any of the solution into the environment.

The Contractor shall provide an accurate temperature-measuring device(s) that shall be capable of measuring the pavement temperature prior to application of the material, the material temperature at the gun tip and the material temperature prior to mixing.

INSTALLATION REQUIREMENTS

A. Surface Preparation:

Clean the surface by a method approved by the Engineer to remove all dirt, grease, debris, glaze, laitance and any other contaminants that may hinder the adhesion of the system to the surface with minimum or no damage to the pavement surface. New Portland cement concrete pavements shall be water, shot or sand blasted clean to remove all latents. New pavements shall be grooved where required by design in accordance with the special provision for grooving for recessed pavement markings followed by blast cleaning. Whenever grinding/grooving, scarifying, sandblasting, shot blasting or other operations are performed, the debris generated must be contained through vacuum type equipment or equivalent and the work shall be conducted in such a manner that the finished pavement surface is not damaged or left in a pattern that will mislead or misdirect the motorist.

When these operations are completed the pavement surface shall first be power broomed and then blown off with compressed air to remove residue and debris resulting from the cleaning work. All such debris must be properly contained especially when removing yellow paint lines and disposed of in the appropriate manner.

Removal and cleaning work shall be a continuous moving operation and conducted in such a manner as to control and minimize airborne dust, and similar debris so as to prevent a hazard to motor vehicle operation or nuisance to property.

Care shall be taken on bituminous and portland cement concrete surface when performing removal and cleaning work to prevent damage or transverse and longitudinal joint sealers.

B. Limits of Work:

Cleaning and surface preparation work shall be confined to the surface area specified for the application of pavement marking materials; or the surface area of existing pavement markings that are specified for removal on the plans, or as directed by the Engineer.

Surface preparation work includes cleaning for lines or cleaning for letters and symbols. Lines will be meant to include: Solid lines, broken lines, dotted lines, channelizing lines, barrier lines, stop lines, crosswalk lines and crossbars.

When lines are cleaned, the area of preparation will be the width of the new pavement marking, or existing line, plus one (1) inch on each side. When letters and symbols are cleaned the area of preparation will be sufficiently large to accommodate the new marking, or to remove the existing marking. Markings shall be applied to the cleaned surfaces on the same calendar day. If this cannot be accomplished, the surface shall be re-cleaned prior to applying the markings. No new marking, line or symbols shall be applied on any pavement that has not been properly prepared as per this specification and until the Engineer approves the cleaning.

C. Removal of Concrete Curing Compounds:

On new portland cement concrete pavements, cleaning operations shall not begin until a minimum of 10 days after the placement of concrete. The extent of the blasting work and/or grooving shall be to clean and prepare the concrete surface such that:

a. There is not visible evidence of curing compound on the peaks of the textured concrete surface.

b. There are no heavy puddled deposits of curing compound in the valleys of the textured concrete surface.

c. All remaining curing compound is intact; all loose and flaking material is removed.

d. The peaks of the textured pavement surface are rounded in profile and free of sharp edges and irregularities.

e. The extent of the removal should be as such to insure the laitance is removed on both old as well as new concrete.

D. Removal of Existing Pavement Markings:

Existing pavement marking shall be cleaned for the purpose of:

a. Preparing the pavement surface for the application of a new multi-polymer pavement marking in the same location as the existing markings of a different type.

b. To remove existing markings that are in good condition which, if allowed to remain, will interfere with or otherwise conflict with newly applied marking patterns.

It shall be understood that in this context cleaning means the removal of an existing marking. It is not intended that all deteriorated existing pavement markings be removed. Example: If a new marking is applied to an unmarked "gap" in a broken line and the existing broken line pattern is worn or deteriorated, as determined by the Engineer, to the extent that it is not misleading or confusing to the motorist, the existing markings do not require removal.

Existing pavement markings that are to be totally replaced with a multi-polymer marking shall be cleaned to the extent that 95% to 100% of the existing marking is removed. Removal operations shall be conducted in such a manner that no more than moderate color and/or surface texture change results on the surrounding pavement surface.

The determination of acceptable removal will be made by judgment of the Engineer.

c. Existing multi-polymer pavement markings to be recapped shall be cleaned via approved light grinding or blasting operations to the extent that all loose/flaky marking materials are removed as well as oil, dirt, etc. that may contaminate the application of the new marking material. A complete removal of the existing multi-polymer pavement markings is not necessary provided that it has been established to the Engineers' satisfaction that the existing markings are well bonded to the substrate and will not compromise the new markings. Recapping of existing markings will be limited to application over only long-life markings (TMPTA or other multifunctional monomer free systems) after verification with manufacturer and limited to one recapping event. A minimum of 20 mil of the liquid multi-polymer material is required for recapping before application of the glass beads.

E. Remove excess oils on asphalt pavements:

Removal of excess oils on SBR Latex, SBS, and SMA polymer/GTR modified asphalts shall require the following procedure (for any other type of polymer modified asphalts contact the pavement marking manufacturer for recommendations):

Remove excess oils exposing the top of the aggregates using approved light grinding or blast cleaning operations. Care shall be taken when performing this work to prevent gouging of the pavement and damage to the transverse and longitudinal joints.

F. Application:

The pavement marking system shall be applied through special machinery designed to precisely meter the two components in the ratio of proportion recommended by the material manufacturer. This equipment shall also comply with the previous specifications. The application of and combination of reflective media (glass beads and/or reflective elements) shall be applied at a rate specified by the manufacturer.

The edge of the center line or lane line shall be offset a minimum distance of 2 in. (50mm) from a longitudinal crack or joint. Edge lines shall be approximately 2 in. (50 mm) from the edge of pavement. The finished center and lane lines shall be straight, with lateral deviation of any 10 ft. line not to exceed 1 in..

G. Atmospheric Conditions:

The pavement marking shall only be applied during conditions of dry weather and on subsequently dry pavement surfaces at the specified minimum uniform wet thickness according to the manufacturer's installation instructions. At the time of installation, the pavement surface temperature and the ambient temperature shall be above 45°F. For application at temperatures below 50°F, the hybridzed polymer manufacturer shall be contacted for guidance. The Engineer shall determine the atmospheric conditions and pavement surface conditions that produce satisfactory results.

H. Application Temperatures:

Both components shall be brought to the temperature condition recommended by the manufacturer prior to mixing and spraying.

At any time throughout the duration of the project, the Contractor shall provide free access to his/her applicating equipment for inspection by the Engineer, his/her authorized representative, or the materials representative.

Notification. The Contractor shall notify the Engineer 72 hours prior to the placement of the markings in order that he/she can be present during the operation. At the time of notification, the Contractor shall provide the Engineer the manufacturer and lot numbers of multi-polymer material and reflective media that will be used.

Inspection. The multi-polymer pavement markings will be inspected following installation according to Article 780.10 of the Standard Specifications, except, no later than October 15, and inspected following a winter performance period that extends 180 days from November 1. Any request for exception to the date of October 15 for final installation shall be submitted for approval to both the pavement marking manufacturer and the Engineer.

Packaging and Shipment. The pavement marking materials shall be shipped to the jobsite in strong substantial containers. Individual containers shall be plainly marked with the following information:

a. Name of Product
b. Lot Number
c. Batch Number
d. Date of Manufacture
e. Quantity
f. Mixing proportions
g. Safety information
h. Manufacturer's Name and Address

Reflective media shall be shipped in moisture resistant bags. Each bag shall be marked with name and address of the manufacture and the name and net weight of the material with a clear indication of what type of coating is present on the beads.

Sampling and Acceptance.

A. Certification of Compliance:
The material manufacturer shall furnish a notarized certification that the material complies with the provisions of this specification. It shall not be inferred that the provisions of a certification of compliance waives Illinois Tollway inspection, sampling or testing.

B. Laboratory Samples: Promptly after execution of the contract, the contractor shall notify the Engineer of the sources of material he/she expects to use. The material manufacturer shall furnish samples of the hybridized polymer materials as may be required by the Engineer, a minimum of ten days before the date of intended use of these materials.

C. Infrared Spectra: A copy of the infrared spectra of each component on each lot number shall be supplied by the manufacturer along with the certification papers. This infrared spectra will be on record with the Illinois Tollway to serve as a quality control measure for the future supply of this system to the Illinois Tollway.

Qualification.

A. Qualifying a Manufacturer:

The Manufacturer must have expertise providing a pavement marking material that meets this specification with a documented performance history to include:

a. Verifiable installations: proof of successful installations of at least 6 years old covering a minimum of 200,000 feet in 4 states in North America inclusive of climates having high UV exposure and high snow fall/plowing (seasonal snow fall >36 inches). Documentation of installations of similar climatic and traffic conditions shall be provided to the Illinois Tollway for material approval.

b. The manufacturer will have demonstrated field performance in the locale of proposed application for a minimum of 12 months.

c. Production facilities; 2 geographically separate locations minimum

d. Compliance with EPA regulations

e. A Verifiable ISO 9001 certified Q.C. Program

B. Qualifying a Contractor:

Multi-polymer pavement markings shall only be applied by Contractors on the IDOT list of Approved Contractors maintained by the Engineer of Operations and in effect on the date of advertisement for bids.

In order for an installer of such pavement marking material to be approved, the following document must be submitted:

a. A certificate from a pre-approved manufacturer of such pavement marking materials, certifying that such a contractor has functional, appropriate equipment to install the pavement marking material of choice. The certification must be submitted to the Illinois Tollway for review and approval prior to the installation of the pavement marking.

Performance and Warranty Requirements.

After one year from the date of installation, the pavement markings shall provide effective delineation, presence, and retroreflectivity as noted below. During this period, the Engineer will make such observations as necessary to determine conformance with these performance requirements.

A. The pavement markings shall meet the following Minimum Retroreflectivity Requirements:

Performance Retroreflectivity Criteria $mcd/m^2/lux$	
White	Yellow
400	350

Retroreflectivity requirements shall be the average retroreflectance, over a 0.1 mile section. Any 0.1 mile section that does not meet this requirement shall be replaced within 30 days, weather permitting.

B. The pavement markings shall meet or exceed 95% present and intact. Evaluation of presence and intact shall be made on 25' sections and averaged for

0.1 mile sections. Any 0.1 mile section that does not meet this requirement shall be replaced within 30 days, weather permitting.

Method of Measurement. Lines will be measured for payment in place, in feet of multi-polymer pavement marking lines applied and accepted, measured in place.

Measurement of the multi-polymer letters, numbers, and symbols conforming to the sizes and dimensions specified will be the total area in square feet (square meter) calculated from the following unit areas

LETTERS SQ. FT. (SQ. M.)									
SIZE	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
6 ft (1.8 m)	3.1 (.28)	4.0 (.37)	2.7 (.25)	3.4 (.31)	3.3 (.31)	2.6 (.24)	3.3 (.31)	3.4 (.31)	1.5 (.14)
8 ft (2.4 m)	5.5 (.51)	7.1 (.66)	4.8 (.45)	6.1 (.57)	5.9 (.55)	4.7 (.44)	5.8 (.54)	6.0 (.56)	2.6 (.24)
SIZE	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**
6 ft (1.8 m)	2.1 (.20)	3.1 (.28)	2.2 (.20)	4.2 (.39)	4.0 (.37)	3.4 (.31)	3.0 (.28)	3.6 (.33)	3.6 (.33)
8 ft (2.4 m)	3.7 (.34)	5.7 (.53)	3.8 (.45)	7.4 (.69)	7.1 (.65)	6.0 (.56)	5.3 (.49)	6.3 (.59)	6.3 (.59)
SIZE	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**	
6 ft (1.8 m)	3.2 (.30)	2.2 (.20)	3.2 (.30)	2.7 (.25)	4.2 (.39)	2.7 (.25)	2.2 (.20)	2.9 (.26)	
8 ft (2.4 m)	5.7 (.53)	3.8 (.35)	5.6 (.52)	4.8 (.45)	7.3 (.68)	4.8 (.45)	3.9 (.36)	5.1 (.47)	

NUMBERS SQ. FT. (SQ. M.)					
SIZE	**1**	**2**	**3**	**4**	**5**
6 ft (1.8 m)	1.5 (0.14)	3.3 (0.31)	3.3 (0.31)	2.9 (0.26)	3.5 (0.33)
8 ft (2.4 m)	2.6 (0.24)	5.8 (0.54)	5.8 (0.54)	5.1 (0.47)	6.1 (0.57)
SIZE	**6**	**7**	**8**	**9**	**0**
6 ft (1.8 m)	3.5 (0.33)	2.2 (0.20)	3.8 (0.35)	3.5 (0.33)	3.4 (0.31)
8 ft (2.4 m)	6.2 (0.58)	3.8 (0.35)	6.7 (0.62)	6.1 (0.58)	6.0 (0.56)

SYMBOLS SQ. FT. (SQ. M.)	LARGE SIZE	SMALL SIZE
Through Arrow	11.5 (1.07)	6.5 (0.60)
Left or Right Arrow	15.6 (1.47)	8.8 (0.82)
Combination Left or Right and Through Arrow	26.0 (2.42)	14.7 (1.37)
Railroad “X” 20 feet (6.1 m)	54.0 (5.02)	--

Basis of Payment. Payment for this work will be made at the contract unit price per foot of applied line width for MULTI-POLYMER PAVEMENT MARKING – LINE, and per square foot for MULTI-POLYMER PAVEMENT MARKING, LETTERS AND SYMBOLS.

Pay Item Number	Designation	Unit of Measure
JT780300	MULTI-POLYMER PAVEMENT MARKING – LINE 4”	FOOT
JT780310	MULTI-POLYMER PAVEMENT MARKING – LINE 6”	FOOT
JT780320	MULTI-POLYMER PAVEMENT MARKING – LINE 10”	FOOT
JT780325	MULTI-POLYMER PAVEMENT MARKING – LINE 12”	FOOT
JT780355	MULTI-POLYMER PAVEMENT MARKING – SYMBOLS (LARGE)	SQ FT

PIPE UNDERDRAINS (Illinois Tollway)
Effective: August 9, 2016

Description. This work shall consist of furnishing and installing Pipe Underdrains, Fabric Lined Trench, and Pipe Underdrains (Special), of the size specified at locations shown on the plans or as directed by the Engineer.

Materials. The materials shall be in accordance with the following.

(a) Pipe Underdrains, Fabric Lined Trench. Materials for pipe underdrains, fabric lined trench shall be according to the following Article/Section of the Standard Specifications.

Item	Article/Section
(1) Perforated Corrugated Steel Pipe (Note 1) (Note 3)	1006.01
(2) Perforated Polyvinyl Chloride (PVC) Pipe (Note 3)	1040.03
(3) Perforated Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior (Note 3)	1040.03
(4) Perforated Corrugated Polyethylene (PE) Pipe (Note 2) (Note 3)	1040.04
(5) Perforated Corrugated Polyethylene (PE) Pipe with a Smooth Interior (Note 3)	1040.04
(6) Fine Aggregate for Bedding and Backfill	1003.04
(7) Fabric Envelope for Pipe Underdrains	1080.01
(8) Geotechnical Fabric for Trench (Note 4)	1080.05
(9) Grout	1024.01

(b) Pipe Underdrains (Special). Materials for pipe underdrains (special) shall be according to the following Article/Section of the Standard Specifications.

Item	Article/Section
(1) Corrugated Polyvinyl Chloride (PVC) Pipe with a Smooth Interior	1040.03
(2) Corrugated Polyethylene (PE) Pipe with a Smooth Interior	1040.04
(3) Grout	1024.01

Note 1. The thickness for steel and aluminum pipe shall be as shown in tables 1B and 1C of Article 542.03 of the Standard Specifications for pipe having up to 3 ft of cover over the top of the pipe. The thickness for corrugated steel pipe shall be 0.052 in. for a pipe with a nominal diameter of 6 in. and 0.064 in. for a pipe with a nominal diameter of 8 in. Corrugations of 1 1/2 x 1/4 in. shall be used in lieu of 2 2/3 x 1/2 in. corrugations for 6 in. and 8 in. diameter pipes. The thickness for corrugated aluminum alloy pipe shall be 0.048 in. for a pipe with a nominal diameter of 6 in. and 0.060 in. for a pipe with a nominal diameter of 8 in.

Note 2. This material is limited to 4 in. diameter.

Note 3. This material shall be encased in a fabric envelope.

Note 4. Non-woven fabric shall not be allowed

CONSTRUCTION REQUIREMENTS

Construction and installation shall conform to the details shown in the Plans, Illinois Tollway Standard Drawing B24, and all applicable portions of Section 601 of the Standard Specifications except as otherwise specified herein.

The trench of the pipe underdrains, fabric lined trench under the paved shoulder shall be backfilled as specified, except CA 16 shall be used in lieu of FA 1 or FA 2 for trench backfill. The CA 16 shall be according to Article 1004.05 and Article 1004.01 of the Standard Specifications, except in the table, Coarse Aggregate Gradation, the percent passing the No. 16 sieve shall be 4 ± 4%. The trench shall be wrapped using a fabric envelope. The fabric encompassing the trench shall be in addition to the fabric required to be placed in direct contact with the pipe.

The portion of the pipe underdrain (special) under the paved shoulder shall be backfilled with CA-16 grade granular backfill as specified for pipe underdrains. The remaining portion shall be backfilled with select material meeting the approval of the Engineer

Where a filter fabric envelope is designated on the plans to prevent fines from entering the bedding material, backfill, or the pipe perforations, it shall be installed as shown on the plans.

Pipe underdrains, fabric lined trench shall be located and constructed as shown in the plans, including the placement of filter fabric, flexible perforated tubing and the specified granular backfill in a trench with a minimum flowline gradient as indicated in Illinois Tollway Standard Drawing B24. The trench shall be constructed in such a manner that the sides and bottom retain a firm, clean surface. Provide any necessary temporary sheeting or bracing required for the excavation of the trench and construction of the pipe underdrain, fabric lined trench.

Following trench excavation, the approved filter fabric shall be unrolled directly over the trench in such a position that the centerline of the fabric width is directly over the ditch centerline. The fabric shall be carefully depressed into the trench, maintaining precise alignment of the fabric with the trench. The perforated tubing and granular backfill shall then be carefully placed in the trench in accordance with the details and dimensions shown in the Plans. After placement of granular backfill to the satisfaction of the Engineer, the remaining exposed filter fabric shall be lapped closed at the top of the trench as shown in the plan details.

Connecting pipe underdrains into proposed and existing drainage structures shall be done according to the details shown in the Plans. The method of connecting proposed underdrains into the structures shall be approved by the Engineer. The invert of the connection is to be determined in the field to ensure positive drainage away from the roadway subgrade. When connecting pipe underdrains into existing drainage structures the Contractor shall carefully core a hole into the existing drainage structure or culvert to the same size as the external diameter of the proposed pipe underdrain, at the line and grade as shown in the plans. The protrusion of the proposed pipe underdrain into the drainage structure or culvert must not exceed one inch. After the pipe underdrain is installed, the drainage structure or culvert shall be mortared with an approved non-shrink concrete grout.

Rodent shield shall be included as shown in Illinois Tollway Standard Drawing B24.

Method of Measurement. This work will be measured for payment of the size specified in feet along the centerline of the pipe, in place, excluding manholes, catch basins and inlets, but including pipe embedded in the walls of manholes, catch basins, inlets or other structures.

Concrete headwalls for pipe drains, pipe underdrains (special), and pipe underdrains, fabric lined trench will be measured separately.

Basis of Payment. This work shall be paid for at the contract unit price per foot for the diameter specified for PIPE UNDERDRAINS (SPECIAL) and PIPE UNDERDRAINS, FABRIC LINED TRENCH.

Concrete headwalls for pipe drains, pipe underdrains (special), and pipe underdrains, fabric lined trench shall be paid for separately.

Pay Item Number	Designation	Unit of Measure
JI601300	PIPE UNDERDRAINS 6” (SPECIAL)	FOOT
JI601320	PIPE UNDERDRAINS, FABRIC LINED TRENCH 6"	FOOT

PIPE UNDERDRAINS FOR STRUCTURES
Effective: May 17, 2000 Revised: January 22, 2010

Description. This work shall consist of furnishing and installing a pipe underdrain system as shown on the plans, as specified herein, and as directed by the Engineer.

Materials. Materials shall meet the requirements as set forth below:

The perforated pipe underdrain shall be according to Article 601.02 of the Standard Specifications. Outlet pipes or pipes connecting to a separate storm sewer system shall not be perforated.

The drainage aggregate shall be a combination of one or more of the following gradations, FA1, FA2, CA5, CA7, CA8, CA11, or CA13 thru 16, according to Sections 1003 and 1004 of the Standard Specifications.

The fabric surrounding the drainage aggregate shall be Geotechnical Fabric for French Drains according to Article 1080.05 of the Standard Specifications.

Construction Requirements. All work shall be according to the applicable requirements of Section 601 of the Standard Specifications except as modified below.

The pipe underdrains shall consist of a perforated pipe drain situated at the bottom of an area of drainage aggregate wrapped completely in geotechnical fabric and shall be installed to the lines and gradients as shown on the plans.

Method of Measurement. Pipe Underdrains for Structures shall be measured for payment in feet (meters), in place. Measurement shall be along the centerline of the pipe underdrains. All connectors, outlet pipes, elbows, and all other miscellaneous items shall be included in the measurement. Concrete headwalls shall be included in the cost of Pipe Underdrains for Structures, but shall not be included in the measurement for payment.

Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for PIPE UNDERDRAINS FOR STRUCTURES of the diameter specified. Furnishing and installation of the drainage aggregate, geotechnical fabric, forming holes in structural elements and any excavation required, will not be paid for separately, but shall be included in the cost of the pipe underdrains for structures.

STRUCTURAL REPAIR OF CONCRETE
Effective: March 15, 2006 Revised: April 1, 2016

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 or R2 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 or R2 concrete shall be from the Department's approved list of Packaged, Dry, Rapid Hardening, Cementitious Materials for Concrete Repairs. The R1 or R2 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 approved list of Concrete Admixtures shall not apply.

Note 3. The “high slump” packaged concrete mixture shall be from the Department’s approved 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 approved 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 approved 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 approved 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 approved 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 ($Na_2O + 0.658K_2O$) 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 approved 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 ± 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 or R2 Concrete with coarse aggregate added, 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) nozzlemen 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 nozzlemen as determined by the Engineer. A copy of the nozzlemen 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.

STRUCTURAL ASSESSMENT REPORTS FOR CONTRACTOR'S MEANS AND METHODS
Effective: March 6, 2009 Revised October 5, 2015

Description. This item shall consist of preparing and submitting, to the Engineer for approval, Structural Assessment Reports (SARs) for proposed work on structure(s) or portions thereof. Unless noted otherwise, a SAR shall be required when the Contractor's means and methods apply loads to the structure or change its structural behavior. A SAR shall be submitted and approved prior to beginning the work covered by that SAR. Separate portions of the work may be covered by separate SARs which may be submitted at different times or as dictated by the Contractor's schedule.

