PILOT SOLICITATION

CONTRACT RR-16-4277

BID OPENING

MAY 1, 2018

10:30:00 AM

PAVEMENT & STRUCTURAL PRESERVATION & REHABILITATION

TRI-STATE TOLLWAY (I-94) HALF DAY ROAD TO EDENS SPUR PLAZA MILE POST 26.25 TO MILE POST 21.86

Illinois Tollway
2700 Ogden Avenue Downers Grove, IL 60515

VOLUME II

SPECIAL PROVISIONS

TABLE OF CONTENTS

VOLUME I

VOLUME II

ILLINOIS STATE TOLL HIGHWAY AUTHORITY (Illinois Tollway)
SPECIAL PROVISIONS
CONTRACT NUMBER RR-16-4277
PAVEMENT AND STRUCTURAL REHABILITATION
TRI-STATE TOLLWAY (I-94)
HALF DAY RD TO LAKE COOK RD
MILE POST 21.86 to MILE POST 26.25

TABLE OF CONTENTS

ILLINOIS STATE TOLL HIGHWAY AUTHORITY (Illinois Tollway)
SPECIAL PROVISIONS
CONTRACT NUMBER RR-16-4277
PAVEMENT AND STRUCTURAL REHABILITATION

TRI-STATE TOLLWAY (I-94)
HALF DAY RD TO EDENS SPUR
MILE POST 21.86 to MILE POST 26.25

S.P. 101 LOCATION AND SCOPE OF WORK

The improvements to be constructed under this contract shall be performed along the Tri-State Tollway between Mile Post 21.86 and Mile Post 26.25 in Cook and Lake County, Illinois.

The work under this contract includes, but is not limited to:

1. Roadway Rehabilitation (approx. 24,100 ft.)
    a. Mainline, shoulder and ramp pavement patching
    b. Mainline, shoulder and ramp asphalt overlay
    c. Warm-Mix Asphalt overlay of shoulders
2. Structural Rehabilitation
    a. Mainline Bridges – No. 339, No. 340, and No. 341
    b. Noise Abatement Walls
    c. Retaining Wall TN25.05R
    d. Sign Structure 10446
3. Roadside safety improvements including installation of guardrail and barrier wall
4. 7900 ft. of shoulder reconstruction
5. Signing Updates
6. Erosion Control Measures
7. Permanent pavement markings
8. Maintenance of Traffic Control operations
9. Lighting and ITS work
10. Drainage improvements
    a. Cleaning and televising storm sewers, culverts and drainage structures
    b. Cleaning ditches
    c. Erosion Repair

All applicable provisions of the IDOT Standard Specifications adopted April 1, 2016, herein after referred to as the Standard Specifications, IDOT Supplemental Specifications and Recurring Special provisions adopted January 1, 2018, Illinois Tollway Supplemental Specifications to said Standard Specifications issued May 1, 2017, and all Illinois Tollway Construction Bulletins in effect at the time of bidding, shall govern this work except as herein amended.