Existing Conditions. An Existing Structure Information Package (ESIP) will be provided by the Department to the Contractor upon request. This package will typically include existing or "As-Built" plans, and the latest National Bridge Inspection Standards (NBIS) inspection report. The availability of structural information from the Department is solely for the convenience and information of the Contractor and shall not relieve the Contractor of the duty to make, and the risk of making, examinations and investigations as required to assess conditions affecting the work. Any data furnished in the ESIP is for information only and does not constitute a part of the Contract. The Department makes no representation or warranty, express or implied, as to the information conveyed or as to any interpretations made from the data.

Removal SARs. A SAR for removal of existing structures, or portions thereof, shall demonstrate that the Contractor's proposed means and methods to accomplish the work do not compromise the structural adequacy of the bridge, or portions thereof that are to remain in service, at any time during the work activities being performed. Each phase of the operation shall be accounted for, as well as the existing condition of the structure.

Construction SARs. A SAR for new construction or for construction utilizing existing components shall demonstrate that the Contractor's proposed means and methods to accomplish the work do not compromise the structural adequacy of the bridge or portions thereof at any time during the work activities being performed. For construction activities applying less than 10 tons (9 metric tons) of total combined weight of equipment and stockpiled materials on the structure at any one time, a SAR submittal shall not be required provided the Contractor submits written verification to the Engineer stating the applied loads do not exceed this threshold. The verification shall be submitted prior to the start of the activity. This SAR exemption shall not relieve the Contractor from responsibility for the structure. A SAR shall be submitted in all cases where the existing structure is posted for less than legal loads or the Contract plans indicate a live load restriction is in place.

Requirements

a) General. All work specified shall be performed according to the Contract plans, Special Provisions and/or Standard Specifications governing that work.

Submittals for falsework and forming for concrete construction shall be according to Articles 503.05 and 503.06 and does not require a SAR. Moving construction equipment across a structure, or portions thereof, open to traffic shall be addressed according to Article 107.16 and does not require a SAR. Operating equipment on an in-service structure and/or using a portion of an in-service structure as a work platform shall require a SAR and Article 107.16 shall not apply.

The Contractor may move vehicles across the existing bridge without a SAR after closure and prior to removal of any portion of the structure provided:

- The vehicles satisfy the requirements of Section 15-111 of the Illinois Vehicle Code (described in the IDOT document “Understanding the Illinois Size & Weight Laws”) or of the Federal Highway Administration document “Bridge Formula Weights” (available at: http://www.ops.fhwa.dot.gov/freight/publications/brdg_frm_wghts/index.htm)
- The Contractor submits written verification to the Engineer stating the vehicles meet these requirements. The verification shall be submitted prior to allowing the vehicles on the structure.

This SAR exemption shall not relieve the Contractor from responsibility for the structure. This SAR exemption shall not be allowed where the existing structure is posted for less than legal loads or the Contract plans indicate a live load restriction is in place. No stockpiling of material is allowed under this exemption.

All SARs shall detail the procedures and sequencing necessary to complete the work in a safe and controlled manner. When appropriate, supporting design calculations shall be provided verifying the following:

- The effects of the applied loads do not exceed the capacity at Operating level for any portions of the structure being utilized in the demolition of the structure provided those portions are not to be reused.
- The effects of the applied loads do not exceed the capacity at Inventory level for new construction or for portions of the existing structure that are to be reused.
- The condition of the structure and/or members has been considered.

See AASHTO Manual for Bridge Evaluation for further information on determining the available capacities at the Operating and Inventory levels.

b) Confidential Documents. Due to the sensitivity of the inspection reports and bridge condition reports to bridge security, the following confidentiality statement applies to these reports:

"Reports used by the Contractor and the contents thereof are the property of the Department, and are subject to the control of the Department in accordance with State and Federal law. The distribution, dissemination, disclosure, duplication or release of these reports or the content thereof in any manner, form or format without the express permission of the keeper of this record is prohibited. The owner is the official keeper of these records, except for state owned bridges, where the official keeper of these records is the Regional Engineer."

c) Submittals. The Contractor shall be pre-approved to prepare SAR(s) or shall retain the services of a pre-qualified engineering firm to provide these services. Pre-approval of the Contractor will be determined by the Illinois Department of Transportation and will allow SAR(s) preparation by the Contractor unless otherwise noted on the plans. For engineering firms, pre-qualification shall be according to the Department in the category of "Highway Bridges-Typical" unless otherwise noted on the plans. Firms involved in any part of the project (plan development or project management) will not be eligible to provide these services. Evidence of pre-approval/pre-qualification shall be submitted with all SAR(s). The SAR(s) shall be prepared and sealed by an Illinois Licensed Structural Engineer. The Contractor shall submit SAR(s), complete with working drawings and supporting design calculations, to the Engineer for approval, at least 30 calendar days prior to start of that portion of the work.

At a minimum a Structural Assessment Report shall include the following:

1. A plan outlining the procedures and sequence for the work, including staging when applicable.
2. A demolition plan (when removal is included as an item of work in the contract) including details of the proposed methods of removal.
3. A beam erection plan (when beam erection is included as an item of work in the contract) including details of the proposed methods of erection.
4. Pertinent specifications for equipment used during the work activity.
5. The allowable positions for that equipment during the work activity.
6. The allowable positions and magnitudes of stockpiled materials and/or spoils, if planned to be located on the structure.
7. Design and details for temporary shoring and/or bracing, if required by the Contractor's means and methods.

Approval or acceptance of a Structural Assessment Report shall not relieve the Contractor of any responsibility for the successful completion of the work.

Revisions to the Contractor's means and methods resulting in no increased load effects to the structure, as determined by the Contractor's Structural Engineer, shall not require a SAR resubmittal. However, the Contractor's Structural Engineer shall submit to the Engineer written verification that there is no increased load effect. The written verification shall specify the revisions and shall be submitted prior to the start of the revised activities.

The Contractor shall be responsible for following the approved SAR related to the work involved.

Method of Measurement. Structural Assessment Reports will not be measured for payment.

Basis of payment. Structural Assessment Reports will not be paid for separately but shall be considered as included in the contract unit price(s) for the work item(s) specified.

WEEP HOLE DRAINS FOR ABUTMENTS, WINGWALLS, RETAINING WALLS AND CULVERTS

Effective: April 19, 2012 Revised: October 22, 2013

Delete the last paragraphs of Articles 205.05 and 502.10 and replace with the following.

"If a geocomposite wall drain according to Section 591 is not specified, a prefabricated geocomposite strip drain according to Section 1040.07 shall be placed at the back of each drain hole. The strip drain shall be 24 inches (600 mm) wide and 48 inches (1.220 m) tall. The strip drain shall be centered over the drain hole with the bottom located 12 inches (300 mm) below the bottom of the drain hole. All form boards or other obstructions shall be removed from the drain holes before placing any geocomposite strip drain."

Revise the last sentence of the first paragraph of Article 503.11 to read as follows.

"Drain holes shall be covered to prevent the leakage of backfill material according to Article 502.10."

Revise the title of Article 1040.07 to Geocomposite Wall Drains and Strip Drains.

AGGREGATE SUBGRADE IMPROVEMENT (BDE)
Effective: April 1, 2012 Revised: April 1, 2016

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.

303.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Coarse Aggregate	1004.07
(b) Reclaimed Asphalt Pavement (RAP) (Notes 1, 2, and 3)	1031

Note 1. Crushed RAP, from either full depth or single lift removal, may be mechanically blended with aggregate gradations CS 01, CS 02, and RR 01 but shall not exceed 40 percent of the total product. The top size of the RAP shall be less than 4 in. (100 mm) and well graded.

Note 2. RAP having 100 percent passing the 1 1/2 in. (37.5 mm) sieve and being well graded, may be used as capping aggregate in the top 3 in. (75 mm) when aggregate gradations CS 01, CS 02, or RR 01 are used in lower lifts.

Note 3. The RAP used for aggregate subgrade improvement shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications".

303.03 Equipment. The vibratory machine shall be according to Article 1101.01, or as approved by the Engineer.

303.04 Soil Preparation. The stability of the soil shall be according to the Department's Subgrade Stability Manual for the aggregate thickness specified.

303.05 Placing Aggregate. The maximum nominal lift thickness of aggregate gradations CA 02, CA 06, or CA 10 shall be 12 in. (300 mm). The maximum nominal lift thickness of aggregate gradations CS 01, CS 02, and RR 01 shall be 24 in. (600 mm).

303.06 Capping Aggregate. The top surface of the aggregate subgrade shall consist of a minimum 3 in. (75 mm) of aggregate gradations CA 06 or CA 10. When the contract specifies that a granular subbase is to be placed on the aggregate subgrade improvement, the 3 in. (75 mm) of capping aggregate shall be the same gradation and may be placed with the underlying aggregate subgrade improvement material.

303.07 Compaction. All aggregate lifts 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.

303.08 Finishing and Maintenance of Aggregate Subgrade Improvement. 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.

303.09 Method of Measurement. This work will be measured for payment according to Article 311.08.

303.10 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.** 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 subgrade material is required, gravel may be used below the first 12 in (300 mm) of subgrade.

(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 subgrade thickness less than or equal to 12 in. (300 mm) shall be CA 2, CA 6, CA 10, or CS 01.

The coarse aggregate gradation for total subgrade thickness more than 12 in. (300 mm) shall be CS 01 or CS 02 as shown below or RR 01 according to Article 1005.01(c).

	COARSE AGGREGATE SUBGRADE GRADATIONS				
Grad No.	Sieve Size and Percent Passing				
	8”	6”	4”	2”	#4
CS 01	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20
CS 02		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 01	100	97 ± 3	90 ± 10	45 ± 25	20 ± 20
CS 02		100	80 ± 10	25 ± 15	

(2) The 3 in. (75 mm) capping aggregate shall be gradation CA 6 or CA 10.”

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, tons = $A \times D \times (G_{mb} \times 46.8) / 2000$. For HMA mixtures measured in square meters: Q, 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, tons = V x 8.33 lb/gal x SG / 2000
For bituminous materials measured in liters: Q, metric tons = V x 1.0 kg/L x 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:

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.

BUTT JOINTS (BDE)
Effective: July 1, 2016

Add the following to Article 406.08 of the Standard Specifications.

"(c) Temporary Plastic Ramps. Temporary plastic ramps shall be made of high density polyethylene meeting the properties listed below. Temporary plastic ramps shall only be used on roadways with permanent posted speeds of 55 mph or less. The ramps shall have a minimum taper rate of 1:30 (V:H). The leading edge of the plastic ramp shall have a maximum thickness of 1/4 in. (6 mm) and the trailing edge shall match the height of the adjacent pavement ± 1/4 in. (± 6 mm).

The ramp will be accepted by certification. The Contractor shall furnish a certification from the manufacturer stating the temporary plastic ramp meets the following requirements.

Physical Property	Test Method	Requirement
Melt Index	ASTM D 1238	8.2 g/10 minutes
Density	ASTM D 1505	0.965 g/cc
Tensile Strength @ Break	ASTM D 638	2223 psi (15 MPa)
Tensile Strength @ Yield	ASTM D 638	4110 psi (28 MPa)
Elongation @ Yield 1/, percent	ASTM D 638	7.3 min.
Durometer Hardness, Shore D	ASTM D 2240	65
Heat Deflection Temperature, 66 psi	ASTM D 648	176 ºF (80 ºC)
Low Temperature Brittleness, F_{50}	ASTM D 746	<-105 ºF (<-76 ºC)

1/ Crosshead speed -2 in./minute

The temporary plastic ramps shall be installed according to the manufacturer's specifications and fastened with anchors meeting the manufacturer's recommendations. Temporary plastic ramps that fail to stay in place or create a traffic hazard shall be replaced immediately with temporary HMA ramps at the Contractor's expense."

COMPENSABLE DELAY COSTS (BDE)
Effective: June 2, 2017

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 working day contracts the payment will be made according to Article 109.04. For completion date contracts, an adjustment will be determined as follows.

Extended Traffic Control occurs between April 1 and November 30:

ETCP Adjustment ($) = TE x (%/100 x CUP / OCT)

Extended Traffic Control occurs between December 1 and March 31:

ETCP Adjustment ($) = TE x 1.5 (%/100 x CUP / OCT)

Where: TE = Duration of approved time extension in calendar days.
% = Percent maintenance for the traffic control, % (see table below).
CUP = Contract unit price for the traffic control pay item in place during the delay.
OCT = Original contract time in calendar days.

Original Contract Amount	Percent Maintenance
Up to $2,000,000	65%
$2,000,000 to $10,000,000	75%
$10,000,000 to $20,000,000	85%
Over $20,000,000	90%

When an ETCP 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."

CONCRETE END SECTIONS FOR PIPE CULVERTS (BDE)
Effective: January 1, 2013 Revised: April 1, 2016

Description. This work shall consist of constructing cast-in-place concrete and precast concrete end sections for pipe culverts. These end sections are shown on the plans as Highway Standard 542001 or 542011. This work shall be according to Section 542 of the Standard Specifications except as modified herein.

Materials. Materials shall be according to the following Articles of Division 1000 – Materials of the Standard Specifications.

Item	Article/Section
(a) Portland Cement Concrete (Note 1)	1020
(b) Precast Concrete End Sections (Note 2)	
(c) Coarse Aggregate (Note 3)	1004.05
(d) Structural Steel (Note 4)	1006.04
(e) Anchor Bolts and Rods (Note 5)	1006.09
(f) Reinforcement Bars	1006.10(a)
(g) Nonshrink Grout	1024.02
(h) Chemical Adhesive Resin System	1027
(i) Mastic Joint Sealer for Pipe	1055
(j) Hand Hole Plugs	1042.16

Note 1. Cast-in-place concrete end sections shall be Class SI, except the 14 day mix design shall have a compressive strength of 5000 psi (34,500 kPa) or a flexural strength of (800 psi) 5500 kPa and a minimum cement factor of 6.65 cwt/cu yd (395 kg/cu m).

Note 2. Precast concrete end sections shall be according to Articles 1042.02 and 1042.03(b)(c)(d)(e) of the Standard Specifications. The concrete shall be Class PC according to Section 1020, and shall have a minimum compressive strength of 5000 psi (34,000 kPa) at 28 days.

Joints between precast sections shall be produced with reinforced tongue and groove ends according to the requirements of ASTM C 1577.

Note 3. The granular bedding placed below a precast concrete end section shall be gradation CA 6, CA 9, CA 10, CA 12, CA 17, CA 18, or CA 19.

Note 4. All components of the culvert tie detail shall be galvanized according to the requirements of AASHTO M 111 or M 232 as applicable.

Note 5. The anchor rods for the culvert ties shall be according to the requirements of ASTM F 1554, Grade 105 (Grade 725).

CONSTRUCTION REQUIREMENTS

The concrete end sections may be precast or cast-in-place construction. Toe walls shall be either precast or cast-in-place, and shall be in proper position and backfilled according to the applicable paragraphs of Article 502.10 of the Standard Specifications prior to the installation of the concrete end sections. If soil conditions permit, cast-in-place toe walls may be poured directly against the soil. When poured directly against the soil, the clear cover of the sides and bottom of the toe wall shall be increased to 3 in. (75 mm) by increasing the thickness of the toe wall.

(a) Cast-In-Place Concrete End Sections. Cast-in-place concrete end sections shall be constructed according to the requirements of Section 503 of the Standard Specifications and as shown on the plans.

(b) Precast Concrete End Sections. When the concrete end sections will be precast, shop drawings detailing the slab thickness and reinforcement layout shall be submitted to the Engineer for review and approval.

The excavation and backfilling for precast concrete end sections shall be according to the requirements of Section 502 of the Standard Specifications, except a layer of granular bedding at least 6 in. (150 mm) in thickness shall be placed below the elevation of the bottom of the end section. The granular bedding shall extend a minimum of 2 ft (600 mm) beyond each side of the end section.

Anchor rods connecting precast sections shall be brought to a snug tight condition followed by an additional 2/3 turn on one of the nuts. Match marks shall be provided on the bolt and nut to verify relative rotation between the bolt and the nut.

When individual, precast end sections are placed side-by-side for a multi-pipe culvert installation, a 3 in. (75 mm) space shall be left between adjacent end section walls and the space(s) filled with Class SI concrete.

Method of Measurement. This work will be measured for payment as each, with each end of each culvert being one each.

Basis of Payment. This work will be paid for at the contract unit price per each for CONCRETE END SECTION, STANDARD 542001 or CONCRETE END SECTION, 542011, of the pipe diameter and slope specified.

CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)
Effective: June 1, 2010 Revised: November 1, 2014

The reduction of emissions of particulate matter (PM) for off-road equipment shall be accomplished by installing retrofit emission control devices. The term "equipment" refers to diesel fuel powered devices rated at 50 hp and above, to be used on the jobsite in excess of seven calendar days over the course of the construction period on the jobsite (including rental equipment).

Contractor and subcontractor diesel powered off-road equipment assigned to the contract shall be retrofitted using the phased in approach shown below. Equipment that is of a model year older than the year given for that equipment's respective horsepower range shall be retrofitted:

Effective Dates	Horsepower Range	Model Year
June 1, 2010 1/	600-749	2002
	750 and up	2006
June 1, 2011 2/	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 2/	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.
2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (http://www.epa.gov/cleandiesel/verification/verif-list.htm), or verified by the California Air Resources Board (CARB) (http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm); or

b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

Diesel Retrofit Deficiency Deduction

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be $1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected. Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

CONTRAST PREFORMED PLASTIC PAVEMENT MARKING (BDE)
Effective: November 1, 2017

Revise the first paragraph of Article 780.07(b) of the Standard Specifications to read:

"(b) Type B or C - Standard Application. Standard application of conventional preformed plastic pavement markings shall consist of applying the markings to the pavement surface or to the bottom of a groove recessed in the pavement surface as specified on the plans. Standard application of contrast preformed plastic pavement markings shall consist of applying the markings to the bottom of a groove recessed in the pavement surface. Both conventional and contrast preformed plastic pavement markings shall only be applied when the air temperature is at least 50 °F (10 °C) and rising and the pavement temperature is at least 70 °F (21 °C). However, application of the markings will not be allowed after October 15."

Add the following paragraph after the fourth paragraph of Article 780.14 of the Standard Specifications:

"The applied line width specified for contrast pavement markings shall include both the white/yellow reflective portion and the black nonreflective portion of the marking."

Revise the first paragraph of Article 1095.03 of the Standard Specifications to read:

"**1095.03Preformed Plastic Pavement Markings.** The material shall consist of a white or yellow (as specified) weather resistant, reflective film meeting the requirements specified herein. Where contrast markings are specified, the white or yellow reflective film shall be bordered along both the left and right edges by a 1 1/2 in. (38 mm) wide black weather resistant, nonreflective film also meeting the requirements specified herein."

Revise the table in Article 1095.03(a) of the Standard Specifications to read:

"Components	Minimum Percent By Weight	
	White or Yellow	Black
Resins and Plasticizers	20 %	20 %
Pigment and Fillers	30 %	30 %
Graded Glass Beads	25 %	- - "

Revise the first paragraph of Article 1095.03(h) of the Standard Specifications to read:

"Glass beads shall be uniformly distributed throughout the white or yellow portions of the material only. A top coating of beads shall be bonded to or directly embedded into the surface of the markings in order to produce immediate retroreflectivity."

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (BDE)
Effective: September 1, 2000 Revised: April 2, 2018

FEDERAL OBLIGATION. The Department of Transportation, as a recipient of federal financial assistance, is required to take all necessary and reasonable steps to ensure nondiscrimination in the award and administration of contracts. Consequently, the federal regulatory provisions of 49 CFR Part 26 apply to this contract concerning the utilization of disadvantaged business enterprises. For the purposes of this Special Provision, a disadvantaged business enterprise (DBE) means a business certified by the Department in accordance with the requirements of 49 CFR Part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory.

STATE OBLIGATION. This Special Provision will also be used by the Department to satisfy the requirements of the Business Enterprise for Minorities, Females, and Persons with Disabilities Act, 30 ILCS 575. When this Special Provision is used to satisfy state law requirements on 100 percent state-funded contracts, the federal government has no involvement in such contracts (not a federal-aid contract) and no responsibility to oversee the implementation of this Special Provision by the Department on those contracts. DBE participation on 100 percent state-funded contracts will not be credited toward fulfilling the Department's annual overall DBE goal required by the US Department of Transportation to comply with the federal DBE program requirements.

CONTRACTOR ASSURANCE. The Contractor makes the following assurance and agrees to include the assurance in each subcontract that the Contractor signs with a subcontractor.

> The Contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of contracts funded in whole or in part with federal or state funds. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:
>
> (a) Withholding progress payments;
>
> (b) Assessing sanctions;
>
> (c) Liquidated damages; and/or
>
> (d) Disqualifying the Contractor from future bidding as non-responsible.

OVERALL GOAL SET FOR THE DEPARTMENT. As a requirement of compliance with 49 CFR Part 26, the Department has set an overall goal for DBE participation in its federally assisted contracts. That goal applies to all federal-aid funds the Department will expend in its federally assisted contracts for the subject reporting fiscal year. The Department is required to make a good faith effort to achieve the overall goal. The dollar amount paid to all approved DBE companies performing work called for in this contract is eligible to be credited toward fulfillment of the Department's overall goal.

CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. This contract includes a specific DBE utilization goal established by the Department. The goal has been included because the Department has determined that the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies. The determination is based on an assessment of the type of work, the location of the work, and the availability of DBE companies to do a part of the work. The assessment indicates that, in the absence of unlawful discrimination, and in an arena of fair and open competition, DBE companies can be expected to perform **13.00%** of the work. This percentage is set as the DBE participation goal for this contract. Consequently, in addition to the other award criteria established for this contract, the Department will only award this contract to a bidder who makes a good faith effort to meet this goal of DBE participation in the performance of the work. A bidder makes a good faith effort for award consideration if either of the following is done in accordance with the procedures set for in this Special Provision:

(a) The bidder documents that enough DBE participation has been obtained to meet the goal or,

(b) The bidder documents that a good faith effort has been made to meet the goal, even though the effort did not succeed in obtaining enough DBE participation to meet the goal.

DBE LOCATOR REFERENCES. Bidders shall consult the IL UCP DBE Directory as a reference source for DBE-certified companies. In addition, the Department maintains a letting and item specific DBE locator information system whereby DBE companies can register their interest in providing quotes on particular bid items advertised for letting. Information concerning DBE companies willing to quote work for particular contracts may be obtained by contacting the Department's Bureau of Small Business Enterprises at telephone number (217) 785-4611, or by visiting the Department's website at:
http://www.idot.illinois.gov/doing-business/certifications/disadvantaged-business-enterprise-certification/il-ucp-directory/index.

BIDDING PROCEDURES. Compliance with this Special Provision is required prior to the award of the contract and the failure of the low bidder to comply will render the bid not responsive.

In order to assure the timely award of the contract, the low bidder shall submit:

(a) The bidder shall submit a DBE Utilization Plan on completed Department forms SBE 2025 and 2026.

(1) The final Utilization Plan must be submitted within five calendar days after the date of the letting in accordance with subsection (a)(2) of Bidding Procedures herein.

(2) To meet the five day requirement, the bidder may send the Utilization Plan electronically by scanning and sending to **DOT.DBE.UP@illinois.gov** or faxing to (217) 785-1524. The subject line must include the bid Item Number and the Letting date. The Utilization Plan should be sent as one .pdf file, rather than multiple files and emails for the same Item Number. It is the responsibility of the bidder to obtain confirmation of email or fax delivery.

Alternatively, the Utilization Plan may be sent by certified mail or delivery service within the five calendar day period. If a question arises concerning the mailing date of a Utilization Plan, the mailing date will be established by the U.S. Postal Service postmark on the certified mail receipt from the U.S. Postal Service or the receipt issued by a delivery service when the Utilization Plan is received by the Department. It is the responsibility of the bidder to ensure the postmark or receipt date is affixed within the five days if the bidder intends to rely upon mailing or delivery to satisfy the submission day requirement. The Utilization Plan is to be submitted to:

Illinois Department of Transportation
Bureau of Small Business Enterprises
Contract Compliance Section
2300 South Dirksen Parkway, Room 319
Springfield, Illinois 62764

The Department will not accept a Utilization Plan if it does not meet the five day submittal requirement and the bid will be declared not responsive. In the event the bid is declared not responsive due to a failure to submit a Utilization Plan or failure to comply with the bidding procedures set forth herein, 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. The Department reserves the right to invite any other bidder to submit a Utilization Plan at any time for award consideration.

(b) The Utilization Plan shall indicate that the bidder either has obtained sufficient DBE participation commitments to meet the contract goal or has not obtained enough DBE participation commitments in spite of a good faith effort to meet the goal. The Utilization Plan shall further provide the name, telephone number, and telefax number of a responsible official of the bidder designated for purposes of notification of Utilization Plan approval or disapproval under the procedures of this Special Provision.

(c) The Utilization Plan shall include a DBE Participation Commitment Statement, Department form SBE 2025, for each DBE proposed for the performance of work to achieve the contract goal. For bidding purposes, submission of the completed SBE 2025 forms, signed by the DBEs and scanned or faxed to the bidder will be acceptable as long as the original is available and provided upon request. All elements of information indicated on the said form shall be provided, including but not limited to the following:

(1) The names and addresses of DBE firms that will participate in the contract;

(2) A description, including pay item numbers, of the work each DBE will perform;

(3) The dollar amount of the participation of each DBE firm participating. The dollar amount of participation for identified work shall specifically state the quantity, unit price, and total subcontract price for the work to be completed by the DBE. If partial pay items are to be performed by the DBE, indicate the portion of each item, a unit price where appropriate and the subcontract price amount;

(4) DBE Participation Commitment Statements, form SBE 2025, signed by the bidder and each participating DBE firm documenting the commitment to use the DBE subcontractors whose participation is submitted to meet the contract goal;

(5) If the bidder is a joint venture comprised of DBE companies and non-DBE companies, the Utilization Plan must also include a clear identification of the portion of the work to be performed by the DBE partner(s); and,

(6) If the contract goal is not met, evidence of good faith efforts; the documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor is selected over a DBE for work on the contract.

GOOD FAITH EFFORT PROCEDURES. The contract will not be awarded until the Utilization Plan submitted by the apparent successful bidder is approved. All information submitted by the bidder must be complete, accurate and adequately document that enough DBE participation has been obtained or document that good faith efforts of the bidder, in the event enough DBE participation has not been obtained, before the Department will commit to the performance of the contract by the bidder. The Utilization Plan will be approved by the Department if the Utilization Plan documents sufficient commercially useful DBE work to meet the contract goal or the bidder submits sufficient documentation of a good faith effort to meet the contract goal pursuant to 49 CFR Part 26, Appendix A. The Utilization Plan will not be approved by the Department if the Utilization Plan does not document sufficient DBE participation to meet the contract goal unless the apparent successful bidder documented in the Utilization Plan that it made a good faith effort to meet the goal. This means that the bidder must show that all necessary and reasonable steps were taken to achieve the contract goal. Necessary and reasonable steps are those which, by their scope, intensity and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not successful. The Department will consider the quality, quantity, and intensity of the kinds of efforts that the bidder has made. Mere *pro forma* efforts, in other words, efforts done as a matter of form, are not good faith efforts; rather, the bidder is expected to have taken genuine efforts that would be reasonably expected of a bidder actively and aggressively trying to obtain DBE participation sufficient to meet the contract goal.

(a) The following is a list of types of action that the Department will consider as part of the evaluation of the bidder's good faith efforts to obtain participation. These listed factors are not intended to be a mandatory checklist and are not intended to be exhaustive. Other factors or efforts brought to the attention of the Department may be relevant in appropriate cases, and will be considered by the Department.

    (1) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBE companies that have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBE companies to respond to the solicitation. The bidder must determine with certainty if the DBE companies are interested by taking appropriate steps to follow up initial solicitations.

    (2) Selecting portions of the work to be performed by DBE companies in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the prime Contractor might otherwise prefer to perform these work items with its own forces.

(3) Providing interested DBE companies with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

(4) a. Negotiating in good faith with interested DBE companies. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBE companies that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBE companies to perform the work.

b. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBE companies is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also the ability or desire of a bidder to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders are not, however, required to accept higher quotes from DBE companies if the price difference is excessive or unreasonable. In accordance with subsection (c)(6) of the above Bidding Procedures, the documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.

(5) Not rejecting DBE companies as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.

(6) Making efforts to assist interested DBE companies in obtaining bonding, lines of credit, or insurance as required by the recipient or Contractor.

(7) Making efforts to assist interested DBE companies in obtaining necessary equipment, supplies, materials, or related assistance or services.

(8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBE companies.

(b) If the Department determines that the apparent successful bidder has made a good faith effort to secure the work commitment of DBE companies to meet the contract goal, the Department will award the contract provided that it is otherwise eligible for award. If the Department determines that the bidder has failed to meet the requirements of this Special Provision or that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan that the bid is not responsive. The notification shall include a statement of reasons for the determination. If the Utilization Plan is not approved because it is deficient as a technical matter, unless waived by the Department, the bidder will be notified and will be allowed no more than a five calendar day period in order to cure the deficiency.

(c) The bidder may request administrative reconsideration of a determination adverse to the bidder within the five working days after the receipt of the notification date of the determination by delivering the request to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764 (Telefax: (217) 785-1524). Deposit of the request in the United States mail on or before the fifth business day shall not be deemed delivery. The determination shall become final if a request is not made and delivered. A request may provide additional written documentation or argument concerning the issues raised in the determination statement of reasons, provided the documentation and arguments address efforts made prior to submitting the bid. The request will be forwarded to the Department's Reconsideration Officer. The Reconsideration Officer will extend an opportunity to the bidder to meet in person in order to consider all issues of documentation and whether the bidder made a good faith effort to meet the goal. After the review by the Reconsideration Officer, the bidder will be sent a written decision within ten working days after receipt of the request for reconsideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid not responsive.

CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work anticipated to be performed and paid for upon satisfactory completion. The Department is only able to count toward the achievement of the overall goal and the contract goal the value of payments made for the work actually performed by DBE companies. In addition, a DBE must perform a commercially useful function on the contract to be counted. A commercially useful function is generally performed when the DBE is responsible for the work and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The Department and Contractor are governed by the provisions of 49 CFR Part 26.55(c) on questions of commercially useful functions as it affects the work. Specific counting guidelines are provided in 49 CFR Part 26.55, the provisions of which govern over the summary contained herein.

(a) DBE as the Contractor: 100 percent goal credit for that portion of the work performed by the DBE's own forces, including the cost of materials and supplies. Work that a DBE subcontracts to a non-DBE does not count toward the DBE goals.

(b) DBE as a joint venture Contractor: 100 percent goal credit for that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work performed by the DBE's own forces.

(c) DBE as a subcontractor: 100 percent goal credit for the work of the subcontract performed by the DBE's own forces, including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the DBE subcontractor from the prime Contractor or its affiliates. Work that a DBE subcontractor in turn subcontracts to a non-DBE does not count toward the DBE goal.

(d) DBE as a trucker: 100 percent goal credit for trucking participation provided the DBE is responsible for the management and supervision of the entire trucking operation for which it is responsible. At least one truck owned, operated, licensed, and insured by the DBE must be used on the contract. Credit will be given for the following:

    (1) The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.

    (2) The DBE may also lease trucks from a non-DBE firm, including from an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission is receives as a result of the lease arrangement.

(e) DBE as a material supplier:

(1) 60 percent goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.

(2) 100 percent goal credit for the cost of materials of supplies obtained from a DBE manufacturer.

(3) 100 percent credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a DBE regular dealer or DBE manufacturer.

CONTRACT COMPLIANCE. Compliance with this Special Provision is an essential part of the contract. The Department is prohibited by federal regulations from crediting the participation of a DBE included in the Utilization Plan toward either the contract goal or the Department's overall goal until the amount to be applied toward the goals has been paid to the DBE. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan. After approval of the Utilization Plan and award of the contract, the Utilization Plan and individual DBE Participation Statements become part of the contract. If the Contractor did not succeed in obtaining enough DBE participation to achieve the advertised contract goal, and the Utilization Plan was approved and contract awarded based upon a determination of good faith, the total dollar value of DBE work calculated in the approved Utilization Plan as a percentage of the awarded contract value shall become the amended contract goal. All work indicated for performance by an approved DBE shall be performed, managed, and supervised by the DBE executing the DBE Participation Commitment Statement.

(a) NO AMENDMENT. No amendment to the Utilization Plan may be made without prior written approval from the Department's Bureau of Small Business Enterprises. All requests for amendment to the Utilization Plan shall be submitted to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764. Telephone number (217) 785-4611. Telefax number (217) 785-1524.

(b) CHANGES TO WORK. Any deviation from the DBE condition-of-award or contract plans, specifications, or special provisions must be approved, in writing, by the Department as provided elsewhere in the Contract. The Contractor shall notify affected DBEs in writing of any changes in the scope of work which result in a reduction in the dollar amount condition-of-award to the contract. Where the revision includes work committed to a new DBE subcontractor, not previously involved in the project, then a Request for Approval of Subcontractor, Department form BC 260A or AER 260A, must be signed and submitted. If the commitment of work is in the form of additional tasks assigned to an existing subcontract, than a new Request for Approval of Subcontractor shall not be required. However, the Contractor must document efforts to assure that the existing DBE subcontractor is capable of performing the additional work and has agreed in writing to the change.

(c) SUBCONTRACT. The Contractor must provide DBE subcontracts to IDOT upon request. Subcontractors shall ensure that all lower tier subcontracts or agreements with DBEs to supply labor or materials be performed in accordance with this Special Provision.

(d) ALTERNATIVE WORK METHODS. In addition to the above requirements for reductions in the condition of award, additional requirements apply to the two cases of Contractor-initiated work substitution proposals. Where the contract allows alternate work methods which serve to delete or create underruns in condition of award DBE work, and the Contractor selects that alternate method or, where the Contractor proposes a substitute work method or material that serves to diminish or delete work committed to a DBE and replace it with other work, then the Contractor must demonstrate one of the following:

(1) That the replacement work will be performed by the same DBE (as long as the DBE is certified in the respective item of work) in a modification of the condition of award; or

(2) That the DBE is aware that its work will be deleted or will experience underruns and has agreed in writing to the change. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so; or

(3) That the DBE is not capable of performing the replacement work or has declined to perform the work at a reasonable competitive price. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so.

(e) TERMINATION AND REPLACEMENT PROCEDURES. The Contractor shall not terminate or replace a DBE listed on the approved Utilization Plan, or perform with other forces work designated for a listed DBE except as provided in this Special Provision. The Contractor shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the Contractor obtains the Department's written consent as provided in subsection (a) of this part. Unless Department consent is provided for termination of a DBE subcontractor, the Contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the DBE in the Utilization Plan.

As stated above, the Contractor shall not terminate or replace a DBE subcontractor listed in the approved Utilization Plan without prior written consent. This includes, but is not limited to, instances in which the Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm. Written consent will be granted only if the Bureau of Small Business Enterprises agrees, for reasons stated in its concurrence document, that the Contractor has good cause to terminate or replace the DBE firm. Before transmitting to the Bureau of Small Business Enterprises any request to terminate and/or substitute a DBE subcontractor, the Contractor shall give notice in writing to the DBE subcontractor, with a copy to the Bureau, of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor shall give the DBE five days to respond to the Contractor's notice. The DBE so notified shall advise the Bureau and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Bureau should not approve the Contractor's action. If required in a particular case as a matter of public necessity, the Bureau may provide a response period shorter than five days.

For purposes of this paragraph, good cause includes the following circumstances:

(1) The listed DBE subcontractor fails or refuses to execute a written contract;

(2) The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;

(3) The listed DBE subcontractor fails or refuses to meet the prime Contractor's reasonable, nondiscriminatory bond requirements;

(4) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;

(5) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1200 or applicable state law.

(6) You have determined that the listed DBE subcontractor is not a responsible contractor;

(7) The listed DBE subcontractor voluntarily withdraws from the projects and provides to you written notice of its withdrawal;

(8) The listed DBE is ineligible to receive DBE credit for the type of work required;

(9) A DBE owner dies or becomes disabled with the result that the listed DBE subcontractor is unable to complete its work on the contract;

(10) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the prime Contractor seeks to terminate a DBE it relied upon to obtain the contract so that the prime Contractor can self-perform the work for which the DBE contractor was engaged or so that the prime Contractor can substitute another DBE or non-DBE contractor after contract award.

When a DBE is terminated, or fails to complete its work on the Contract for any reason the Contractor shall make a good faith effort to find another DBE to substitute for the original DBE to perform at least the same amount of work under the contract as the terminated DBE to the extent needed to meet the established Contract goal. The good faith efforts shall be documented by the Contractor. If the Department requests documentation under this provision, the Contractor shall submit the documentation within seven days, which may be extended for an additional seven days if necessary at the request of the Contractor. The Department shall provide a written determination to the Contractor stating whether or not good faith efforts have been demonstrated.

(f) FINAL PAYMENT. After the performance of the final item of work or delivery of material by a DBE and final payment therefore to the DBE by the Contractor, but not later than thirty calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Agreement on Department form SBE 2115 to the Resident Engineer. If full and final payment has not been made to the DBE, the DBE Payment Agreement shall indicate whether a disagreement as to the payment required exists between the Contractor and the DBE or if the Contractor believes that the work has not been satisfactorily completed. If the Contractor does not have the full amount of work indicated in the Utilization Plan performed by the DBE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages. The Contractor may request an administrative reconsideration of any amount deducted as damages pursuant to subsection (h) of this part.

(g) ENFORCEMENT. The Department reserves the right to withhold payment to the Contractor to enforce the provisions of this Special Provision. Final payment shall not be made on the contract until such time as the Contractor submits sufficient documentation demonstrating achievement of the goal in accordance with this Special Provision or after liquidated damages have been determined and collected.

(h) RECONSIDERATION. Notwithstanding any other provision of the contract, including but not limited to Article 109.09 of the Standard Specifications, the Contractor my request administrative reconsideration of a decision to deduct the amount of the goal not achieved as liquidated damages. A request to reconsider shall be delivered to the Contract Compliance Section and shall be handled and considered in the same manner as set forth in paragraph (c) of "Good Faith Effort Procedures" of this Special Provision, except a final decision that a good faith effort was not made during contract performance to achieve the goal agreed to in the Utilization Plan shall be the final administrative decision of the Department. The result of the reconsideration process is not administratively appealable to the U.S. Department of Transportation.

EQUIPMENT PARKING AND STORAGE (BDE)
Effective: November 1, 2017

Replace the first paragraph of Article 701.11 of the Standard Specifications with the following.

"**701.11 Equipment Parking and Storage.** During working hours, all vehicles and/or nonoperating equipment which are parked, two hours or less, shall be parked at least 8 ft (2.5 m) from the open traffic lane. For other periods of time during working and for all nonworking hours, all vehicles, materials, and equipment shall be parked or stored as follows.

(a) When the project has adequate right-of-way, vehicles, materials, and equipment shall be located a minimum of 30 ft (9 m) from the pavement.

(b) When adequate right-of-way does not exist, vehicles, materials, and equipment shall be located a minimum of 15 ft (4.5 m) from the edge of any pavement open to traffic.

(c) Behind temporary concrete barrier, vehicles, materials, and equipment shall be located a minimum of 24 in. (600 mm) behind free standing barrier or a minimum of 6 in. (150 mm) behind barrier that is either pinned or restrained according to Article 704.04. The 24 in. or 6 in. measurement shall be from the base of the non-traffic side of the barrier.

(d) Behind other man-made or natural barriers meeting the approval of the Engineer."

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:

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.

GROOVING FOR RECESSED PAVEMENT MARKINGS (BDE)
Effective: November 1, 2012 Revised: November 1, 2017

Description. This work shall consist of grooving the pavement surface in preparation for the application of recessed pavement markings.

Equipment. Equipment shall be according to the following.

(a) Preformed Plastic Pavement Marking Installations. The grooving equipment shall have a free-floating saw blade cutting head equipped with gang-stacked diamond saw blades. The diamond saw blades shall be of uniform wear and shall produce a smooth textured surface. Any ridges in the groove shall have a maximum height of 15 mils (0.38 mm).

(b) Liquid and Thermoplastic Pavement Marking Installations. The grooving equipment shall be equipped with either a free-floating saw blade cutting head or a free-floating grinder cutting head configuration with diamond or carbide tipped cutters and shall produce an irregular textured surface.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall supply the Engineer with a copy of the pavement marking material manufacturer's recommendations for constructing a groove.

Pavement Grooving Methods. The grooves for recessed pavement markings shall be constructed using the following methods.

(a) Wet Cutting Head Operation. When water is required or used to cool the cutting head, the groove shall be flushed with high pressure water immediately following the cut to avoid build up and hardening of slurry in the groove. The pavement surface shall be allowed to dry for a minimum of 24 hours prior to the final cleaning of the groove and application of the pavement marking material.

(b) Dry Cutting Head Operation. When used on HMA pavements, the groove shall be vacuumed or cleaned by blasting with high-pressure air to remove loose aggregate, debris, and dust generated during the cutting operation. When used on PCC pavements, the groove shall be flushed with high pressure water or shot blasted to remove any PCC particles that may have become destabilized during the grooving process. If high pressure water is used, the pavement surface shall be allowed to dry for a minimum of 24 hours prior to the final cleaning of the groove and application of the pavement marking material.

Pavement Grooving. Grooving shall not cause ravels, aggregate fractures, spalling or disturbance of the joints to the underlying surface of the pavement. Grooves shall be cut into the pavement prior to the application of the pavement marking material. Grooves shall be cut such that the width is 1 in. (25 mm) greater than the width of the pavement marking line as specified on the plans. Grooves for letters and symbols shall be cut in a square or rectangular shape so that the entire marking will fit within the limits of the grooved area. The position of the edge of the grooves shall be a minimum of 2 in. (50 mm) from the edge of all longitudinal joints. The depth of the groove shall not be less than the manufacturer's recommendations for the pavement marking material specified, but shall be installed to a minimum depth of 110 mils (2.79 mm) and a maximum depth of 200 mils (5.08 mm) for pavement marking tapes thermoplastic markings and a minimum depth of 40 mils (1.02 mm) and a maximum depth of 80 mils (2.03 mm) for liquid markings. The cutting head shall be operated at the appropriate speed in order to prevent undulation of the cutting head and grooving at an inconsistent depth.

At the start of grooving operations, a 50 ft (16.7 m) test section shall be installed and depth measurements shall be made at 10 ft (3.3 m) intervals within the test section. The individual depth measurements shall be within the allowable ranges according to this Article. If it is determined the test section has not been grooved at the appropriate depth or texture, adjustments shall be made to the cutting head and another 50 ft (16.7 m) test section shall be installed and checked. This process shall continue until the test section meets the requirements of this Article.

For new HMA pavements, grooves shall not be installed within 10 days of the placement of the final course of pavement.

Final Cleaning. Immediately prior to the application of the pavement marking material or primer sealer, the groove shall be cleaned with high-pressure air blast.

Method of Measurement. This work will be measured for payment in place, in feet (meter) for the groove width specified.

Grooving for letter, numbers and symbols will be measured in square feet (square meters).

Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for GROOVING FOR RECESSED PAVEMENT MARKING of the groove width specified, and per square foot (square meter) for GROOVING FOR RECESSED PAVEMENT MARKING, LETTERS AND SYMBOLS.

The following shall only apply when preformed plastic pavement markings are to be recessed:

Add the following paragraph after the first paragraph of Article 780.07 of the Standard Specifications.

"The markings shall be capable of being applied in a grooved slot on new and existing portland cement concrete and HMA surfaces, by means of a pressure-sensitive, precoated adhesive, or liquid contact cement which shall be applied at the time of installation. A primer sealer shall be applied with a roller and shall cover and seal the entire bottom of the groove. The primer sealer shall be recommended by the manufacturer of the pavement marking material and shall be compatible with the material being used. The Contractor shall install the markings in the groove as soon as possible after the primer sealer cures according to the manufacturer's recommendations. The markings placed in the groove shall be rolled and tamped into the groove with a roller or tamper cart cut to fit the groove and loaded with or weighing at least 200 lb (90kg). Vehicle tires shall not be used for tamping. The Contractor shall roll and tamp the material with a minimum of 6 passes to prevent easy removal or peeling."

HOT-MIX ASPHALT - DENSITY TESTING OF LONGITUDINAL JOINTS (BDE)
Effective: January 1, 2010 Revised: April 1, 2016

Description. This work shall consist of testing the density of longitudinal joints as part of the quality control/quality assurance (QC/QA) of hot-mix asphalt (HMA). Work shall be according to Section 1030 of the Standard Specifications except as follows.

Quality Control/Quality Assurance (QC/QA). Delete the second and third sentence of the third paragraph of Article 1030.05(d)(3) of the Standard Specifications.

Add the following paragraphs to the end of Article 1030.05(d)(3) of the Standard Specifications:

"Longitudinal joint density testing shall be performed at each random density test location. Longitudinal joint testing shall be located at a distance equal to the lift thickness or a minimum of 4 in. (100 mm), from each pavement edge. (i.e. for a 5 in. (125 mm) lift the near edge of the density gauge or core barrel shall be within 5 in. (125 mm) from the edge of pavement.) Longitudinal joint density testing shall be performed using either a correlated nuclear gauge or cores.

a. Confined Edge. Each confined edge density shall be represented by a one-minute nuclear density reading or a core density and shall be included in the average of density readings or core densities taken across the mat which represents the Individual Test.

b. Unconfined Edge. Each unconfined edge joint density shall be represented by an average of three one-minute density readings or a single core density at the given density test location and shall meet the density requirements specified herein. The three one-minute readings shall be spaced 10 ft (3 m) apart longitudinally along the unconfined pavement edge and centered at the random density test location."