S.P. 102 CONTRACT RR-16-4277 INDEX OF DRAWINGS

VOLUME 1

Drawing No.	Sheet No.	Description
1	COVER	COVER SHEET
2	IDX-01	INDEX OF DRAWINGS
3	IDX-02	LIST OF STANDARDS
4	GN-01	GENERAL NOTES AND JOB SPECIFIC NOTES
5	PS-1	PROGRESS SCHEDULE
6 - 14	SOQ1 - SOQ9	SUMMARY OF QUANTITIES
15	LD1	ALIGNMENT GEOMETRICS - LAKE COOK ROAD
16	LD2	ALIGNMENT GEOMETRICS - DEERFIELD ROAD
17	LD3	ALIGNMENT GEOMETRICS - HALF DAY ROAD
18	SV1	SURVEY CONTROL POINTS
19 - 32	TYPO1 - TYP12	EXISTING AND PROPOSED TYPICAL SECTIONS
33 - 40	SCH01-SCH08	SCHEDULE OF QUANTITIES
41	AMT-01	ASPHALT MIX TABLE
42	MGN-01	MOT GENERAL NOTES
43	MGN-02	MOT STAGING SUMMARY
44	DTR	DETOUR NOTES
45	CZ01	MOT CONSTRUCTION ZONES
46	MT00	MOT TYPICAL SECTIONS - TRI-STATE PRE-STAGE
47	MT01	MOT TYPICAL SECTIONS - EDENS PRE-STAGE
48 - 50	MT02 - MT04	MOT TYPICAL SECTIONS - ZONE A
51 - 53	MT05 - MT07	MOT TYPICAL SECTIONS - ZONE B
54 - 56	MT08 - MT10	MOT TYPICAL SECTIONS - ZONE C
57 - 59	MT11 - MT13	MOT TYPICAL SECTIONS - ZONE D
60 - 62	MT14 - MT16	MOT TYPICAL SECTIONS - ZONE E
63 - 80	M2-00 - M2-15	MOT STAGE 1 AND 3 - TRI-STATE PLANS
81 - 85	M2-16 - M2-20	MOT STAGE 1 AND 3 - EDENS PLANS
86 - 90	M2A02 - M2A06	MOT STAGE 1A - TRI-STATE PLANS
91 - 95	M2A16 - M2A19	MOT STAGE 1A - EDENS PLANS
96 - 113	M1-00 - M1-15	MOT STAGE 2 - TRI-STATE PLANS
114 - 118	M1-16 - M1-20	MOT STAGE 2 - EDENS PLANS
119 - 123	M1A02 - M1A06	MOT STAGE 2A - TRI-STATE PLANS
124 - 127	M1A16 - M1A19	MOT STAGE 2A - EDENS PLANS
128 - 130	M1L-01 - M1L-03	LAKE COOK ROAD MOT BRIDGE 341
131 - 132	M1L-03 - M2L-03	LAKE COOK ROAD RAMP B MOT BRIDGE 340
133 - 136	M1N-01 - M24-02	NORTHBOUND I-294 MOT BRIDGE 339
137 - 140	DT-01 - DT-04	MOT DETOUR PLANS
141 - 154	RM-01 - RM-14	REMOVAL PLANS - TRI-STATE
155 - 158	RM-15 - RM-18	REMOVAL PLANS - EDENS
159 - 172	R-01 - R-14	ROADWAY REPAIR PLANS - TRI-STATE
173 - 176	R-17 - R-20	ROADWAY REPAIR PLANS - EDENS
177 - 193	PM-00 - PM-15	PAVEMENT MARKING AND EROSION CONTROL PLANS - TRI-STATE
194 - 197	PM-16 - PM-19	PAVEMENT MARKING AND EROSION CONTROL PLANS - EDENS
198 - 203	DET-01 - DET-06	DETAILS

VOLUME 2

Drawing No.	Sheet No.	Description
204	COVER2	COVER SHEET
205	IV2-01	INDEX OF DRAWINGS
LIGHTING		
206	LT-1	LIGHTING PLAN LEGEND
207 - 222	LT-2 - LT-17	LIGHTING PLANS
223 - 224	LT-18 - LT-19	UNDERPASS LIGHTING PLANS
225 - 229	LT-20 - LT-24	SINGLE LINE DIAGRAM FOR LIGHTING CONTROLLER
230	LT-25	EXTERIOR CONTROL CONSOLE DETAILS
INTELLIGENT TRANSPORTATION SYSTEM		
231	ITS01	ITS GENERAL NOTES
232	ITS02	SCHEDULE OF WORK
233	ITS03	CABINET WIRING DIAGRAM CCTV AC AND FOC ITS ASSEMBLY
234	ITS04	TUNNEL 449 CCTV CABINET AND DETAILS
235	ITS05	ITS DETAILS TOWER MOUNT CAMERA DETAILS
236	ITS06	ITS DETAILS TOWER MOUNT CAMERA ASSEMBLY
237	ITS07	DMS TYPE 1 ELECTRICAL PLAN
238	ITS08	DMS TYPE 1 SITE GROUNDING PLAN
239	ITS09	POLE MOUNTED SOLAR MVDS ASSEMBLY
DRAINAGE AND EROSION CONTROL		
240 - 256	DR-1 - DR17	DRAINAGE PLANS
257	EC-1	EROSION AND SEDIMENT CONTROL GENERAL NOTES
258 -260	EC-2 - EC-4	EROSION CONTROL PLAN AND DETAILS
BRIDGE NO. 339		
261	SA-1	GENERAL PLAN AND ELEVATION BRIDGE NO. 339
262	SA-2	GENERAL NOTES BRIDGE NO. 339
263	SA-3	SA-3 CONSTRUCTION STAGING BRIDGE NO. 339
264	SA-4	SOUTH ABUTMENT BRIDGE NO. 339
265	SA-5	NORTH ABUTMENT BRIDGE NO. 339
266	SA-6	ABUTMENT DETAILS BRIDGE NO. 339
267	SA-7	PIER NORTH FACE BRIDGE NO. 339
268	SA-8	PIER SOUTH FACE BRIDGE NO. 339
269	SA-9	EXPANSION JOINT DETAILS BRIDGE NO. 339
BRIDGE NO. 340		
270	SB-1	GENERAL PLAN AND ELEVATION BRIDGE NO. 340
271	SB-2	GENERAL NOTES BRIDGE NO. 340
272	SB-3	CONSTRUCTION STAGING BRIDGE NO. 340
273	SB-4	NORTH AND SOUTH ABUTMENTS BRIDGE NO. 340
274	SB-5	PIER REPAIRS BRIDGE NO. 340
275	SB-6	DECK AND PARAPET REPAIRS BRIDGE NO. 340
276	SB-7	EXPANSION JOINT DETAILS BRIDGE NO. 340