Revise the Density Control Limits table in Article 1030.05(d)(4) of the Standard Specifications to read:

"Mixture Composition	Parameter	Individual Test (includes confined edges)	Unconfined Edge Joint Density Minimum
IL-4.75	Ndesign = 50	93.0 – 97.4% 1/	91.0%
IL-9.5	Ndesign = 90	92.0 – 96.0%	90.0%
IL-9.5,IL-9.5L	Ndesign < 90	92.5 – 97.4%	90.0%
IL-19.0	Ndesign = 90	93.0 – 96.0%	90.0%
IL-19.0, IL-19.0L	Ndesign < 90	93.0 2/– 97.4%	90.0%
SMA	Ndesign = 50 & 80	93.5 – 97.4%	91.0%"

HOT MIX ASPHALT - PAY FOR PERFORMANCE USING PERCENT WITHIN LIMITS - JOBSITE SAMPLING (BDE)

Effective: November 1, 2014 Revised: January 1, 2018

Description. This special provision describes the procedures for production, placement and payment for hot-mix asphalt (HMA) under the pay for performance (PFP) program. This special provision shall apply to the HMA mixtures specified in the plans. This work shall be according to the Standard Specifications except as modified herein.

Delete Articles:	406.06(b)(1), 2nd paragraph	(Temperature requirements)
	406.06(e), 3rd paragraph	(Paver speed requirements)
	406.07(b)	(Rolling)
	406.07(c)	(Density)
	1030.04, last two sentences of first paragraph	(Mix design verification)
	1030.05(a)(4, 5, 7, 8, 9, & 10)	(QC/QA Documents)
	1030.05(d)(2)a.	(Plant Tests)
	1030.05(d)(2)b.	(Dust-to-Asphalt and Moisture Content)
	1030.05(d)(2)d.	(Small Tonnage)
	1030.05(d)(2)f.	(HMA Sampling)
	1030.05(d)(3)	(Required Field Tests)
	1030.05(d)(4)	(Control Limits)
	1030.05(d)(5)	(Control Charts)
	1030.05(d)(6)	(Corrective Action for Required Plant Tests)
	1030.05(d)(7)	(Corrective Action for Field Tests (Density))
	1030.05(e)	(Quality Assurance by the Engineer)
	1030.05(f)	(Acceptance by the Engineer)
	1030.06(a), 2nd paragraph	(Before start-up…)

Definitions.

(a) Quality Control (QC): All production and construction activities by the Contractor required to achieve the required level of quality.

(b) Quality Assurance (QA): All monitoring and testing activities by the Engineer required to assess product quality, level of payment, and acceptability of the product.

(c) Percent Within Limits (PWL): The percentage of material within the quality limits for a given quality characteristic.

(d) Quality Characteristic: The characteristics that are evaluated by the Department for payment using PWL. The quality characteristics for this project are field voids in the mineral aggregate (Field VMA), voids, and density. Field VMA will be calculated using the combined aggregates bulk specific gravity (G_{sb}) from the mix design.

(e) Quality Level Analysis (QLA): QLA is a statistical procedure for estimating the amount of product within specification limits.

(f) Mixture Sublot: A mixture sublot for Field VMA and voids shall be a maximum of 1000 tons (910 metric tons). If the quantity is less than 8000 tons (7260 metric tons), the sublot size will be adjusted to achieve a minimum of 8 tests.

(1) If the remaining quantity is greater than 200 tons (180 metric tons) but less than 1000 tons (910 metric tons), the last mixture sublot will be that quantity.

(2) If the remaining quantity is 200 tons (180 metric tons) or less, the quantity shall be combined with the previous mixture sublot.

(g) Density Interval: Density intervals shall be every 0.2 miles (320 m) for lift thicknesses of 3 in. (75 mm) or less and 0.1 miles (160 m) for lift thicknesses greater than 3 in. (75 mm). If a density interval is less than 200 ft (60 m), it will be combined with the previous density interval.

(h) Lot: A lot consists of ten mixture sublots or 30 density intervals. If seven or less mixture sublots or 19 or less density intervals remain at the end of production of a mixture, the test results for these sublots will be combined with the previous lot for evaluation of percent within limits and pay factors.

Lots for mixture testing are independent of lots for density testing.

(i) Density Test: A density test shall consist of a core taken at a random location within each density interval.

When establishing the target density, the HMA maximum theoretical gravity (G_{mm}) shall be based on the running average of four Department test results including the current day of production. Initial G_{mm} shall be based on the average of the first four test results.

(j) Unconfined Edge Density: The unconfined edge density shall be randomly selected within each 1/2 mile (800 m) section for each unconfined edge.

Pre-Production Meeting. The Engineer will schedule a pre-production meeting prior to the start of production. The HMA QC Plan, test frequencies, and responsibilities of all parties involved in testing and determining the PWL will be addressed. The Engineer will provide the random locations and tonnages in a sealed envelope for the Contractor to sign at the pre-production meeting or prior to paving. The random locations and tonnages may be adjusted due to field conditions according to the Department's Manual of Test Procedures for Materials "PFP and QCP Hot-Mix Asphalt Random Jobsite Sampling" and "PFP and QCP Random Density Procedure". The signed sealed envelope will be given to the Contractor after paving is complete along with documentation of any adjustments. Personnel attending the meetings may include the following:

(a) Resident Engineer

(b) District Mixture Control Representative

(c) QC Manager

(d) Contractor Paving Superintendent

(e) Any consultant involved in any part of the HMA sampling or testing on this project

Quality Control (QC) by the Contractor. The Contractor's QC plan shall include the schedule of testing for both quality characteristics and non-quality characteristics required to control the product such as asphalt binder content and mixture gradation. The schedule shall include sample location. The minimum test frequency shall be according to the following table.

Table 1
Minimum Quality Control Sampling and Testing Requirements

Quality Characteristic	Minimum Test Frequency	Sampling Location
Mixture Gradation	1/day	per QC Plan
Binder Content		
G_{mm}		
G_{mb}		
Density	per QC plan	per QC Plan

The Contractor shall submit QC test results to the Engineer within 48 hours of the time of sampling.

Initial Production Testing. The Contractor shall split and test the first two samples with the Department for comparison purposes. The Contractor shall complete all tests and report all results to the Engineer within two working days of sampling. The Engineer will make Department test results of the initial production testing available to the Contractor within two working days from the receipt of the samples.

Quality Assurance (QA) by the Engineer. The Department's laboratories which conduct PFP testing will participate in the AASHTO re:source's (formerly AMRL) Proficiency Sample Program. The Engineer will test each mixture sublot for Field VMA, voids, and dust/AC ratio; and each density interval for density to determine payment for each lot. A sublot shall begin once an acceptable test-strip has been completed and the AJMF has been determined. All Department testing will be performed in a qualified laboratory by personnel who have successfully completed the Department HMA Level I training.

(a) Voids, Field VMA, and Dust/AC Ratio. For each sublot, the Engineer will determine the random tonnage for the sample and the Contractor shall be responsible for obtaining the sample according to the Department's Manual of Test Procedures for Materials "PFP and QCP Hot-Mix Asphalt Random Jobsite Sampling Procedure". The Engineer will not disclose the random location of the sample until after the truck containing the random tonnage has been loaded and en-route to the project.

(b) Density. The Engineer will not disclose the random location of the sample until after the final rolling.

The Contractor shall cut the 4 in. (100 mm) diameter cores within the same day and prior to opening to traffic unless otherwise approved by the Engineer. All core holes shall be filled immediately upon completion of coring. All water shall be removed from the core holes prior to filling. All core holes shall be filled with a rapid hardening mortar or concrete which shall be mixed in a separate container prior to placement in the hole. Any depressions in the surface of the filled core holes greater than 1/4 in. (6 mm) at the time of final inspection will require removal of the fill material to the depth of the lift thickness and replacement.

The Engineer will witness and secure all mixture and density samples. The Contractor shall transport the secured sample to a location designated by the Engineer.

Test Results. The Department's test results for the first mixture sublot and density interval, of every lot will be available to the Contractor within three working days from the receipt of secured samples. Test results for remaining sublots will be available to the Contractor within ten working days from receipt of the secured sample that was delivered to the Department's testing facility or a location designated by the Engineer.

The Engineer will maintain a complete record of all Department test results. Copies will be furnished upon request. The records will contain, at a minimum, the originals of all Department test results and raw data, random numbers used and resulting calculations for sampling locations, and quality level analysis calculations.

Dispute Resolution. Dispute resolution testing will only be permitted when the Contractor submits their split sample test results prior to receiving Department split sample test results and meets the requirements listed in the Department's Manual of Test Procedures for Materials "Pay for Performance Dispute Resolution". If dispute resolution is necessary, the Contractor shall submit a request in writing within four working days of receipt of the results of the quality index analysis for the lot. The Engineer will document receipt of the request. The request shall specify Method 1 (pay parameter dispute) or Method 2 (individual parameter dispute) as defined in the Department's Manual of Test Procedures for Materials "Pay for Performance Dispute Resolution". The Central Bureau of Materials laboratory will be used for dispute resolution testing.

Acceptance by the Engineer. All of the Department's tests shall be within the acceptable limits listed below:

Table 2

Acceptable Limits	
Parameter	Acceptable Range
Field VMA	-1.0 – +3.0 %[1/]
Voids	2.0 – 6.0 %
Density: IL-19.0, IL-9.5 SMA	 90.0 – 98.0 % 92.0 – 98.0 %
Dust / AC Ratio	0.4 – 1.6[2/]

1/ Based on minimum required Field VMA from mix design

2/ Does not apply to SMA

In addition, the PWL for any quality characteristic shall be 50 percent or above for any lot. No visible pavement distress shall be present such as, but not limited to, segregation, excessive coarse aggregate fracturing or flushing.

Basis of Payment. Payment will be based on the calculation of the composite pay factor for each mixture according to the Department's Manual of Test Procedure for Materials "PFP Quality Level Analysis" document. Payment for full depth pavement will be based on the calculation of the Full Depth Pay Factor according to the "PFP Quality Level Analysis" document.

Additional Pay Adjustments. In addition to the composite pay factor for each mix, monetary deductions will be made for dust/AC ratios and unconfined edge densities as shown in Tables 3 and 4 as follows.

Table 3

Dust / AC Pay Adjustment Table [1/]	
Range	Deduct / sublot
$0.6 \le X \le 1.2$	$0
$0.5 \le X < 0.6$ or $1.2 < X \le 1.4$	$1000
$0.4 \le X < 0.5$ or $1.4 < X \le 1.6$	$3000
$X < 0.4$ or $X > 1.6$	Shall be removed and replaced

1/ Does not apply to SMA.

Table 4

Unconfined Edge Density Adjustment Table	
Density	Deduct / 0.5 mile (800 m)
≥ 90%	$0
89.0% to 89.9%	$1000
88.0% to 88.9%	$3000
< 88.0%	Outer 1.0 ft (300 mm) will require remedial action acceptable to the Engineer

HOT MIX ASPHALT – QUALITY CONTROL FOR PERFORMANCE (BDE)
Effective: April 1, 2017 Revised: November 1, 2017

Description. This special provision describes the procedures for production, placement and payment of hot-mix asphalt (HMA) under the quality control for performance (QCP) program; as well as the requirements for intelligent compaction. This special provision shall apply to the HMA mixtures specified in the plans. This work shall be according to the Standard Specifications except as modified herein.

Delete Articles:	406.06(b)(1), 2nd Paragraph	(Temperature Requirements)
	406.06(b)(2)d.	(Temperature Requirements)
	406.06(b)(3)b.	(Temperature Requirements)
	406.06(e), 3rd Paragraph	(Paver Speed Requirements)
	406.07(b)	(Rolling)
	406.07(c)	(Density)
	1030.05(a)(4, 5, 9,)	(QC/QA Documents)
	1030.05(d)(2)a.	(Plant Tests)
	1030.05(d)(2)b.	(Dust-to-Asphalt and Moisture Content)
	1030.05(d)(2)d.	(Small Tonnage)
	1030.05(d)(2)f.	(HMA Sampling)
	1030.05(d)(3)	(Required Field Tests)
	1030.05(d)(4)	(Control Limits)
	1030.05(d)(5)	(Control Charts)
	1030.05(d)(7)	(Corrective Action for Field Tests (Density))
	1030.05(e)	(Quality Assurance by the Engineer)
	1030.05(f)	(Acceptance by the Engineer)
	1030.06(a), 2nd paragraph	(Before start-up…)

Definitions.

(a) Quality Control (QC). All production and construction activities by the Contractor required to achieve the required level of quality.

(b) Quality Assurance (QA). All monitoring and testing activities by the Engineer required to assess product quality, level of payment, and acceptability of the product.

c) Pay Parameters. Pay parameters shall be field voids in the mineral aggregate (Field VMA), voids, and density. Field VMA will be calculated using the combined aggregates bulk specific gravity (G_{sb}) from the mix design.

(d) Mixture Lot. A mixture lot shall begin once an acceptable test strip has been completed and the adjusted job mix formula has been determined. If the test strip is waived, a mixture lot shall begin with the start of production. A mixture lot shall consist of four sublots unless it is the last or only lot, in which case it may consist of as few as one sublot.

(e) Mixture Sublot. A mixture sublot for Field VMA, voids, and dust/AC shall be a maximum of 1000 tons (910 metric tons).

(1) If the remaining quantity is greater than 200 tons (180 metric tons) but less than 1000 tons (910 metric tons), the last mixture sublot will be that quantity.

(2) If the remaining quantity is 200 tons (180 metric tons) or less, the quantity shall be combined with the previous mixture sublot.

(f) Density Interval. Density intervals shall be every 0.2 miles (320 m) for lift thicknesses of 3 in. (75 mm) or less and 0.1 miles (160 m) for lift thicknesses greater than 3 in. (75 mm). If a density interval is less than 200 ft (60 m), it will be combined with the previous density interval.

(g) Density Sublot. A density sublot shall be the average of five consecutive density intervals.

(1) If less than three density intervals remain outside a density sublot, they shall be included in the previous density sublot.

(2) If three or more density intervals remain, they shall be considered a density sublot.

(h) Density Test. A density test shall consist of a core taken at a random location within each density interval.

When establishing the target density, the HMA maximum theoretical gravity (G_{mm}) shall be based on the running average of four Department test results. Initial G_{mm} shall be based on the average of the first four test results. If less than four G_{mm} results are available, an average of all available Department G_{mm} test results shall be used.

Pre-Production Meeting. The Engineer will schedule a pre-production meeting prior to the start of production. The HMA QC Plan, test frequencies, and responsibilities of all parties involved in testing will be addressed. The Engineer will provide the random locations, tonnages, and sublot selected from each lot in a sealed envelope for the Contractor to sign at the pre-production meeting or prior to paving. The locations, tonnages, and sublot selected from each lot may be adjusted due to field conditions according to the Department's Manual of Test Procedures for Materials "PFP and QCP Hot-Mix Asphalt Random Jobsite Sampling" and "PFP and QCP Random Density Procedure". The signed sealed envelope will be given to the Contractor after paving is complete, along with documentation of any adjustments. Personnel attending the meetings may include the following:

(a) Resident Engineer

(b) District Mixture Control Representative

(c) QC Manager

(d) Contractor Paving Superintendent

(e) Any consultant involved in any part of the HMA sampling or testing on this project

Quality Control (QC) by the Contractor. The Contractor's QC plan shall include the schedule of testing for both pay parameters and non-pay parameters required to control the product such as asphalt binder content and mixture gradation. The minimum test frequency shall be according to Table 1.

Table 1

Minimum Quality Control Sampling and Testing Requirements		
Quality Characteristic		Minimum Test Frequency
Mixture Gradation		1 per sublot
Asphalt Binder Content		
Dust/AC Ratio		
Field VMA		
Voids	G_{mb}	
	G_{mm}	

The Contractor's splits in conjunction with other quality control tests shall be used to control production.

The Contractor shall submit split jobsite mix sample test results to the Engineer within 48 hours of the time of sampling. All QC testing shall be performed in a qualified laboratory by personnel who have successfully completed the Department's HMA Level I training.

Intelligent Compaction. When a "Number of Roller Passes" is specified in the HMA Mixture Requirements table on the plans, the Contractor may opt to use intelligent compaction (IC) in lieu of density testing. Coring according to the Department's Manual of Test Procedures for Materials "PFP and QCP Random Density Procedure" is required and will be used for pay adjustments for density sublots that are not in compliance with the contract specifications.

The IC equipment shall be mounted on the breakdown roller(s) and shall record GPS location data, roller pass counts, roller speeds, and HMA mat temperatures. Each day, the accuracy of the GPS and temperature data shall be verified and documented. If the verification fails or is not performed, the IC data will not be used for the affected density sublots.

The IC data for each density sublot shall be analyzed using Veta software to determine the average roller speed, percent roller coverage, and average mat surface temperature for the final roller pass. The Contractor shall submit these summary results, and if requested the raw data from the IC equipment and the data analysis software, to the Engineer within 24 hours of each day of paving using IC.

The required number of roller passes shall be as specified on the plans. The roller speeds shall be according to Article 406.07. The minimum roller coverage shall be 90 percent. The average HMA mat temperature for the initial break down roller pass shall be according to Table 2.

Table 2

Asphalt Mixture Type	Temperature Range (ºF (ºC))
Warm Mix Asphalt	215-275 °F (102-135 °C)
IL-4.75	300-350 °F (155-175 °C)
HMA using SBS PG76-22	300-350 °F (155-175 °C)
HMA using SBS PG76-28	300-350 °F (155-175 °C)
HMA using SBS PG70-22	300-350 °F (155-175 °C)
HMA using SBS PG70-28	300-350 °F (155-175 °C)
Other HMA not listed above	260-325 °F (125-165 °C)

Quality Assurance (QA) by the Engineer. Quality Assurance by the Engineer will be as follows.

(a) Voids, Field VMA, and Dust/AC Ratio. The Engineer will determine the random tonnage and the Contractor shall be responsible for obtaining the sample according to the Department's Manual of Test Procedures for Materials "PFP Hot-Mix Asphalt Random Jobsite Sampling Procedure".

(b) Density: After final rolling, the Engineer will identify the random core locations within each density testing interval according to the Department's Manual of Test Procedures for Materials "PFP and QCP Random Density Procedure".

The Contractor shall cut the 4 in. (100 mm) cores within the same day and prior to opening to traffic unless otherwise approved by the Engineer. All core holes shall be filled immediately upon completion of coring. All water shall be removed from the core holes prior to filling. All core holes shall be filled with a rapid hardening mortar or concrete which shall be mixed in a separate container prior to placement in the hole. Any depressions in the surface of the filled core holes greater than 1/4 in. (6 mm) at the time of final inspection will require removal of the fill material to the depth of the lift thickness and replacement.

The Engineer will witness and secure all mixture and density samples. The Contractor shall transport the secured sample to a location designated by the Engineer.

The Engineer will select at random one split sample from each lot for testing of voids, Field VMA and dust/AC ratio. The Engineer will test a minimum of one sample per project. The Engineer will test all of the pavement cores for density unless intelligent compaction is used. All QA testing will be performed in a qualified laboratory by personnel who have successfully completed the Department's HMA Level I training. QA test results will be available to the Contractor within ten working days from receipt of secured cores and split mixture samples and after the last sublot from each lot.

The Engineer will maintain a complete record of all Department test results and copies will be provided to the Contractor with each set of sublot results. The records will contain, at a minimum, the originals of all Department test results and raw data, random numbers used and resulting calculations for sampling locations, and quality level analysis calculations.

If QA results do not meet the precision limits listed in Table 3, the Department will verify the results by retesting the retained split sample. The retest will replace the original results.

If the QA results do not meet the 100 percent sublot pay factor limits or still do not compare to QC results within the precision limits in Table 3, after retesting the Engineer will test all split mix samples for the lot.

Table 3

Test Parameter	Limits of Precision
G_{mb}	0.030
G_{mm}	0.026
Field VMA	1.0 %

Acceptance by the Engineer. All of the Department's tests shall be within the acceptable limits listed in Table 4.

Table 4

Parameter		Acceptable Limits
Field VMA		-1.0 – +3.0%[1/]
Voids		2.0 – 6.0%
Density	IL-9.5, IL-19.0, IL-4.75, IL-9.5FG[3/]	90.0 – 98.0%
	SMA	92.0 – 98.0%
Dust / AC Ratio		0.4 – 1.6[2/]

1/ Based on minimum required VMA from mix design

2/ Does not apply to SMA.

3/ Acceptable density limits for IL-9.5FG placed less than 1 1/4 in. (32 mm) shall be 89.0% - 98.0%

In addition, no visible pavement distresses shall be present such as, but not limited to, segregation, excessive coarse aggregate fracturing or flushing.

Basis of Payment. Payment will be based on the calculation of the composite pay factor using QA test results for each mixture according to the Department's Manual of Test Procedures for Materials "QCP Pay Calculation" document.

If intelligent compaction is successfully implemented, the Contractor will receive 100 percent for the density pay factor in Equation 1 of the "QCP Pay Calculation" document for each applicable HMA mixture; otherwise, the density tests and pay adjustments will apply. The pay factor for each density sublot will be based upon either intelligent compaction or density tests and the two will not be mixed.

Dust/AC Ratio. A monetary deduction will be made using the pay adjustment table below for dust/AC ratios that deviate from the 0.6 to 1.2 range. If the tested mixture sublot is outside of this range, the Department will test the remaining sublots for dust/AC pay adjustment.

Table 5

Dust/AC Pay Adjustment Table[1/]	
Range	Deduct / sublot
$0.6 \le X \le 1.2$	$0
$0.5 \le X < 0.6$ or $1.2 < X \le 1.4$	$1000
$0.4 \le X < 0.5$ or $1.4 < X \le 1.6$	$3000
$X < 0.4$ or $X > 1.6$	Shall be removed and replaced

1/ Does not apply to SMA.

HOT-MIX ASPHALT – TACK COAT (BDE)
Effective: November 1, 2016

Revise Article 1032.06(a) of the Standard Specifications to read:

"(a) Anionic Emulsified Asphalt. Anionic emulsified asphalts shall be according to AASHTO M 140. SS-1h emulsions used as a tack coat shall have the cement mixing test waived."

LIGHTS ON BARRICADES (BDE)
Effective: January 1, 2018

Revise Article 701.16 of the Standard Specifications to read:

"**701.16 Lights.** Lights shall be used on devices as required in the plans, the traffic control plan, and the following table.

Circumstance	Lights Required
Daylight operations	None
First two warning signs on each approach to the work involving a nighttime lane closure and "ROUGH GROOVED SURFACE" (W8-I107) signs	Flashing mono-directional lights
Devices delineating isolated obstacles, excavations, or hazards at night (Does not apply to patching)	Flashing bi-directional lights
Devices delineating obstacles, excavations, or hazards exceeding 100 ft (30 m) in length at night (Does not apply to widening)	Steady burn bi-directional lights
Channelizing devices for nighttime lane closures on two-lane roads	None
Channelizing devices for nighttime lane closures on multi-lane roads	None
Channelizing devices for nighttime lane closures on multi-lane roads separating opposing directions of traffic	None
Channelizing devices for nighttime along lane shifts on multilane roads	Steady burn mono-directional lights
Channelizing devices for night time along lane shifts on two lane roads	Steady burn bi-directional lights
Devices in nighttime lane closure tapers on Standards 701316 and 701321	Steady burn bi-directional lights
Devices in nighttime lane closure tapers	Steady burn mono-directional lights
Devices delineating a widening trench	None
Devices delineating patches at night on roadways with an ADT less than 25,000	None
Devices delineating patches at night on roadways with an ADT of 25,000 or more	None

Batteries for the lights shall be replaced on a group basis at such times as may be specified by the Engineer."

Delete the fourth sentence of the first paragraph of Article 701.17(c)(2) of the Standard Specifications.

Revise the first paragraph of Article 603.07 of the Standard Specifications to read:

"**603.07 Protection Under Traffic.** After the casting has been adjusted and Class SI concrete has been placed, the work shall be protected by a barricade for at least 72 hours."

MANHOLES, VALVE VAULTS, AND FLAT SLAB TOPS (BDE)
Effective: January 1, 2018 Revised: March 2, 2018

Description. Manholes, valve vaults, and flat slab tops manufactured according to the current or previous Highway Standards listed below will be accepted on this contract:

Product	Current Standard	Previous Standard
Precast Manhole Type A, 4' (1.22 m) Diameter	602401-04	602401-03
Precast Manhole Type A, 5' (1.52 m) Diameter	602402	602401-03
Precast Manhole Type A, 6' (1.83 m) Diameter	602406-08	602406-07
Precast Manhole Type A, 7' (2.13 m) Diameter	602411-06	602411-05
Precast Manhole Type A, 8' (2.44 m) Diameter	602416-06	602416-05
Precast Manhole Type A, 9' (2.74 m) Diameter	602421-06	602421-05
Precast Manhole Type A, 10' (3.05 m) Diameter	602426	n/a
Precast Valve Vault Type A, 4' (1.22 m) Diameter	602501-03	602501-02
Precast Valve Vault Type A, 5' (1.52 m) Diameter	602506	602501-02
Precast Reinforced Concrete Flat Slab Top	602601-05	602601-04

When manufacturing to the current standards, the following revisions to the Standard Specifications shall apply:

Revise Article 602.02(g) of the Standard Specifications to read:

"(g) Structural Steel (Note 4)..... 1006.04

Note 4. All components of the manhole joint splice shall be galvanized according to the requirements of AASHTO M 111 or M 232 as applicable."

Add the following to Article 602.02 of the Standard Specifications:

"(s) Anchor Bolts and Rods (Note 5) 1006.09

Note 5. The threaded rods for the manhole joint splice shall be according to the requirements of ASTM F 1554, Grade 55, (Grade 380)."

Add the following paragraph after the first paragraph of Article 602.07 of the Standard Specifications:

"Threaded rods connecting precast sections shall be brought to a snug tight condition."

Revise the second paragraph of Article 1042.10 of the Standard Specifications to read:

"Catch basin Types A, B, C, and D; Manhole Type A; Inlet Types A and B; Drainage Structures Types 1, 2, 3, 4, 5, and 6; Valve Vault Type A; and reinforced concrete flat slab top (Highway Standard 602601) shall be according to AASHTO M 199 (M 199M), except the minimum wall thickness shall be 3 in. (75 mm). Additionally, catch basins, inlets, and drainage structures shall have a minimum concrete compressive strength of 4500 psi (31,000 kPa) at 28 days and manholes, valve vaults, and reinforced concrete flat slab tops shall have a minimum concrete compressive strength of 5000 psi (34,500 kPa) at 28 days."

PAVEMENT MARKING REMOVAL (BDE)
Effective: July 1, 2016

Revise Article 783.02 of the Standard Specifications to read:

"**783.02 Equipment.** Equipment shall be according to the following.

Item	Article/Section
(a) Grinders (Note 1)	
(b) Water Blaster with Vacuum Recovery	1101.12

Note 1. Grinding equipment shall be approved by the Engineer."

Revise the first paragraph of Article 783.03 of the Standard Specifications to read:

"**783.03 Removal of Conflicting Markings.** Existing pavement markings that conflict with revised traffic patterns shall be removed. If darkness or inclement weather prohibits the removal operations, such operations shall be resumed the next morning or when weather permits. In the event of removal equipment failure, such equipment shall be repaired, replaced, or leased so removal operations can be resumed within 24 hours."

Revise the first and second sentences of the first paragraph of Article 783.03(a) of the Standard Specifications to read:

"The existing pavement markings shall be removed by the method specified and in a manner that does not materially damage the surface or texture of the pavement or surfacing. Small particles of tightly adhering existing markings may remain in place, if in the opinion of the Engineer, complete removal of the small particles will result in pavement surface damage."

Revise the first paragraph of Article 783.04 of the Standard Specifications to read:

"**783.04 Cleaning.** The roadway surface shall be cleaned of debris or any other deleterious material by the use of compressed air or water blast."

Revise the first paragraph of Article 783.06 of the Standard Specifications to read:

"**783.06 Basis of Payment.** This work will be paid for at the contract unit price per each for RAISED REFLECTIVE PAVEMENT MARKER REMOVAL, or at the contract unit price per square foot (square meter) for PAVEMENT MARKING REMOVAL – GRINDING and/or PAVEMENT MARKING REMOVAL – WATER BLASTING."

Delete Article 1101.13 from the Standard Specifications.

PAYMENTS TO SUBCONTRACTORS (BDE)
Effective: November 2, 2017

Add the following to the end of the fourth paragraph of Article 109.11 of the Standard Specifications:

"If reasonable cause is asserted, written notice shall be provided to the applicable subcontractor and/or material supplier and the Engineer within five days of the Contractor receiving payment. The written notice shall identify the contract number, the subcontract or material purchase agreement, a detailed reason for refusal, the value of payment being withheld, and the specific remedial actions required of the subcontractor and/or material supplier so that payment can be made."

PORTABLE CHANGEABLE MESSAGE SIGNS (BDE)
Effective: November 1, 2016 Revised: April 1, 2017

Revise the second paragraph of Article 701.20(h) of the Standard Specifications to read:

"For all other portable changeable message signs, this work will be paid for at the contract unit price per calendar day for each sign as CHANGEABLE MESSAGE SIGN."

Revise this second sentence of the first paragraph of Article 1106.02(i) of the Standard Specifications to read:

"The message panel shall be a minimum of 7 ft (2.1 m) above the edge of pavement in urban areas and a minimum of 5 ft (1.5 m) above the edge of pavement in rural areas, present a level appearance, and be capable of displaying up to eight characters in each of three lines at a time."

PORTLAND CEMENT CONCRETE (BDE)
Effective: November 1, 2017

Revise the Air Content % of Class PP Concrete in Table 1 Classes of Concrete and Mix Design Criteria in Article 1020.04 of the Standard Specifications to read:

"TABLE 1. CLASSES OF CONCRETE AND MIX DESIGN CRITERIA		
Class of Conc.	Use	Air Content %
PP	Pavement Patching Bridge Deck Patching (10)	
	PP-1	4.0 - 8.0"
	PP-2	
	PP-3	
	PP-4	
	PP-5	

Revise Note (4) at the end of Table 1 Classes of Concrete and Mix Design Criteria in Article 1020.04 of the Standard Specifications to read:

"(4) For all classes of concrete, the maximum slump may be increased to 7 in (175 mm) when a high range water-reducing admixture is used. For Class SC, the maximum slump may be increased to 8 in. (200 mm). For Class PS, the maximum slump may be increased to 8 1/2 in. (215 mm) if the high range water-reducing admixture is the polycarboxylate type."

PORTLAND CEMENT CONCRETE SIDEWALK (BDE)
Effective: August 1, 2017

Revise the first paragraph of Article 424.12 of the Standard Specifications to read:

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

PREFORMED PLASTIC PAVEMENT MARKING TYPE D - INLAID (BDE)
Effective: April 1, 2012 Revised: April 1, 2016

Revise subparagraph (c) and add subparagraph (i) to Article 780.02 of the Standard Specifications:

"(c) Preformed Plastic Pavement Markings, Type B and Type C 1095.03
(i) Preformed Plastic Pavement Marking, Type D ..... 1095.10"

Revise the first paragraph of Article 780.07(a) of the Standard Specifications to read:

"(a) Type B or D - Inlaid Application. On freshly placed HMA, the inlaid markings shall be applied before final compaction and when the pavement temperature has cooled to approximately 150 °F (65 °C) and when, in the opinion of the Engineer, the pavement is acceptable for vehicular traffic."

Revise the first paragraph of Article 780.12 of the Standard Specifications to read:

"**780.12 Inspection.** The epoxy, thermoplastic, preformed thermoplastic, preformed plastic Type B, C, or D, and polyurea pavement markings will be inspected following installation, but no later than October 15 for preformed plastic markings, November 1 for thermoplastic and preformed thermoplastic markings, and December 15 for epoxy and polyurea markings. In addition, they will be inspected following a winter performance period that extends 180 days from November 1."

Revise the ninth paragraph of Article 780.12 of the Standard Specifications to read:

"This performance inspection and performance acceptance of the epoxy, thermoplastic, preformed thermoplastic, preformed plastic Type B, C, or D, and polyurea markings shall not delay acceptance of the entire project and final payment due if the Contractor requires and receives from the subcontractor a third party "performance" bond naming the Department as obligee in the full amount of all pavement marking quantities listed in the contract, multiplied by the contract unit price. The bond shall be executed prior to acceptance and final payment of the non-pavement marking items and shall be in full force and effect until final performance inspection and performance acceptance of the epoxy, thermoplastic, preformed thermoplastic, preformed plastic, and polyurea pavement markings. Execution of the third party bond shall be the option of the Contractor."

Revise the first paragraph of Article 780.14 of the Standard Specifications to read:

"**780.14 Basis of Payment.** This work will be paid for at the contract unit prices per foot (meter) of applied line width, as specified, for THERMOPLASTIC PAVEMENT MARKING - LINE; PAINT PAVEMENT MARKING - LINE; EPOXY PAVEMENT MARKING - LINE; PREFORMED PLASTIC PAVEMENT MARKING - LINE - TYPE B, C, B – INLAID, or D - INLAID; PREFORMED THERMOPLASTIC PAVEMENT MARKING – LINE, POLYUREA PAVEMENT MARKING TYPE I – LINE, POLYUREA PAVEMENT MARKING TYPE II - LINE; and/or per square foot (square meter) for THERMOPLASTIC PAVEMENT MARKING - LETTERS AND SYMBOLS; PAINT PAVEMENT MARKING - LETTERS AND SYMBOLS; EPOXY PAVEMENT MARKING - LETTERS AND SYMBOLS; PREFORMED PLASTIC PAVEMENT MARKING - TYPE B, C, B – INLAID, or D - INLAID - LETTERS AND SYMBOLS; PREFORMED THERMOPLASTIC PAVEMENT MARKING - LETTERS AND SYMBOLS."

Add the following to Section 1095 of the Standard Specifications:

"**1095.10 Preformed Plastic Pavement Marking, Type D.** The preformed patterned markings shall consist of a white or yellow tape with wet retroreflective media incorporated to provide immediate and continuing retroreflection during both wet and dry conditions. The pavement marking shall be manufactured without the use of heavy metals including lead chromate pigments or other similar, lead-containing chemicals.

The white and yellow preformed plastic pavement markings shall meet the Type B requirements of Article 1095.03(b), (c), (d), (e), (i), (l), (m), (n) and the following.

(a) Composition. The pliant polymer pavement markings shall consist of a mixture of high-quality polymeric materials, pigments and glass beads distributed throughout its base cross-sectional area, with a layer of wet retroreflective media bonded to a durable polyurethane topcoat surface. The patterned surface shall have approximately 40% ± 10% 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 beads or particles.

(b) Retroreflectance. The white and yellow markings shall meet the following for initial dry and wet retroreflectance.

(1) Dry Retroreflectance. Dry retroreflectance shall be measured under dry conditions according to ASTM D4061 and meet the values described in Article 1095.03(I) for Type B.

(2) Wet Retroreflectance. Wet retroreflectance shall be measured under wet conditions according to ASTM E2177 and meet the values shown in the following table.

Wet Retroreflectance, Initial R_L

Color	R_L 1.05/88.76
White	300
Yellow	200

(c) Color. The material 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 a 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 minimum
*Yellow	36-59

*Shall match Federal 595 Color No. 33538 and the chromaticity limits as follows.

x	0.490	0.475	0.485	0.530
y	0.470	0.438	0.425	0.456

(d) Sampling, Testing, Acceptance, and Certification. Prior to approval and use of the preformed pavement marking materials, 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 certification test report shall state the lot tested, manufacturer's name, and date of manufacture.

After approval by the Department, samples and certification by the manufacturer shall be submitted for each batch used. The manufacturer shall submit a certification stating that the material meets the requirements as set forth herein and is essentially identical to the material sent for qualification. The certification shall state the lot tested, manufacturer's name, and date of manufacture."

PROGRESS PAYMENTS (BDE)
Effective: November 2, 2013

Revise Article 109.07(a) of the Standard Specifications to read:

"(a) Progress Payments. At least once each month, the Engineer will make a written estimate of the quantity of work performed in accordance with the contract, and the value thereof at the contract unit prices. The amount of the estimate approved as due for payment will be vouchered by the Department and presented to the State Comptroller for payment. No amount less than $1000.00 will be approved for payment other than the final payment.

Progress payments may be reduced by liens filed pursuant to Section 23(c) of the Mechanics' Lien Act, 770 ILCS 60/23(c).

If a Contractor or subcontractor has defaulted on a loan issued under the Department's Disadvantaged Business Revolving Loan Program (20 ILCS 2705/2705-610), progress payments may be reduced pursuant to the terms of that loan agreement. In such cases, the amount of the estimate related to the work performed by the Contractor or subcontractor, in default of the loan agreement, will be offset, in whole or in part, and vouchered by the Department to the Working Capital Revolving Fund or designated escrow account. Payment for the work shall be considered as issued and received by the Contractor or subcontractor on the date of the offset voucher. Further, the amount of the offset voucher shall be a credit against the Department's obligation to pay the Contractor, the Contractor's obligation to pay the subcontractor, and the Contractor's or subcontractor's total loan indebtedness to the Department. The offset shall continue until such time as the entire loan indebtedness is satisfied. The Department will notify the Contractor and Fund Control Agent in a timely manner of such offset. The Contractor or subcontractor shall not be entitled to additional payment in consideration of the offset.

The failure to perform any requirement, obligation, or term of the contract by the Contractor shall be reason for withholding any progress payments until the Department determines that compliance has been achieved."

STEEL COST ADJUSTMENT (BDE)
Effective: April 2, 2004 Revised: August 1, 2017

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, mesh 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 X 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:

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
Mesh 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)

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."

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)
Effective: November 2, 2017

Replace the second paragraph of Article 109.12 of the Standard Specifications with the following:

"This mobilization payment shall be made at least 14 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%"

TEMPORARY PAVEMENT MARKING (BDE)
Effective: April 1, 2012 Revised: April 1, 2017

Revise Article 703.02 of the Standard Specifications to read:

"**703.02 Materials.** Materials shall be according to the following.

(a) Pavement Marking Tape, Type I and Type III 1095.06
(b) Paint Pavement Markings 1095.02
(c) Pavement Marking Tape, Type IV ..... 1095.11"

Revise the second paragraph of Article 703.05 of the Standard Specifications to read:

"Type I marking tape or paint shall be used at the option of the Contractor, except paint shall not be applied to the final wearing surface unless authorized by the Engineer for late season applications where tape adhesion would be a problem. Type III or Type IV marking tape shall be used on the final wearing surface when the temporary pavement marking will conflict with the permanent pavement marking such as on tapers, crossovers and lane shifts."

Revise Article 703.07 of the Standard Specifications to read:

"**703.07 Basis of Payment.** This work will be paid for as follows.

a) Short Term Pavement Marking. Short term pavement marking will be paid for at the contract unit price per foot (meter) for SHORT TERM PAVEMENT MARKING. Removal of short term pavement markings will be paid for at the contract unit price per square foot (square meter) for SHORT TERM PAVEMENT MARKING REMOVAL.

b) Temporary Pavement Marking. Where the Contractor has the option of material type, temporary pavement marking will be paid for at the contract unit price per foot (meter) for TEMPORARY PAVEMENT MARKING of the line width specified, and at the contract unit price per square foot (square meter) for TEMPORARY PAVEMENT MARKING LETTERS AND SYMBOLS.

Where the Department specifies the use of pavement marking tape, the Type III or Type IV temporary pavement marking will be paid for at the contract unit price per foot (meter) for PAVEMENT MARKING TAPE, TYPE III or PAVEMENT MARKING TAPE, TYPE IV of the line width specified and at the contract unit price per square feet (square meter) for PAVEMENT MARKING TAPE, TYPE III - LETTERS AND SYMBOLS or PAVEMENT MARKING TAPE, TYPE IV – LETTERS AND SYMBOLS.

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

When temporary pavement marking is shown on the Standard, the cost of the temporary pavement marking and its removal will be included in the cost of the Standard."

Add the following to Section 1095 of the Standard Specifications:

"**1095.11 Pavement Marking Tape, Type IV.** The temporary, preformed, patterned markings shall consist of a white or yellow tape with wet retroreflective media incorporated to provide immediate and continuing retroreflection during both wet and dry conditions. The tape shall be manufactured without the use of heavy metals including lead chromate pigments or other similar, lead-containing chemicals.

The white and yellow Type IV marking tape shall meet the Type III requirements of Article 1095.06 and the following.

(a) Composition. The retroreflective pliant polymer pavement markings shall consist of a mixture of high-quality polymeric materials, pigments and glass beads distributed throughout its base cross-sectional area, with a layer of wet retroreflective media bonded to a durable polyurethane topcoat surface. The patterned surface shall have approximately 40% ± 10% 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 beads or particles.

(b) Retroreflectance. The white and yellow markings shall meet the following for initial dry and wet retroreflectance.

(1) Dry Retroreflectance. Dry retroreflectance shall be measured under dry conditions according to ASTM D 4061 and meet the values described in Article 1095.06 for Type III tape.

(2) Wet Retroreflectance. Wet retroreflectance shall be measured under wet conditions according to ASTM E 2177 and meet the values shown in the following table.

Wet Retroreflectance, Initial R_L

Color	**R_L 1.05/88.76**
White	300
Yellow	200

(c) Color. The material 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 a 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 minimum
*Yellow	36-59

*Shall match Federal 595 Color No. 33538 and the chromaticity limits as follows.

x	0.490	0.475	0.485	0.530
y	0.470	0.438	0.425	0.456

(d) Skid Resistance. The surface of the markings shall provide an average minimum skid resistance of 50 BPN when tested according to ASTM E 303.

(e) Sampling, Testing, Acceptance, and Certification. Prior to approval and use of the wet reflective, temporary, removable 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 certification test report shall state the lot tested, manufacturer's name, and date of manufacture.

After approval by the Department, samples and certification by the manufacturer shall be submitted for each batch used. The manufacturer shall submit a certification stating that the material meets the requirements as set forth herein and is essentially identical to the material sent for qualification. The certification shall state the lot tested, manufacturer's name, and date of manufacture.

All costs of testing (other than tests conducted by the Department) shall be borne by the manufacturer."

TRAINING SPECIAL PROVISIONS (BDE)
Effective: October 15, 1975

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, he 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 insure 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 employed by him 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 that he 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 has successfully completed a training course leading to journeyman status or in which he 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, Manpower Administration, Bureau of Apprenticeship and Training 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 then 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 his performance under this Training Special Provision.

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.

IDOT TRAINING PROGRAM GRADUATE ON-THE-JOB TRAINING SPECIAL PROVISION
Effective: August 1, 2012 Revised: February 2, 2017

In addition to the Contractor's equal employment opportunity (EEO) affirmative action efforts undertaken as required by this Contract, the Contractor is encouraged to participate in the incentive program described below to provide additional on-the-job training to certified graduates of the IDOT pre-apprenticeship training program, as outlined in this Special Provision.

IDOT funds, and various Illinois community colleges operate, pre-apprenticeship training programs throughout the State to provide training and skill-improvement opportunities to promote the increased employment of minority groups, disadvantaged persons and women in all aspects of the highway construction industry. The intent of this IDOT Pre-Apprenticeship Training Program Graduate (TPG) special provision (Special Provision) is to place these certified program graduates on the project site for this Contract in order to provide the graduates with meaningful on-the-job training. Pursuant to this Special Provision, the Contractor must make every reasonable effort to recruit and employ certified TPG trainees to the extent such individuals are available within a practicable distance of the project site.

Specifically, participation of the Contractor or its subcontractor in the Program entitles the participant to reimbursement for graduates' hourly wages at $15.00 per hour per utilized TPG trainee, subject to the terms of this Special Provision. Reimbursement payment will be made even though the Contractor or subcontractor may also receive additional training program funds from other non-IDOT sources for other non-TPG trainees on the Contract, provided such other source does not specifically prohibit the Contractor or subcontractor from receiving reimbursement from another entity through another program, such as IDOT through the TPG program. With regard to any IDOT funded construction training program other than TPG, however, additional reimbursement for other IDOT programs will not be made beyond the TPG Program described in this Special Provision when the TPG Program is utilized.

No payment will be made to the Contractor if the Contractor or subcontractor fails to provide the required on-site training to TPG trainees, as solely determined by IDOT. A TPG trainee must begin training on the project as soon as the start of work that utilizes the relevant trade skill and the TPG trainee must remain on the project site through completion of the Contract, so long as training opportunities continue to exist in the relevant work classification. Should a TPG trainee's employment end in advance of the completion of the Contract, the Contractor must promptly notify the IDOT District EEO Officer for the Contract that the TPG's involvement in the Contract has ended. The Contractor must supply a written report for the reason the TPG trainee involvement terminated, the hours completed by the TPG trainee on the Contract, and the number of hours for which the incentive payment provided under this Special Provision will be, or has been claimed for the separated TPG trainee.

Finally, the Contractor must maintain all records it creates as a result of participation in the Program on the Contract, and furnish periodic written reports to the IDOT District EEO Officer that document its contractual performance under and compliance with this Special Provision. Finally, through participation in the Program and reimbursement of wages, the Contractor is not relieved of, and IDOT has not waived, the requirements of any federal or state labor or employment law applicable to TPG workers, including compliance with the Illinois Prevailing Wage Act.

Method of Measurement: The unit of measurement is in hours.

Basis of Payment: This work will be paid for at the contract unit price of $15.00 per hour for each utilized certified TPG Program trainee (TRAINEES TRAINING PROGRAM GRADUATE). The estimated total number of hours, unit price, and total price must be included in the schedule of prices for the Contract submitted by Contractor prior to beginning work. The initial number of TPG trainees for which the incentive is available for this contract is __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 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.