Drawing No.	Sheet No.	Description
BRIDGE NO. 341		
277	SC-1	GENERAL PLAN AND ELEVATION BRIDGE NO. 341
278	SC-2	GENERAL NOTES BRIDGE NO. 341
279	SC-3	CONSTRUCTION STAGING BRIDGE NO. 341
280	SC-4	EAST ABUTMENT BRIDGE NO. 341
281	SC-5	WEST ABUTMENT BRIDGE NO. 341
282	SC-6	PIER 1 BRIDGE NO. 341
283	SC-7	PIER 2 BRIDGE NO. 341
284	SC-8	PIER 3 BRIDGE NO. 341
285	SC-9	FRAMING PLAN AND DIAPHRAGMS BRIDGE NO. 341
286	SC-10	REPAIR DETAILS BRIDGE NO. 341
287	SC-11	EXPANSION JOINT DETAILS BRIDGE NO. 341
NOISE ABATEMENT WALLS		
288	NW-1	REPAIR DETAILS
RETAINING WALL TN25.05R		
289	RW-1	REPAIR DETAILS
SIGN STRUCTURE 10446		
290	SS-1	REPAIR DETAILS

ILLINOIS TOLLWAY STANDARD DRAWINGS

A1-06	CONCRETE PAVEMENT REPAIR FULL DEPTH
A4-05	BUTT JOINTS AND TEMPORARY ASPHALT WEDGE
A7-03	PAVEMENT JOINTS
A18-04	PRECAST PAVEMENT SLABS
B1-08	GUTTER AND CURB DETAILS
B2-07	TY. G-2 AND TY. G-3 GUTTER TRANSITIONS
B3-07	TY. G-2/G-3 GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TY. T6
B6-06	HEADWALL TYPE III 18"-24"-30"-36"-42"-48"-54"-60"
B8-05	CATCH BASINS TYPE G AND TYPE G MODIFIED, FRAMES AND GRATES
B9-04	SLOPED HEADWALLS TYPE I AND TYPE II
B10-09	SLOPED HEADWALL TYPE III DETAILS
B12-07	TRENCH DRAIN DETAIL
B19-02	EROSION PROTECTION
B25-01	FRAME AND GRATE TYPE 20A
B26-01	FRAME AND GRATE TYPE 21A
B28-05	GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1 (SPL)
B29-03	GUTTER TRANSITION AT TRAFFIC BARRIER TERMINAL, TYPE T1-A (SPL)
C1-10	GALVANIZED STEEL PLATE BEAM GUARDRAIL
C3-06	SINGLE FACE REINFORCED CONCRETE BARRIER
C6-09	SHOULDER WIDENING FOR TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL) TANGENT
C7-08	TRAFFIC BARRIER TERMINAL, TYPE T2