TRAVERSABLE PIPE GRATE FOR CONCRETE END SECTIONS (BDE)
Effective: January 1, 2013 Revised: January 1, 2018

Description. This work shall consist of constructing a traversable pipe grate on a concrete end section.

Materials. Materials shall be according to the following Articles of Division 1000 – Materials of the Standard Specifications.

Item	Article/Section
(a) Traversable Pipe Grate Components (Note 1)	
(b) Chemical Adhesive Resin System	1027
(c) High Strength Steel Bolts, Nuts, and Washers (Note 2)	1006.08

Note 1. All steel pipe shall be according to ASTM A 53 (Type E or S), Grade B, or ASTM A 500 Grade B, standard weight (SCH. 40). Structural steel shapes and plates shall be according to AASHTO M270 Grade 50 (M 270M Grade 345) and the requirements of Article 1006.04 of the Standard Specifications. All steel components of the grating system shall be galvanized according to AASHTO M 111 or ASTM F 2329 as applicable.

Anchor rods shall be according to ASTM F 1554, Grade 36 (Grade 250).

Note 2. Threaded rods conforming to the requirements of ASTM F 1554, Grade 105 (Grade 725) may be used for the thru bolts.

CONSTRUCTION REQUIREMENTS

Fabrication of the traversable pipe grate shall be according to the requirements of Section 505 of the Standard Specifications and as shown on the plans.

Anchor rods shall be set according to Article 509.06 of the Standard Specifications. Bolts and anchor rods shall be snug tightened by a few impacts of an impact wrench or the full force of a worker using an ordinary spud wrench. Thru bolts shall be snug tightened and shall be brought to a snug tight condition followed by an additional 2/3 turn on one of the nuts. Match marks shall be provided on the bolt and nut to verify relative rotation between the bolt and the nut.

Splicing of pipes shall be made by utilizing full penetration butt welds according to Article 505.04(q) of the Standard Specifications. In lieu of welding, bolted or sleeve type splices may be utilized, provided the splices are located over intermediate supports with no more than one splice per pipe run with the exception that no splice may occur in pipe runs under 30 ft (9 m) in length.

Method of Measurement. This work will be measured for payment in place in feet (meters). The length measured shall be along the pipe grate elements from end to end for both longitudinal and intermediate support pipes.

Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for TRAVERSABLE PIPE GRATE FOR CONCRETE END SECTION.

WARM MIX ASPHALT (BDE)

Effective: January 1, 2012 Revised: April 1, 2016

Description. This work shall consist of designing, producing and constructing Warm Mix Asphalt (WMA) in lieu of Hot Mix Asphalt (HMA) at the Contractor's option. Work shall be according to Sections 406, 407, 408, 1030, and 1102 of the Standard Specifications, except as modified herein. In addition, any references to HMA in the Standard Specifications, or the special provisions shall be construed to include WMA.

WMA is an asphalt mixture which can be produced at temperatures lower than allowed for HMA utilizing approved WMA technologies. WMA technologies are defined as the use of additives or processes which allow a reduction in the temperatures at which HMA mixes are produced and placed. WMA is produced by the use of additives, a water foaming process, or combination of both. Additives include minerals, chemicals or organics incorporated into the asphalt binder stream in a dedicated delivery system. The process of foaming injects water into the asphalt binder stream, just prior to incorporation of the asphalt binder with the aggregate.

Approved WMA technologies may also be used in HMA provided all the requirements specified herein, with the exception of temperature, are met. However, asphalt mixtures produced at temperatures in excess of 275 °F (135 °C) will not be considered WMA when determining the grade reduction of the virgin asphalt binder grade.

Equipment.

Revise the first paragraph of Article 1102.01 of the Standard Specifications to read:

"**1102.01 Hot-Mix Asphalt Plant.** The hot-mix asphalt (HMA) plant shall be the batch-type, continuous-type, or dryer drum plant. The plants shall be evaluated for prequalification rating and approval to produce HMA according to the current Bureau of Materials and Physical Research Policy Memorandum, "Approval of Hot-Mix Asphalt Plants and Equipment". Once approved, the Contractor shall notify the Bureau of Materials and Physical Research to obtain approval of all plant modifications. The plants shall not be used to produce mixtures concurrently for more than one project or for private work unless permission is granted in writing by the Engineer. The plant units shall be so designed, coordinated and operated that they will function properly and produce HMA having uniform temperatures and compositions within the tolerances specified. The plant units shall meet the following requirements."

Add the following to Article 1102.01(a) of the Standard Specifications.

"(11) Equipment for Warm Mix Technologies.

a. Foaming. Metering equipment for foamed asphalt shall have an accuracy of ± 2 percent of the actual water metered. The foaming control system shall be electronically interfaced with the asphalt binder meter.

b. Additives. Additives shall be introduced into the plant according to the supplier's recommendations and shall be approved by the Engineer. The system for introducing the WMA additive shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes."

Mix Design Verification.

Add the following to Article 1030.04 of the Standard Specifications.

"(e) Warm Mix Technologies.

(1) Foaming. WMA mix design verification will not be required when foaming technology is used alone (without WMA additives). However, the foaming technology shall only be used on HMA designs previously approved by the Department.

(2) Additives. WMA mix designs utilizing additives shall be submitted to the Engineer for mix design verification."

Construction Requirements.

Revise the second paragraph of Article 406.06(b)(1) of the Standard Specifications to read:

> "The HMA shall be delivered at a temperature of 250 to 350 °F (120 to 175 °C). WMA shall be delivered at a minimum temperature of 215 °F (102 °C)."

Basis of Payment.

This work will be paid at the contract unit price bid for the HMA pay items involved. Anti-strip will not be paid for separately, but shall be considered as included in the cost of the work.

WEEKLY DBE TRUCKING REPORTS (BDE)
Effective: June 2, 2012 Revised: April 2, 2015

The Contractor shall submit a weekly report of Disadvantaged Business Enterprise (DBE) trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) that are used for DBE goal credit.

The report shall be submitted to the Engineer on Department form "SBE 723" within ten business days following the reporting period. The reporting period shall be Monday through Sunday 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.

SWPPP

Illinois Department of Transportation

Storm Water Pollution Prevention Plan

Route	Marked Route	Section
Interstate 90	F.A.I. 90	(1517 & 1415) R-2
Project Number	**County**	**Contract Number**
C-91-377-14	Cook	60Y39

This plan has been prepared to comply with the provisions of the National Pollutant Discharge Elimination System (NPDES) Permit No. ILR10 (Permit ILR10), issues 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.

Print Name	Title	Agency
Anthony Quigley, P.E	Regional Engineer	Illinois Dept. of Transportation

Signature: A. Quigley

Date: 4-21-17

I. Site Description

A. Provide a description of the project location (include latitude and longitude):

The project is located at Interstate 90, a distance approximately 160' east of the I-190 Bridge over I-90 to Harlem Avenue. The latitude is 41°59'00" and the longitude is 87°49'00". A legal description of the project is Section 1, 2; Township 40 N, Range 12 E from the Third Principal Meridian. The location map is included on the front sheet of the Highway Plan Set.

The design, installation, and maintenance of BMPs at these locations are within an area where annual erosivity (R value) is less than or equal to 160. Erosivity is less than 5 in all two-week periods between October 12 and April 15, which would qualify for a construction rainfall erosivity waiver under the US Construction General Permit requirements. At these locations, erosivity is highest in spring and summer, April 16 - October 11.

B. Provide a description of the construction activity which is subject of this plan:

The project consists of resurfacing and widening the roadway from 160' east of the I-190 Bridge over I-90 to Harlem Avenue. The mainline is to be resurfaced and the existing inside shoulder along the CTA barrier is to be reconstructed. The widening will include removing the existing outside shoulder and constructing an additional lane and new outside shoulder. Seven retaining walls, storm sewer, and roadway ramps are to be constructed. ITS/Communication conduit and cable, conventional high mast lighting and foundations of sign structures are to be installed along with the grading of detention basin and ditches/swales.

The project will be completed in four stages; pre-stage and three main construction stages.

B. Continued

Pre-stage Sub-stage A:
- Install Erosion and Sediment Control measure for Pre-stage Sub-stage A work areas.
- Remove and resurface WB I-90 mainline shoulder rumble strips.
- Install temporary sheet piling at Harlem Ramp D.
- Widen WB I-90 outside shoulder, WB I-190 inside shoulder, Cumberland Ave. Ramps C, CC, and D pavement, and Harlem Ramp D pavement at locations identified on the plans.
- Install temporary lighting as shown on the plans prior to shifting mainline traffic to Pre-stage Sub-stage B.

Pre-stage Sub-stage B:
- Install Erosion and Sediment Control measure for Pre-stage Sub-stage B work areas.
- Reconstruct WB I-90 inside shoulder.

Stage 1:
- Install Erosion and Sediment Control measure for Stage 1.
- Construct proposed WB I-90 mainline widening and outside shoulder, construct WB I-190 mainline outside widening, construct Cumberland Ave. Ramps C, C,C and DD, Canfield Rd. Ramp C, and Harlem Ave. Ramp D as shown on the plans.
- Construct storm sewer lateral jacked under I-90.

Stage 1 Sub-stage A:
- Install Erosion and Sediment Control measure for Stage 1 Sub-stage A.
- Continue construction of I-90 and I-190 WB mainline, Cumberland Ave. Ramps C, CC and DD, and Canfield Rd. Ramp D as shown on the plans.
- Construct Cumberland Ave. Ramp D as shown on the plans.
- Construct temporary pavement for Cumberland Ave. Ramp D temporary alignment as shown on the plans.

Stage 1 Sub-stage B:
- Install Erosion and Sediment Control measure for Stage 1 Sub-stage B.
- Continue construction of I-90 and I-190 WB mainline as shown on the plans.
- Complete construction of Cumberland Ave. Ramp C, CC, and DD, Canfield Rd. Ramp D, and Harlem Ave. Ramp D as shown on the plans.

Stage 2:
- Install Erosion and Sediment control measure for Stage 2.
- Continue construction of I-90 and I-190 WB mainline as shown on the plans.

Stage 2 Sub-stage A:
- Install Erosion and Sediment control measure for Stage 2 Sub-stage A
- Complete construction of I-90 and I-190 WB mainline as shown on the plans.

Stage 3:
- Install Erosion and Sediment control measure for Stage 2 Sub-stage B.
- Mill and resurface WB I-90 mainline as shown on the plans.
- Remove temporary pavement.

C. Provide the estimated duration of this project:

Approximately 18 months.

D. The total area of the construction site is estimated to be 34.94 acres.

The total area of the site estimated to be disturbed by excavation, grading or other activities is 9.48 acres.

E. The following is a weighted average of the runoff coefficient for this project after construction activities are completed:

C=0.58 (Proposed); C=0.56 (Existing)

F. List all soils found within project boundaries. Include map unit name, slope information and erosivity:

69A - Milford silty clay loam, 0 to 2 percent slopes, N/A erosivity
533 - Urban Land, N/A erosivity
534A - Urban land-Orthents, clayey, complex, nearly level, N/A erosivity
802A - Orthents, loamy, nearly level, .37 erosivity
805B - Orthents, clayey, undulating, .32 erosivity
2517A - Orthents, loamy-Urban land-Whitaker complex, 0 to 2 percent slopes, .37 erosivity
2811A - Urban land-Alfic Udarents, clayey, complex, 0 to 2 percent slopes, N/A erosivity

G. Provide an aerial extent of wetland acreage at the site:

No wetlands were identified within the project limits.

H. Provide a description of potentially erosive areas associated with this project:

Potentially errosive areas include: the embankment slopes adjacent to WB I-90 mainline from the WB I-190 WB Bridge to Harlem Ramp B and the embankments slopes adjacent to Cumberland Ave Ramps C, CC, D and DD, Canfield Ave. Ramp, and Harlem Ramp D.

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 scopes, etc.):

A description of soil disturbing activities by stages is included in item 1B. The steepness of proposed embankment slopes varies up to 1V:3H.

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 off site 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:

The existing and proposed drainage system along I-90 - Illinois Department of Transportation.

L. The following is a list of General NPDES ILR40 permittees within whose reporting jurisdiction this project is located.

Illinois Department of Transportation, Cook County, City of Chicago

M. The following is a list of receiving water(s) and the ultimate receiving water(s) for this site. The location of the receiving waters can be found on the erosion and sediment control plans:

West of station 3063+00, the storm water from the project is directed to an existing 66" storm sewer that outlets to the Des Plaines River outside the project limits. The Des Plaines River is located approximately 700 feet west of the project limits. The Des Plaines River is tributary to the Illinois River. The Des Plaines and the Illinois River are not identified by the IDNR as "biologically significant streams". The location of the receiving waters are not located on the erosion and sediment control plans.

East station 3063+00, the storm water from the project is directed to and existing 48" storm sewer that which ultimately discharges into Pump Station 23, east of the project limits.

N. Describe areas of the site that are to be protected or remain undisturbed. These areas may include steep slopes, highly erodible soils, streams, stream buffers, specimen trees, natural vegetation, nature preserves, etc.

All locations within the construction limits are expected to be disturbed through construction site activities and should be protected. The existing construction area primarily consists of existing roadway within IDOT right-of-way. Embankments associated with the WB I-90 mainline and ramps include steep slopes. Procedures to minimize damages to these areas are described in the Controls section of the SWPPP.

O. The following sensitive environmental resources are associated with this project, and may have the potential to be impacted by the proposed development:

- ☐ Floodplain
- ☐ Wetland Riparian
- ☐ Threatened and Endangered Species
- ☐ Historic Preservation
- ☒ 303(d) Listed receiving waters for suspended solids, turbidity, or siltation
- ☐ Receiving waters with Total Maximum Daily Load (TMDL) for sediment, total suspended solids, turbidity, or siltation
- ☐ Applicable Federal, Tribal, State or Local Programs
- ☐ Other

1. 303(d) Listed receiving waters (fill out this section if checked above):

Des Plaines River
Illinois River

a. The name(s) of the listed water body, and identification of all pollutants causing impairment:

The direct receiving water for the project is the Des Plaines River. The Des Plaines River is tributary to the Illinois River. The Des Plaines River and the Illinois River are not identified by the IDNR as

"biologically significant streams".

The Des Plaines River (segment IL_G-15) is listed on the 2016 IEPA 303(d) list as impaired. The 2016 303(d) list identifies the following uses of the Des Plaines River as being impaired:
- aquatic life use being impaired by chloride, total phosphorus, dissolved oxygen, and sedimentation/siltation
- fish consumption use being impaired by mercury and polychlorinated biphenyls
- primary contact recreation use as being impaired by fecal coliform

The Illinois River (segment IL_D-10) is listed on the 2016 IEPA 303(d) list as impaired. The 2014 303(d) list identifies the fish consumption use as being impaired by mercury and polychlorinated biphenyls.

No TMDLs are currently being developed for these impairments.

b. 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:

The erosion and sediment control practices as described in the following section and as shown on the Erosion and Sediment Control Drawings will be installed and maintained by the contractor. These practices will also be observed by the Resident Engineer and if necessary, instruction will be give to the Contractor to provide additional erosion and sediment control practices. The potential that construction activities performed onsite will impact the impaired Des Plaines River is reduced by the construction BMPs (perimeter erosion barrier, drainage structure inlet filters, temporary ditch check, temporary seeding with erosion control blanket, temporary sediment basin, temporary fence for tree trunk protection, storm water outlet, stone riprap, proposed ditch) in this plan. It is unlikely for there to be quantities of soluble phosphorus, fluoride, mercury, zinc, or PCBs discharged. Portable toliets will be placed away from inlets and water courses. Chloride will discharge, especially during winter application of ice melters required for safety.

Most seeded areas within the project limits are located within the Cumberland NE and NW infield ramps. Other areas of concern are hydraulically connected to the Des Plaines River so if a large storm event would occur, it is likely that the river would flood these areas.

The 25-yr, 24-hr storm is a total of nearly 6 inches of rainfall in District One. Temporary Ditch Checks are approximately 6 inches tall when properly installed. Additionally, 6 inches of freeboard shall be maintained in Concrete Washouts.

c. Provide a description of the location(s) of direct discharge from the project site to the 303(d) water body:

The drainage system drains into an existing 66 inch storm sewer which discharges to the Des Plaines River.

d. Provide a description of the location(s) of any dewatering discharges to the MS4 and/or water body:

The design and implementation of dewatering systems as needed to construct facilities included in this contract are the responsibility of the Contractor. At the start of construction the Contractor will be required to submit a dewatering plan which includes a description and location of dewatering discharges.

2. TMDL (fill out this section if checked above)

a. The name(s) of the listed water body:

b. 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:

c. 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 the allocation:

P. The following pollutants of concern will be associated with this construction project:

☒ Soil Sediment	☒ Petroleum (gas, diesel, oil, kerosene, hydraulic oil / fluids)
☒ Concrete	☒ Antifreeze / Coolants
☒ Concrete Truck waste	☒ Waste water from cleaning construction equipment
☒ Concrete Curing Compounds	☐ Other (specify)
☒ Solid waste Debris	☐ Other (specify)
☒ Paints	☐ Other (specify)
☒ Solvents	☐ Other (specify)
☒ Fertilizers / Pesticides	☐ 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 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:

☒ Preservation of Mature Vegetation	☒ Erosion Control Blanket / Mulching
☐ Vegetated Buffer Strips	☐ Sodding
☒ Protection of Trees	☐ Geotextiles
☒ Temporary Erosion Control Seeding	☒ Other (specify) Short term seeding
☐ Temporary Turf (Seeding, Class 7)	☒ Other (specify) Mulch method 2
☐ Temporary Mulching	☐ Other (specify)
☒ Permanent Seeding	☐ Other (specify)

Describe how the stabilization practices listed above will be utilized during construction:

Stablization controls runoff volume and velocity, peak runoff rates and volumes of discharge to minimize exposed soil, distrurbed slopes, sediment deischarges from construction, and provides for natural buffers and minimization of soil compaction. Existing vegetated areas where disturbance can be avoided will not require stablization.

Where possible, temporary stabilization of the initial Stage should be completed before work is moved to subsequest stages.

1. Preservation of Mature Vegetation - Mature vegetation shall be protected by "temporary fencing" as directed by the engineer and in accordance with Article 201.05 of Illinois Department of Transportation's Standard Specifications of Road and Bridge Construction.

2. Temporary Erosion Control Seeding shall be applied in accordance with Special Provision. Seed mixture will depend on the time of year it is applied. Oats will be applied from January 1 to July 31 and Hard Red Winter Wheat from August 1 to December 31.

3. Short Term Seeding - Seeding Class 2A shall be used to protect bare earth from more than just one or two summer-winter cycles. Due to the length and complexity of this project, it is necessary that short term, final graded slopes be short term seeded as directed by the Engineer.

4. Protection of Trees - Shall consist of items "temporary fencing" and "tree trunk protection" as directed by the engineer and in accordance with Article 201.05 of the Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction.

5. Permanent Seeding - All areas disturbed by construction will be stablized as soon as permitted with permanent seeding following the finished grading, but always within seven days with Temporary Erosion Control Seeding. Erosion Control Blankets will be installed over fill slopes, which have been brought to final grade and have been seeded to protect the slopes from rill and gully erosion and allow seeds to germinated properly.

6. Erosion Control Blankets and Mulching - Erosion control blankets will be installed over fill slopes with slopes less than 1V:3H. Mulch will be applied in relatively flat areas to prevent erosion.

7. Mulch Method 2 - Mulch Method 2 should be applied to slopes for temporary stabilization prior to seasons when Temporary seed will not germinate, for example in mid-July or February.

Describe how the stabilization practices listed above will be utilized after construction activities have been completed:

At the completion of grading and application of final seeding, temporary stabilization practices shall be removed.

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.

The following stabilization practices will be used for this project:

☒ Perimeter Erosion Barrier	☒ Rock Outlet Protection
☒ Temporary Ditch Check	☒ Riprap
☒ Storm Drain Inlet Protection	☐ Gabions
☐ Sediment Trap	☐ Slope Mattress
☐ Temporary Pipe Slope Drain	☒ Retaining Walls
☒ Temporary Sediment Basin	☐ Slope Walls
☐ Temporary Stream Crossing	☐ Concrete Revetment Mats
☒ Stabilized Construction Exits	☐ Level Spreaders
☐ Turf Reinforcement Mats	☒ Other (specify) Dust control
☐ Permanent Check Dams	☒ Other (specify) Stable conveyance
☐ Permanent Sediment Basin	☐ Other (specify) _____
☐ Aggregate Ditch	☐ Other (specify) _____
☐ Paved Ditch	☐ Other (specify) _____

Describe how the structural practices listed above will be utilized during construction:

1. Sediment Control, Stablized Construction Exits - Coarse aggregate overlaying a geotextile fabric will be placed in locations necessary for contractor access. The aggregate surface of the access points will capture soil debris, reducing the amount of soil deposits placed on to the roadway by vehicles leaving the work zones.

All work associated with installation and maintenance of Stabilized Construction Entrances, concrete washouts, and in-stream work are incidental to the contract.

2. Storm Drain Inlet Protection - Inlet filters will be placed in every inlet, catch basin or manhole with an open lid, which will drain water during at least a 10-year storm event. The Erosion Control Plan identifies the structures requiring inlet filters. Avoid using the INLET AND PIPE PROTECTION shown on the Highway Standard Sheets 280001. Straw bales and silt fence should not be used as inlet and pipe protection. Inlet and pipe protection should be comprised of ditch checks, temporary seeding and temporary erosion control blanket and will be installed at all storm sewer and culverts. Inlet filters, as specified in Article 1081.15(h) of the Standard Specifications (current edition) will be installed at all inlets, catch basins, and manholes for the duration of construction. Inlet filters will be cleaned on a regular basis. Ensure proper quantities of inlet filters. ditch checks, temporary seeding and temporary erosion control blanket are included in the contract.

3. Perimeter Erosion Barrier - A sediment control silt fence will be placed at the locations shown on the erosion control plans to intercept waterborne silt and prevent it from leaving the site. Silt fence should only be used as PEB 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.

4. Temporary Ditch Checks - Rolled excelsior ditch checks will be placed in swales at the rate of one for every 1 foot in vertical drop, or as directed by the Engineer, in order to prevent downstream erosion.

5. Sediment Control, Dewatering Basin - This item will be provided at wherever the contractor is removing and discharging water from excavated areas and the water is not being routed through a sediment trap or basin.

6. Stone Riprap - Class A4 stone riprap with filter fabric will be used as protection at the discharge end of storm sewer outfalls to prevent scouring and downstream erosion.

7. Temporary Sediment Basin - A temporary sediment basin will be located in the infield of Cumberland Ramp DD to collect and temporarily detain storm water runoff, providing settling time before runoff discharges from site.

8. Covers will be placed on open ends of pipes in trenches.

9. Dust control - Dust control measures will be performed for the duration of the construction.

10. Retaining Walls - Retaining walls will be constructed along I-90 from Sta. 3067+00. to Canfield Ave. Bridge, from Canfield Ave. Bridge to Canfield Ave. Exit Ramp, and from Oriole Avenue to Harlem Ave. Ramp D, and along the Canfield Ave. Exit Ramp.

11. Stable Conveyance During Storm Sewer Installation - Contractor is to provide a plan for conveyance of runoff during storm sewer demolition and construction. The plan will provide that runoff does not errode and convey sediment into storm sewer under construction. This plan may be by sequencing or stabilization. Lack of an approved plan or failure to comply will result in an ESC Deficiency Deduction.

Describe how the structural practices listed above will be utilized after construction activities have been completed:

When final grading is completed and all storm water management systems are in place, structural practices shall be removed. At locations where riprap is to remain from the "interim" construction condition, the contractor shall investigate each site and repair/replace the riprap as directed by the engineer in the field.

D. **Treatment Chemicals**

Will polymer flocculents or treatment chemicals be utilized on this project: ☐ Yes ☒ No

If yes above, identify where and how polymer flocculents or treatment chemicals will be utilized on this project.

E. **Permanent 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 on the basis of the technical guidance in Chapter 41 (Construction Site Storm Water Pollution Control) of the IDOT Bureau of Design & Environment 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:

1. The 48" main drain is oversized for storage. The length of oversized pipe is 2650'

2. Lengths of ditches will be maximized to aid in pollutant filtering along with the oversizing of storm sewers and ditches.

3. Temporary sediment basins located outside the final clear zone and below the elevation of the roadway subgrade will be left in place upon the completion of the project.

4. Permanent measures for storm water management controls will be placed as soon as possible during construction:
a. All ditches will be vegetated, where feasible, which will provide a buffering effect for run off contaminates.
b. Ditches will receive permanent seeding after the final grading and topsoil have been placed.
c. In turf areas where low maintenance seeding is required, native prairie grasses will be used in the final landscaping design.
d. Wet bottom ditches will be employed before outfalls. The ditches will be oversized to contribute to detention, where feasible, if wet bottom ditches are not feasible, the ditches will be lined with riprap.

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 Illinois Environmental Protection Agency'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:

See the Erosion and Sediment Control Plans and Landscaping Plans for means and methods utilized.

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 construction entrances/exits)
   - 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 operations
   - Time frame for other significant long-term operations or activities that may plan non-storm water discharges such as dewatering, grinding, etc.
   - Permanent stabilization activities for each area of the project
2. 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:
   - 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 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 to the Contractor for the practices associated with this project. 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 Contractor's responsibility to attain maintenance guidelines for any manufactured BMPs which are to be installed and maintained per manufacture's specifications.

All ESC measures will 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).

All maintenance of ESC systems is the responsibility of the contractor.

The Contractor shall check all ESC measures weekly and after each rainfall, 0.5 inches or greater in a 24 hour period, or equivalent snowfall. Additionally, during winter months, all measures should be checked by the Contractor after each significant snow melt.

Maintenance procedures as outlined in the Field Guide and/or BMP Maintenance Guide are also described below for each ESC measure:

Perimeter Erosion Barrier (PEB)
-Repair tears, gaps, or undermining. Restore PEB and ensure taut.
-Repair or replace any missing or broken stakes immediately.
-Clean PEB if sediment reaches one-third height of barrier.
-Remove PEB once final stabilization establishes since PEB is no longer necessary and should be removed.
-Repair PEB if undermining occurs anywhere along its entire length.

Temporary Erosion Control Seeding
-Reapply seed if stabilization hasn't been achieved.
-Apply temporary mulch to hold seed in place if seed has been washed away or found to be concentrated in ditch bottoms.
-Restore rills, greater than 4 inches deep, as quickly as possible on slopes steeper than 1V:4H to prevent sheet-flow from becoming concentrated flow patterns.
-Mow, if necessary to promote seed soil contact when excessive weed development occurs, a common indication of ineffective temporary seeding.
-Supplement BMP if weather conditions (extreme heat or cold) are not conducive for germination.

Mulch
-Repair straw if blown or washed away, or if hydraulic mulch washes away.
-Place tackifier or an Erosion Control Blanket if mulch does not control erosion.

Soil and Mulch Binders
-Reapply soil binders after heavy rainfall if spot failures occur.
-Check manufacturer's specification for re-application criteria.

III. Continued

Erosion Control Blanket (ECB)
-Repair damage due to water running beneath the blanket and restore ECBs when displacement occurs. Reseeding may be necessary.
-Replace all displaced ECBs and restaple.

Temporary Ditch Check
-Remove sediment from upstream side of ditch check when sediment has reached 50% of height of structure.
-Repair or replace ditch checks whenever tears, splits, unraveling or compressed excelsior are apparent.
-Replace torn fabric mat that may allow water to undermine the ditch check. Remove debris (garbage) when observed on check. Reestablish the flow over the center of the ditch check. Water or sediment going around the ditch check indicates incorrect installation. Device needs lengthening or the selected device is inappropriate for the site conditions.
-Remove ditch checks once all upslope areas are stabilized, seed or otherwise stablize TDC area(s).

Storm Drain Inlet Protection (Inlet Filters)
-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 there is water standing in the filter for more than 1 hour following a rain event.
-Remove trash accumulated around or on top of practice. Replace filter if tears are observed.

Outlet Protection
-Restore dislodged protection at outlet structures and correct erosion that my occur.
-Remove sediment buildup that deposits in the protection.
-Remedy deficient areas, prone to increased erosion, immediately to prevent greater deficiencies.
-Remove sediment when voids are full and replace protection. Protection is reusable if the accumulated sediment is removed.
-Temporary devices (temporary pipe slope drains) should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.
-Correct erosion at outlet and provide stabilization if necessary.
-Repair areas that allow seepage from the basin.
-Implement other BMPs if sediment discharges or other pollutants are identified at the discharge point to appropriately address pollutants.
-Replace/augment armoring at the outfall as needed to reestablish outfall integrity.
-The presence of stagnant water can result in mosquito larvae, requiring treatment. Mosquito larvae will trigger treatment with larvicide. Contact District Environmental staff for guidance.
-Regrade base if ponding observed.
Protect Existing Vegetation & Natural Features
-Replace damaged vegetation with similar species. Check with designer for appropriate replacements.
-Restore areas disturbed or damaged by the Contractors to pre-construction conditions or better at no additional expense to the contract.

III. Continued

-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. Cut all limbs and branches, one-half inch or greater in diameter, at the base of the damage, flush with the adjacent limb or tree trunk.
-Smoothly cut, perpendicular to the root, all cut, broken, or severed, during construction, roots one inch or greater in diameter.
-Cover roots exposed during excavation with moist earth and/or backfill immediately to prevent roots from drying.

Stockpile Management
-Repair and/or replace perimeter control and stabilization measures when stockpile material has potential to be discharged or leave the limits of protection.
-Remove all off-tracked material by sweeping or other methods.
-Update the SWPPP anytime a stockpile location has been removed, relocated, added, or required maintenance.
-Handle contaminated soil stockpiles according to Article 669.11 Temporary Staging in the Standard Specifications.
-During summer months, water stockpiles to maintain the crop cover.

Stabilized Construction Exits
-Replenish stone or replace exit if vehicles continue to track sediment into the roadway from the construction site.
-Sweep sediment on roadway from construction activities immediately.
-Ensure culverts are free from damage.
-Use street sweeping in conjunciton with this BMP to remove sediment not removed by the stabilized construction exit.

Tire Wash Station
-Adjust truck activity through better fueling operation, fixing leaks and wiping off excess grease to minimize pollutant discharge. Inspect tire wash discharge for evidence of oils, grease, petrol or other chemicals removed by the tire wash procedures. Alternatively, additional containment removal procedures may be required to remove petrochemicals.

Temporary Concrete Washout Facilities
-Remove washout water from high volume facilities with a vacuum truck and dispose of properly. Do not discharge wastewater into the environment. (Note: acidity, not particulates, is environmentally hazardous)
-Do not discharge washout water into the environment; facilitate evaporation of low volume washout water.
-Clean and remove any discharges within 24 hours of discovery.
-If effluent cannot be removed prior to the anticipated rainfall event, place and secure a non-collapsing, non-water collecting cover over the washout facility to prevent accumulation and precipitation overflow.
-Replace damaged liner immediately.
-Remove temporary concrete washout facilities when no longer needed and restore disturbed areas to original condition.
-Dispose of solidified concrete waste, considered Lean Construction or Demolition Debris (CCDD) as per the IEPA Act (415 ILCS5).

Material Delivery & Storage

III. Continued

-Document the various types of materials delivered and their storage locations in the SWPPP.
-Update the SWPPP anytime significant changes occur to material storage or handling locations and when they have been removed.
-Cleanup spills immediately.
-Remove empty containers.

Solid Waste Management
-If containers are full, empty them immediately.
-Update the SWPPP anytime a Contractors' trash management plan significantly changes.
-Correct items discarded outside of designated areas.

Vehicle and Equipment Fueling, Cleaning and Maintenance
-Cleanup spills immediately.
-Contractor must provide documentation that spills were cleaned, materials disposed of and impacts mitigated.
-Update the SWPPP when a designated location has been removed, relocated, added or required maintenance.
-Any spills discharged through a drainage system will require the submission of an ION.
-In the event of a spill into a storm drain, waterway or onto a paved suRface such as a parking lot, street, driveway or other surface connect to the storm water drainage system, the owner of the fuel must immediately take action to contain the spill.
-Once contained, clean up the spill. As initial step this may involve collecting any bulk material and placing it in a secure container for later disposal. Follow up cleaning will also be required to remove residues from paved or other hard surfaces.

Extended Work Cessation/Shutdown
-Maintain ESC during a shutdown. This includes winter shutdown and spring snowmelt prior to construction restart where the Contractor must install appropriate BMPs and provide timely regular maintenance.
-Inpsection frequencies during winter or project shutdown are as required under the ILR10 Permit.
-The important aspect of winter shutdown inspection is to ensure there is limited sediment and other pollutants to escape the project site.

IV. Inspections

Qualified personnel shall inspect disturbed areas of the construction site 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 e-mail 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

Additional Inspections Required:

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.

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.

Illinois Department of Transportation

Contractor Certification Statement

Prior to conducting any professional services at the site covered by this contract, the Contractor and every subcontractor must complete and return to the Resident Engineer the following certification. A separate certification must be submitted by each firm. Attach to this certification all items required by Section II.G of the Storm Water Pollution Prevention Plan (SWPPP) which will be handled by the Contractors/subcontractor completing this form.

Route	Marked Route	Section
Interstate 90	F.A.I. 90	(1517 & 1415) R-3
Project Number	**County**	**Contract Number**
C-91-377-14	Cook	60Y39

This certification statement is a part of SWPPP for the project described above, in accordance with the General NPDES Permit No. ILR10 issued by the Illinois Environmental Protection Agency.

I certify under penalty of law that I understand the terms of the Permit No. ILR10 that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

In addition, I have read and understand all of the information and requirements stated in SWPPP for the above mentioned project; I have received copies of all appropriate maintenance procedures; and, I have provided all documentation required to be in compliance with the Permit ILR10 and SWPPP and will provide timely updates to these documents as necessary.

☐ Contractor

☐ Sub-Contractor

Print Name	Signature
Title	**Date**
Name of Firm	**Telephone**
Street Address	**City/State/Zip**

Items which the Contractor/subcontractor will be responsible for as required in Section II.G. of SWPPP:

404 PERMIT

DEPARTMENT OF THE ARMY
CHICAGO DISTRICT, CORPS OF ENGINEERS
231 SOUTH LA SALLE STREET
CHICAGO, ILLINOIS 60604-1437

REPLY TO
ATTENTION OF:

October 16, 2017

Technical Services Division
Regulatory Branch
LRC-2016-00871

SUBJECT: Westbound Interstate 90 from Interstate 190 to Harlem Avenue I-90 in Norwood Park, Cook County, Illinois, (Latitude 41.98468, Longitude -87.8376)

Anthony Quigley
Illinois Department of Transportation
201 West Center Court
Schaumburg, Illinois 60196-1096

Dear Mr. Quigley:

This office has verified that your proposed activity complies with the terms and conditions of Regional Permit 3 (Transportation Projects) and the General Conditions for all activities authorized under the Regional Permit Program.

This verification expires three (3) years from the date of this letter and covers only your activity as described in your notification and as shown on the plans entitled "F.A.I. Route 90 From I-190 to IL 43 (Harlem Avenue) – Section (1517 & 1415) R-2 – Project Resurfacing, Widening, Drainage, Lighting, ITS, Signing (New), Regaining Walls, Cook County – C-91-377-14) dated 6/28/2017. Caution must be taken to prevent construction materials and activities from impacting waters of the United States beyond the scope of this authorization. If you anticipate changing the design or location of the activity, you should contact this office to determine the need for further authorization.

The activity may be completed without further authorization from this office provided the activity is conducted in compliance with the terms and conditions of the RPP, including conditions of water quality certification issued under Section 401 of the Clean Water Act by the Illinois Environmental Protection Agency (IEPA). If the design, location, or purpose of the project is changed, you should contact this office to determine the need for further authorization.

The following special conditions are a requirement of your authorization:

1. You are required to retain a qualified Independent SESC Inspector (ISI). The following requirements apply:

    a. You shall contact this office and the ISI at least 10 calendar days prior to the preconstruction meeting so that a representative of this office may attend. The

meeting agenda will include a discussion of the SESC plan and the installation and maintenance requirements of the SESC practices on the site;

b. Prior to commencement of any in-stream work, you shall submit construction plans and a detailed narrative to this office that disclose the contractor's preferred method of cofferdam and dewatering method;
c. The ISI will perform weekly inspections of the implemented SESC measures to ensure proper installation and regular maintenance of the approved methods. The ISI contact information form shall be submitted to this office via e-mail and/or hard copy prior to commencement of the permitted work;
d. The ISI shall submit to the Corps an inspection report with digital photographs of the SESC measures on a weekly basis during the active and non-active phases of construction. An inspection report shall also be submitted at the completion of the project once the SESC measures have been removed and final stabilization has been completed; and
e. Field conditions during project construction may require the implementation of additional SESC measures not included in the SESC plans for further protection of aquatic resources. You shall contact this office immediately in the event of any changes or modifications to the approved plan set or non-compliance of an existing SESC method. Upon direction of the Corps, corrective measure shall be instituted at the site to resolve the problem along with a plan to protect and/or restore the impacted jurisdictional area(s). If you fail to implement corrective measures, this office may require more frequent site inspections to ensure the installed SESC measures are acceptable.

2. Prior to commencement of work, you shall submit constructions plans and a narrative of the contractor's preferred method of cofferdam. Work in the waterway shall not commence until this office notifies you, in writing, that the plans have been approved.

3. Under no circumstances shall the Contractor prolong final grading and shaping so that the entire project can be permanently seeded at one time. Permanent stabilization within the wetland and stream buffers identified in the plans shall be initiated immediately following the completion of work. Final stabilization of these areas should not be delayed due to utility work to be performed by others.

4. This site is within the aboriginal homelands of several American Indian Tribes. If any human remains, Native American cultural items falling under the Native American Graves Protection and Repatriation Act (NAGPRA), or archaeological evidence are discovered during any phase of this project, interested Tribes request immediate consultation with the entity of jurisdiction for the location of discovery. In such case, please contact Julie Rimbault by telephone at 312-846-5542, or email at Julie.C.Rimbault@usace.army.mil.

5. You are responsible for all work authorized herein and for ensuring that all contractors are aware of the terms and conditions of this authorization.

6. A copy of this authorization must be present at the project site during all phases of construction.

7. You shall notify this office of any proposed modifications to the project, including revisions to any of the plans or documents cited in this authorization. You must receive approval from this office before work affected by the proposed modification is performed.

8. You shall notify this office prior to the transfer of this authorization and liabilities associated with compliance with its terms and conditions.

This office is in receipt of a copy the Mitigation Ledger for Mink Creek WMB confirming a purchase of 0.38 mitigation credits.

The authorization is without force and effect until all other permits or authorizations from local, state, or other Federal agencies are secured. Please note that IEPA has issued Section 401 Water Quality Certification for this RP. These conditions are included in the enclosed fact sheet. If you have any questions regarding Section 401 certification, please contact Mr. Dan Heacock at IEPA's Division of Water Pollution Control, Permit Section #15, by telephone at (217) 782-3362.

Once you have completed the authorized activity, please sign and return the enclosed compliance certification. If you have any questions, please contact Julie Rimbault of my staff by telephone at (312) 846-5542, or email at Julie.C.Rimbault@usace.army.mil.

Sincerely,

CHERNICH.KATHLEEN.G.1230365616
Digitally signed by CHERNICH.KATHLEEN.G.1230365616
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=CHERNICH.KATHLEEN.G.1230365616
Date: 2017.10.20 10:24:16 -05'00'

Kathleen G. Chernich
Chief, East Section
Regulatory Branch

Enclosures

Copy Furnished:

Huff & Huff (Alycia Kluenenberg)
IDOT (Ken Eng)

PERMIT COMPLIANCE

CERTIFICATION

Permit Number: LRC-2016-00871

Permittee: Anthony Quigley
Illinois Department of Transportation

Date: October 16, 2017

I hereby certify that the work authorized by the above-referenced permit has been completed in accordance with the terms and conditions of said permit and if applicable, compensatory wetland mitigation was completed in accordance with the approved mitigation plan.[1]

_____ _____
PERMITTEE DATE

Upon completion of the activity authorized by this permit and any mitigation required by the permit, this certification must be signed and returned to the following address:

U.S. Army Corps of Engineers
Chicago District, Regulatory Branch
231 South LaSalle Street, Suite 1500
Chicago, Illinois 60604-1437

Please note that your permitted activity is subject to compliance inspections by Corps of Engineers representatives. If you fail to comply with this permit, you may be subject to permit suspension, modification, or revocation.

[1] If compensatory mitigation was required as part of your authorization, you are certifying that the mitigation area has been graded and planted in accordance with the approved plan. You are acknowledging that the maintenance and monitoring period will begin after a site inspection by a Corps of Engineers representative or after thirty days of the Corps' receipt of this certification. You agree to comply with all permit terms and conditions, including additional reporting requirements, for the duration of the maintenance and monitoring period.

GENERAL CONDITIONS

US Army Corps of Engineers®
Chicago District

GENERAL CONDITIONS APPLICABLE TO THE 2012 REGIONAL PERMIT PROGRAM

The permittee shall comply with the terms and conditions of the Regional Permits and the following general conditions for all activities authorized under the RPP:

1. State 401 Water Quality Certification - Water quality certification under Section 401 of the Clean Water Act may be required from the Illinois Environmental Protection Agency (IEPA). The District may consider water quality, among other factors, in determining whether to exercise discretionary authority and require an Individual Permit. Please note that Section 401 Water Quality Certification is a requirement for projects carried out in accordance with Section 404 of the Clean Water Act. Projects carried out in accordance with Section 10 of the Rivers and Harbors Act of 1899 do not require Section 401 Water Quality Certification

On March 2, 2012, the IEPA granted Section 401 certification, with conditions, for all Regional Permits, except for activities in certain waterways noted under RPs 4 and 8. The following conditions of the certification are hereby made conditions of the RPP:

1. The applicant shall not cause:
   a) a violation of applicable water quality standards of the Illinois Pollution Control Board Title 35, Subtitle C: Water Pollution Rules and Regulations;
   b) water pollution defined and prohibited by the Illinois Environmental Protection Act;
   c) interference with water use practices near public recreation areas or water supply intakes;
   d) a violation of applicable provisions of the Illinois Environmental Protection Act.
2. The applicant shall provide adequate planning and supervision during the project construction period for implementing construction methods, processes and cleanup procedures necessary to prevent water pollution and control erosion.
3. Except as allowed under condition 9, any spoil material excavated, dredged or otherwise produced must not be returned to the waterway but must be deposited in a self-contained area in compliance with all State statutes, regulations and permit requirements with no discharge to waters of the State unless a permit has been issued by the Illinois EPA. Any backfilling must be done with clean material placed in a manner to prevent violation of applicable water quality standards.
4. All areas affected by construction shall be mulched and seeded as soon after construction as possible. The applicant shall undertake necessary measures and procedures to reduce erosion during construction. Interim measures to prevent soil erosion during construction shall be taken and may include the installation of sedimentation basins and temporary mulching. All construction within the waterway shall be conducted during zero or low flow conditions. The applicant shall be responsible for obtaining a NPDES Stormwater Permit prior to initiating construction if the construction activity associated with the project will result in the disturbance of (1) one or more acres, total land area. A NPDES Stormwater Permit may be obtained by submitting a properly completed Notice of Intent (NOI) form by certified mail to the Illinois EPA's Division of Water Pollution Control, Permit Section.
5. The applicant shall implement erosion control measures consistent with the Illinois Urban Manual (IEPA/USDA, NRCS; 2011, http://aiswcd.org/IUM/index.html).
6. The applicant is advised that the following permits(s) must be obtained from the Illinois EPA: The applicant must obtain permits to construct sanitary sewers, water mains, and related facilities prior to construction.
7. Backfill used in the stream-crossing trench shall be predominantly sand or larger size material, with less than 20% passing a #230 U.S. sieve.
8. Any channel relocation shall be constructed under dry conditions and stabilized to prevent erosion prior to the diversion of flow.
9. Backfill used within trenches passing through surface waters of the State, except wetland areas, shall be clean course aggregate, gravel or other material which will not cause siltation, pipe damage during placement, or chemical corrosion in place. Excavated material may be used only if:
   a) particle size analysis is conducted and demonstrates the material to be at least 80% sand or larger size material, using #230 U.S. sieve; or
   b) excavation and backfilling are done under dry conditions.
10. Backfill used within trenches passing through wetland areas shall consist of clean material which will not cause siltation, pipe damage during placement, or chemical corrosion in place. Excavated material shall be used to the extent practicable, with the upper six (6) to twelve (12) inches backfilled with the topsoil obtained during trench excavation.
11. Any applicant proposing activities in a mined area or previously mined area shall provide to the IEPA a written determination regarding the sediment and materials used which are considered "acid-producing material" as defined in 35 Il. Adm. Code,

Subtitle D. If considered "acid-producing material," the applicant shall obtain a permit to construct pursuant to 35 Il. Adm. Code 404.101.

12. Asphalt, bituminous material and concrete with protruding material such as reinforcing bar or mesh shall not be 1) used for backfill, 2) placed on shorelines/stream banks, or 3) placed in waters of the State.

13. Applicants that use site dewatering techniques in order to perform work in waterways for construction activities approved under Regional Permits 1 (Residential, Commercial and Institutional Developments), 2 (Recreation Projects), 3 (Transportation Projects), 7 (Temporary Construction Activities), 9 (Maintenance) or 12 (Bridge Scour Protection) shall maintain flow in the stream during such construction activity by utilizing dam and pumping, fluming, culverts or other such techniques.

14. In addition to any action required of the Regional Permit 13 (Cleanup of Toxic and Hazardous Materials Projects) applicant with respect to the "Notification" General Condition 22, the applicant shall notify the Illinois EPA Bureau of Water, of the specific activity. This notification shall include information concerning the orders and approvals that have been or will be obtained from the Illinois EPA Bureau of Land (BOL) for all cleanup activities under BOL jurisdiction, or for which authorization or approval is sought from BOL for no further remediation. This Regional Permit is not valid for activities that do not require or will not receive authorization or approval from the BOL.

2. Threatened and Endangered Species - If the District determines that the activity may affect Federally listed species or critical habitat, the District will initiate section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) in accordance with the Endangered Species Act of 1973, as amended (Act). Applicants shall provide additional information that would enable the District to conclude that the proposed action will have no effect on federally listed species.

The application packet shall indicate whether resources (species, their suitable habitats, or critical habitat) listed or designated under the Act, may be present within areas affected (directly or indirectly) by the proposed project. Applicants shall provide a section 7 species list for the action area using the on-line process at the USFWS website. You can access "U.S. Fish and Wildlife Service Endangered Species Program of the Upper Midwest" website at www.fws.gov/midwest/Endangered. Click on the section 7 Technical Assistance green shaded box in the lower right portion of the screen and follow the instructions to completion. Review all documentation pertaining to the species list, provide the rationale for your effects determination for each species, and send the information to this office for review.

If no species, their suitable habitats, or critical habitat are listed, then a "no effect" determination can be made, and section 7 consultation is not warranted. If species or critical habitat appear on the list or suitable habitat is present within the action area, then a biological assessment or biological evaluation will need to be completed to determine if the proposed action will have "no effect" or "may effect" the species or suitable habitat. The District will request initiation of section 7 consultation with the USFWS upon agreement with the applicant on the effect determinations in the biological assessment or biological evaluation.
If the issues are not resolved, the analysis of the situation is complicated, or impacts to listed species or critical habitat are found to be greater than minimal, the District will consider reviewing the project under the Individual Permit process.

Projects in Will, DuPage, or Cook Counties that are located in the recharge zones for Hine's emerald dragonfly critical habitat units may be reviewed under the RPP, with careful consideration due to the potential impacts to the species. All projects reviewed that are located within 3.25 miles of a critical habitat unit will be reviewed under Category II of the RPP. Please visit the following website for the locations of the Hine's emerald dragonfly critical habitat units in Illinois.
http://www.fws.gov/midwest/endangered/insects/hed/FRHinesFinalRevisedCH.html

3. Historic Properties - In cases where the District determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity may require an Individual Permit. A determination of whether the activity may be authorized under the RPP instead of an Individual Permit will not be made until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.

Federal permittees should follow their own procedures for complying with the requirements of Section 106 of the National Historic Preservation Act. Federal permittees must provide the District with the appropriate documentation to demonstrate compliance with those requirements.

Non-Federal permittees must include notification to the District if the authorized activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the permit application must state which historic properties may be affected by the proposed work or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of or potential for the presence of historic resources can be sought from the State Historic Preservation Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing permit submittals, the District will comply with the current procedures for addressing the requirements of Section 106 of the National Historic Preservation Act. Based on the information submitted and these efforts, the District shall determine whether the proposed activity has the potential to cause an effect on the historic properties. Where the non-Federal applicant has identified historic properties which the activity may have the potential to cause effects and so notified the District, the non-Federal applicant shall not begin the activity until notified by the District either that the activity has no potential to cause effects or that consultation under Section 106 of the NHPA has been completed.

The District will take into account the effects on such properties in accordance with 33 CFR Part 325, Appendix C, and 36 CFR 800. If all issues pertaining to historic properties have been resolved through the consultation process to the satisfaction of the District, Illinois Historic Preservation Agency (IHPA) and Advisory Council on Historic Preservation, the District may, at its discretion, authorize the activity under the RPP instead of an Individual Permit.

Applicants are encouraged to obtain information on historic properties from the IHPA and the National Register of Historic Places at the earliest stages of project planning. For information, contact:

Illinois Historic Preservation Agency
1 Old State Capitol Plaza
Springfield, IL 62701-1507
(217) 782-4836
www.illinoishistory.gov

If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity, you must immediately notify this office of what you have found, and to the maximum extent practicable, stop activities that would adversely affect those remains and artifacts until the required coordination has been completed. We will initiate the Federal, Tribal and State coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. Soil Erosion and Sediment Control - Measures shall be taken to control soil erosion and sedimentation at the project site to ensure that sediment is not transported to waters of the U.S. during construction. Soil erosion and sediment control measures shall be implemented before initiating any clearing, grading, excavating or filling activities. All temporary and permanent soil erosion and sediment control measures shall be maintained throughout the construction period and until the site is stabilized. All exposed soil and other fills, and any work below the ordinary high water mark shall be permanently stabilized at the earliest practicable date.

Applicants are required to prepare a soil erosion and sediment control (SESC) plan including temporary BMPs. The plan shall be designed in accordance with the Illinois Urban Manual, 2011 (http://aiswcd.org/IUM/index.html). Practice standards and specifications for measures outlined in the soil erosion and sediment control plans will follow the latest edition of the "Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement." Additional Soil Erosion and Sediment Control (SESC) measures not identified in the Illinois Urban Manual may also be utilized upon District approval.

At the District's discretion, an applicant may be required to submit the SESC plan to the local Soil and Water Conservation District (SWCD), or the Lake County Stormwater Management Commission (SMC) for review. When the District requires submission of an SESC plan, the following applies: An activity may not commence until the SESC plan for the project site has been approved; The SWCD/SMC will review the plan and provide a written evaluation of its adequacy; A SESC plan is considered acceptable when the SWCD/SMC has found that it meets technical standards. Once a determination has been made, the authorized work may commence unless the SWCD/SMC has requested that they be notified prior to commencement of the approved plans. The SWCD/SMC may attend pre-construction meetings with the permittee and conduct inspections during construction to determine compliance with the plans. Applicants are encouraged to begin coordinating with the appropriate SWCD/SMC office at the earliest stages of project planning. For information, contact:

Kane-DuPage SWCD
2315 Dean Street, Suite 100
St. Charles, IL 60174
(630) 584-7961 ext.3
www.kanedupageswcd.org

McHenry-Lake County SWCD
1648 South Eastwood Dr.
Woodstock, IL 60098
(815) 338-0099 ext.3
www.mchenryswcd.org

North Cook SWCD
899 Jay Street
Elgin, IL 60120
(847) 468-0071
www.northcookswcd.org

Lake County SMC
500 W. Winchester Rd, Suite 201
Libertyville, IL 60048
(847) 377-7700
www.lakecountyil.gov/stormwater

5. Total Maximum Daily Load - For projects that include a discharge of pollutant(s) to waters for which there is an approved Total Maximum Daily Load (TMDL) allocation for any parameter, the applicant shall develop plans and BMPs that are consistent with the assumptions and requirements in the approved TMDL. The applicant must incorporate into their plans and BMPs any conditions applicable to their discharges necessary for consistency with the assumptions and requirements of the TMDL within any timeframes established in the TMDL. The applicant must carefully document the justifications for all BMPs and plans, and install, implement and maintain practices and BMPs that are consistent with all relevant TMDL allocations and with all relevant conditions in an implementation plan. Information regarding the TMDL program, including approved TMDL allocations, can be found at the following website: www.epa.state.il.us/water/tmdl/

6. Floodplain - Discharges of dredged or fill material into waters of the United States within the 100-year floodplain (as defined by the Federal Emergency Management Agency) resulting in permanent above-grade fills shall be avoided and minimized to the maximum extent practicable. When such an above-grade fill would occur, the applicant may need to obtain approval from the Illinois

Department of Natural Resources, Office of Water Resources, (IDNR-OWR) which regulates activities affecting the floodway and the local governing agency (e.g., Village or County) with jurisdiction over activities in the floodplain. Compensatory storage may be required for fill within the floodplain. Applicants are encouraged to obtain information from the IDNR-OWR and the local governing agency with jurisdiction at the earliest stages of project planning. For information on floodway construction, contact:

IDNR/OWR
2050 Stearns Road
Bartlett, IL 60103
(847) 608-3100
http://dnr.state.il.us/owr/

For information on floodplain construction, please contact the local government and/or the Federal Emergency Management Agency. Pursuant to 33 CFR 320.4(j), the District will consider the likelihood of the applicant obtaining approval for above-ground permanent fills in floodplains in determining whether to issue authorization under the RPP.

7. Navigation - No activity may cause more than a minimal adverse effect on navigation. Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

8. Proper Maintenance - Any authorized structure or fill shall be properly maintained, including that necessary to ensure public safety.

9. Aquatic Life Movements - No activity may substantially disrupt the movement of those species of aquatic life indigenous to the waterbody, including species that normally migrate through the area, unless the activity's primary purpose is to impound water.

10. Equipment - Soil disturbance and compaction shall be minimized through the use of matting for heavy equipment, low ground pressure equipment, or other measures as approved by the District.

11. Wild and Scenic Rivers - No activity may occur in a component of the National Wild and Scenic River System or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status. Information on Wild and Scenic Rivers may be obtained from the appropriate land management agency in the area, such as the National Park Service and the U.S. Forest Service.

12. Tribal Rights - No activity or its operation may impair reserved tribal rights, such as reserved water rights, treaty fishing and hunting rights.

13. Water Supply Intakes - No discharge of dredged or fill material may occur in the proximity of a public water supply intake except where the discharge is for repair of the public water supply intake structures or adjacent bank stabilization.

14. Shellfish Production - No discharge of dredged or fill material may occur in areas of concentrated shellfish production.

15. Suitable Material - No discharge of dredged or fill material may consist of unsuitable material and material discharged shall be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act). Unsuitable material includes trash, debris, car bodies, asphalt, and creosote treated wood.

16. Spawning Areas - Discharges in spawning areas during spawning seasons shall be avoided to the maximum extent practicable.

17. Obstruction of High Flows - Discharges shall not permanently restrict or impede the passage of normal or expected high flows. All crossings shall be culverted, bridged or otherwise designed to prevent the restriction of expected high water flows, and shall be designed so as not to impede low water flows or the movement of aquatic organisms.

18. Impacts From Impoundments - If the discharge creates an impoundment of water, adverse impacts on aquatic resources caused by the accelerated passage of water and/or the restriction of its flow shall be avoided to the maximum extent practicable.

19. Waterfowl Breeding Areas - Discharges into breeding areas for migratory waterfowl shall be avoided to the maximum extent practicable.

20. Removal of Temporary Fills - Any temporary fill material shall be removed in its entirety and the affected area returned to its pre-existing condition.

21. Mitigation - All appropriate and practicable steps must first be taken to avoid and minimize impacts to aquatic resources. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland, stream, and/or other aquatic resource functions (33 CFR 332). The proposed compensatory mitigation shall utilize a watershed approach and fully consider the ecological needs of the watershed. Where an appropriate watershed plan is available, mitigation site selection should consider recommendations in the plan. The applicant shall describe in detail how the mitigation site was chosen and will be developed, based on the specific

resource need of the impacted watershed. Permit applicants are responsible for proposing an appropriate compensatory mitigation option to offset unavoidable impacts. However, the District is responsible for determining the appropriate form and amount of compensatory mitigation required when evaluating compensatory mitigation options, and determining the type of mitigation that would be environmentally preferable. In making this determination, the District will assess the likelihood for ecological success and sustainability, the location of the compensation site relative to the impact site and their significance within the watershed. Methods of providing compensatory mitigation include aquatic resource restoration, establishment, enhancement, and in certain circumstances, preservation. Compensatory mitigation will be accomplished by establishing a minimum ratio of 1.5 acres of mitigation for every 1.0 acre of impact to waters of the U.S. Furthermore, the District has the discretion to require additional mitigation to ensure that the impacts are no more than minimal. Further information is available at www.lrc.usace.army.mil/Missions/Regulatory/Illinois/Mitigation.aspx

22. Notification - The applicant shall provide written notification (i.e., a complete application) for a proposed activity to be authorized under the RPP prior to commencing a proposed activity. The District's receipt of the complete application is the date when the District receives all required notification information from the applicant (see below). If the District informs the applicant within 60 calendar days that the notification is incomplete (i.e., not a complete application), the applicant shall submit to the District, in writing, the requested information to be considered for review under the Regional Permit Program. A new 60 day review period will commence when the District receives the requested information. Applications that involve unauthorized activities that are completed or partially completed by the applicant are not subject to the 60-day review period.

For all activities, notification shall include:

a. A cover letter providing a detailed narrative of the proposed activity describing all work to be performed, a clear project purpose and need statement, the Regional Permit(s) to be used for the activity, the area (in acres) of waters of the U.S. to be impacted (be sure to specify if the impact is permanent or temporary, and identify which area it affects), and a statement that the terms and conditions of the RPP will be followed.

b. A completed joint application form for Illinois signed by the applicant or agent. The application form is available at www.lrc.usace.army.mil/Portals/36/docs/regulatory/forms/appform.pdf. If the applicant does not sign the joint application form, notification shall include a signed, written statement from the applicant designating the agent as their representative.

c. A delineation of waters of the U.S., including wetlands, for the project area, and for areas adjacent to the project site (off-site wetlands shall be identified through the use of reference materials including review of local wetland inventories, soil surveys and the most recent available aerial photography), shall be prepared in accordance with the current U.S. Army Corps of Engineers methodology (www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/reg_supp.aspx) and generally conducted during the growing season.* Our wetland delineation standards are available at www.lrc.usace.army.mil/Portals/36/docs/regulatory/pdf/Delineations.pdf. For sites supporting wetlands, the delineation shall include a Floristic Quality Assessment (Swink and Wilhelm. 1994, latest edition, Plants of the Chicago Region). The delineation shall also include information on the occurrence of any high-quality aquatic resources (see Appendix A), and a listing of waterfowl, reptile and amphibian species observed while at the project area. The District reserves the right to exercise judgment when reviewing submitted wetland delineations. Flexibility of the requirements may be determined by the District on a case-by-case basis only.

d. A street map showing the location of the project area.

e. Latitude and longitude for the project in decimal degrees format (i.e. 41.88377N, -87.63960W).

f. Preliminary engineering drawings sized 11" by 17" (full-sized may be requested by the project manager and you may also submit plans in PDF format on a disc) showing all aspects of the proposed activity and the location of waters of the U.S. to be impacted and not impacted. The plans shall include grading contours, proposed and existing structures such as buildings footprints, roadways, road crossings, stormwater management facilities, utilities, construction access areas and details of water conveyance structures. The plans shall also depict buffer areas, outlots or open space designations, best management practices, deed restricted areas and restoration areas, if required under the specific RP.

g. Submittal of soil erosion and sediment control (SESC) plans that identify all SESC measures to be utilized during construction of the project.

h. The application packet shall indicate whether resources (species, their suitable habitats, or critical habitat) listed or designated under the Endangered Species Act of 1973, as amended, may be present within areas affected (directly or indirectly) by the proposed project. Applicants shall provide a section 7 species list for the action area using the on-line process at the USFWS website. You can access "U.S. Fish and Wildlife Service Endangered Species Program of the Upper Midwest" website at www.fws.gov/midwest/Endangered. Click on the section 7 Technical Assistance green shaded box in the lower right portion of the screen and follow the instructions to completion. Print all documentation pertaining to the species list, include the rationale for your effects determination for each species, and forward the information to this office for review.

* If a wetland delineation is conducted outside of the growing season, the District will determine on a case-by-case basis whether sufficient evidence is available to make an accurate determination. If the District finds that the delineation lacks sufficient evidence, the application will not be considered complete until the information is provided. This may involve re-delineating the project site during the growing season.

In the event there are no species, their suitable habitats, or critical habitat, then a "no effect" determination can be made and section 7 consultation is not warranted. If species or critical habitat appear on the list, or suitable habitat is present within the action area, then a biological assessment or biological evaluation will need to be completed to determine if the proposed action will have "no effect" or "may effect" on the species or suitable habitat. The District will request initiation of section 7 consultation with the USFWS upon agreement with the applicant on the effect determinations in the biological assessment or biological evaluation. If the issues are not resolved, the analysis of the situation is complicated, or impacts to listed species or critical habitat are found to be greater than minimal, the District will consider reviewing the project under the Individual Permit process.

i. A determination of the presence or absence of any State threatened or endangered species. Please contact the Illinois Department of Natural Resources (IDNR) to determine if any State threatened and endangered species could be in the project area. You can access the IDNR's Ecological Compliance Assessment Tool (EcoCAT) at the following website: http://dnrecocat.state.il.us/ecopublic/. Once you complete the EcoCAT and consultation process, forward all resulting information to this office for consideration. The report shall also include recommended methods as required by the IDNR for minimizing potential adverse effects of the project.

j. A statement about the knowledge of the presence or absence of Historic Properties, which includes properties listed, or properties eligible to be listed in the National Register of Historic Places. A letter from the Illinois Historic Preservation Agency (IHPA) can be obtained indicating whether your project is in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended. The permittee shall provide all pertinent correspondence with the IHPA documenting compliance. The IHPA has a checklist of documentation required for their review located here: www.illinoishistory.gov/PS/rcdocument.htm .

k. Where an appropriate watershed plan is available, the applicant shall address in writing how the proposed activity is aligned with the relevant water quality, hydrologic, and aquatic resource protection recommendations in the watershed plan.

l. A discussion of measures taken to avoid and/or minimize impacts to aquatic resources on the project site.

m. A compensatory mitigation plan for all impacts to waters of the U.S. (if compensatory mitigation is required under the specific RP).

n. A written narrative addressing all items listed under the specific RP.

For Category II activities, the District will provide an Agency Request for Comments (ARC) which describes the proposed activity. The ARC will be sent to the following agencies: United States Fish & Wildlife Service (USFWS), United States Environmental Protection Agency (USEPA), Illinois Department of Natural Resources (IDNR), Illinois Department of Natural Resources/Office of Water Resources (IDNR/OWR), Illinois Environmental Protection Agency (IEPA), Illinois Historic Preservation Agency (IHPA), Illinois Nature Preserves Commission (INPC) and U.S. Coast Guard (Section 10 activities only). Additional entities may also be notified as needed. These agencies have ten (10) calendar days from the date of the ARC to contact the District and either provide comments or request an extension not to exceed fifteen (15) calendar days. The District will fully consider agency comments received within the specified time frame. If the District determines the activity complies with the terms and conditions of the RPP and impacts on aquatic resources are minimal, the District will notify the applicant in writing and include special conditions if deemed necessary. If the District determines that the impacts of the proposed activity are more than minimal, the District will notify the applicant that the project does not qualify for authorization under the RPP and instruct the applicant on the procedures to seek authorization under an Individual Permit.

23. Compliance Certification - Any permittee who has received authorization under the RPP from the District shall submit a signed certification regarding the completed work and any required mitigation. The certification will be forwarded by the District with the authorization letter and will include: a) a statement that the authorized work was done in accordance with the District's authorization, including any general or specific conditions; b) a statement that any required mitigation was completed in accordance with the permit conditions and; c) the signature of the permittee certifying the completion of the work and mitigation.

24. Multiple use of Regional Permits - In any case where a Regional Permit is combined with any other Regional Permit to cover a single and complete project (except where prohibited under specific Regional Permits), the applicant shall notify the District in accordance with General Condition 22. If multiple Regional Permits are used, the total impact may not exceed the maximum allowed by the Regional Permit with the greatest impact threshold.

25. Other Restrictions - Authorization under the RPP does not obviate the need to obtain other Federal, State or local permits, approvals, or authorizations required by law nor does it grant any property rights or exclusive privileges, authorize any injury to the property or rights of others or authorize interference with any existing or proposed Federal project.

Approved by:

//ORIGINAL SIGNED//	February 24, 2012
Frederic A. Drummond, Jr.	Date
Colonel, U.S. Army	
District Commander	

REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (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).

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.

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). 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 bid proposal or request for proposal 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).

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.

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. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 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 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, 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 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, 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 230, 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 (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 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 35 and 29 CFR 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.

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, 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 who 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.

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, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure 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. 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, 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, 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 there under. 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, 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 and 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. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor 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 contracting agency deems appropriate.

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 $10,000 or more.

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, 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). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

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

a. All laborers and mechanics employed or working upon the site of the work, 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 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.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. 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 shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). 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 classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall 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. (1) The contracting officer shall 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 shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore 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 utilized 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) 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 shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. 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.

(3) 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 shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour 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.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall 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.

c. 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 shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. 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, 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.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, 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.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, 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 section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) 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 section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall 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. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed 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 Regulations, 29 CFR part 3;

(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 of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, 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 may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed 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 Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall 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 the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall 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, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. 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. 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 journeymen 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.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 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.

9. Disputes concerning labor standards. 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 he or she) 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 section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

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 watchmen 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.

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. 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 watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 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.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or 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, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

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” 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:

(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.

2. 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. 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.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

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 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.

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 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).

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 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 1, 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

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

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.

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.

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.

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.

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 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee 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 grantee or subgrantee 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.

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.

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. 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 Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

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. 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) 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;

(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; 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.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. **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)

a. By signing and submitting this proposal, the prospective lower tier 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.

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 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 grantee or subgrantee 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 grantee or subgrantee 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.

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.

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 Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

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.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall 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 20).

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.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS

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.

Contract Provision - Cargo Preference Requirements

In accordance with Title 46 CFR § 381.7 (b), the contractor 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.

(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 Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract."

Provisions (1) and (2) apply to materials or equipment that are acquired solely for the project. The two provisions do not apply to goods or materials that come into inventories independent of the project, such as shipments of Portland cement, asphalt cement, or aggregates, when industry suppliers and contractors use these materials to replenish existing inventories.

MINIMUM WAGES FOR FEDERAL AND FEDERALLY ASSISTED CONSTRUCTION CONTRACTS

This project is funded, in part, with Federal-aid funds and, as such, is subject to the provisions of the Davis-Bacon Act of March 3, 1931, as amended (46 Sta. 1494, as amended, 40 U.S.C. 276a) and of other Federal statutes referred to in a 29 CFR Part 1, Appendix A, as well as such additional statutes as may from time to time be enacted containing provisions for the payment of wages determined to be prevailing by the Secretary of Labor in accordance with the Davis-Bacon Act and pursuant to the provisions of 29 CFR Part 1. The prevailing rates and fringe benefits shown in the General Wage Determination Decisions issued by the U.S. Department of Labor shall, in accordance with the provisions of the foregoing statutes, constitute the minimum wages payable on Federal and federally assisted construction projects to laborers and mechanics of the specified classes engaged on contract work of the character and in the localities described therein.

General Wage Determination Decisions, modifications and supersedes decisions thereto are to be used in accordance with the provisions of 29 CFR Parts 1 and 5. Accordingly, the applicable decision, together with any modifications issued, must be made a part of every contract for performance of the described work within the geographic area indicated as required by an applicable DBRA Federal prevailing wage law and 29 CFR Part 5. The wage rates and fringe benefits contained in the General Wage Determination Decision shall be the minimum paid by contractors and subcontractors to laborers and mechanics.