C9-08	TRAFFIC BARRIER TERMINAL, TYPE T6
C10-08	TRAFFIC BARRIER TERMINAL, TYPE T6B
C11-07	TRAFFIC BARRIER TERMINAL, TYPE T10
C12-08	SHOULDER WIDENING FOR TRAFFIC BARRIER TERMINAL, TY. T1-A (SPL)
D2-04	SYMBOLS AND PATTERNS
D4-06	ROADWAY DELINEATORS AND REFLECTORS
D5-06	PERMANENT PAVEMENT MARKINGS
D6-07	PAVEMENT MARKING AND SHOULDER RUMBLE STRIP DETAILS
D8-02	RAISED PAVEMENT LANE MARKER
E1-06	CONSTRUCTION SIGNS
E2-07	LANE CLOSURE DETAILS
E3-06	SHOULDER CLOSURE DETAILS
E4-07	MAINTENANCE OF TRAFFIC REVERSE CURVE
E5-07	TEMPORARY GORE DETAILS
E6-04	CONTRACTOR ACCESS TO WORK AREA
E7-04	PULL-OUT AREA
F9-04	BREAKAWAY SIGN SUPPORT DETAILS
F10-03	MISCELLANEOUS DETAILS AND ALUMINUM SIGN PANELS
F11-04	MILEPOST MARKER
H1-07	LIGHT STANDARD FOUNDATION
H2-06	LIGHT STANDARD DETAILS
H3-05	BRIDGE CONDUIT DETAILS
H4-04	HEAVY-DUTY HANDHOLE AND BURIED WIRING DETAILS
H5-05	SERVICE POLE AND PEDESTAL DETAILS
H7-02	EXTERIOR CONTROL CONSOLE FOUNDATION DETAILS
H9-01	UNDERPASS LIGHTING INSTALLATION DETAILS
H16	MAST ARM CABLE ASSEMBLY (TWIM MAST ARMS)
H17	MAST ARM CABLE ASSEMBLY (SINGLE MAST ARM)
K1-07	TEMPORARY EROSION AND SEDIMENT CONTROLS

IDOT HIGHWAY STANDARDS

000001-06	STANDARD SYMBOLS, ABBREVIATIONS AND PATTERNS
001001-02	AREAS OF REINFORCEMENT BARS
602301-04	INLET TYPE A
602401-04	MANHOLE TYPE A
701422-10	LANE CLOSURE MULTILANE FOR SPEEDS >= 45 MPH TO 55 MPH
701451-05	RAMP CLOSURE FREEWAY/EXPRESSWAY
701456-05	PARTIAL EXIT RAMP CLOSURE FREEWAY / EXPRESSWAY
701601-09	URBAN LANE CLOSURE, MULTILANE, 1W OR 2W WITH NONTRAVERSABLE MEDIAN
701901-07	TRAFFIC CONTROL DEVICES
720001-01	SIGN PANEL MOUNTING DETAILS
720006-04	SIGN PANEL ERECTION DETAILS
720011-01	METAL POSTS FOR SIGNS, MARKERS AND DELINEATORS
725001-01	OBJECT AND TERMINAL MARKERS
728001-01	TELESCOPING STEEL SIGN SUPPORT
780001-05	TYPICAL PAVEMENT MARKINGS
886001-01	DETECTOR LOOP INSTALLATIONS
886006-01	TYPICAL LAYOUTS FOR DETECTION LOOPS

S.P. 103 CONTRACT COMPLETION AND SUBSTANTIAL COMPLETION DATES

S.P. 103.1 CONTRACT COMPLETION DATE

The Contractor shall complete all work under this Agreement for the performance of Contract **RR-16-4277** on or before 11:59 p.m. on **June 1, 2019** and as specified in Article 108.05 of the Illinois Tollway Supplemental Specifications.

S.P. 103.2 SUBSTANTIAL COMPLETION DATE

The Contractor shall have completed late season temporary pavement markings, installation of permanent signing, installation of permanent lighting, all cleaning and televising of indicated sewers, culverts, drainage structures and bridge scuppers, ditch cleaning, sediment removal, stream restoration and landscaping restoration, and all work, excluding grooving for recessed pavement marking lines and permanent pavement markings, required under this Agreement for the performance of **Contract RR-16-4277** on or before 11:59 p.m. on **November 30, 2018**.

S.P. 103.3 INTERIM COMPLETION DATE

The Contractor shall have completed all roadway and bridge paving work, shoulder work and any work required, excluding late season temporary pavement marking, for the establishment of the traffic lanes to the final proposed traffic lane configuration for **Contract RR-16-4277** on or before 11:59 p.m. on **October 19, 2018**.

S.P. 104 NOTICE TO PROCEED/COMMENCEMENT OF ON-SITE WORK

In accordance with Article 103.08 of the Illinois Tollway Supplemental Specifications, it is anticipated the Notice to Proceed will be issued after the Contract is approved by all parties; including a work commencement date no earlier than **June 25, 2018**. The Illinois Tollway will not issue the Notice to Proceed until all required contract documents, including bond and insurance requirements, are submitted by the Contractor and approved by the Illinois Tollway. A Time Extension Request will not be considered should the issuance of Notice to Proceed to the Contractor be delayed due to the failure of the Contractor to submit contract documents which comply with the specified requirements. There shall be no damages or additional compensation due the Contractor for delays, if any, in issuing the Notice to Proceed.

Permits, access agreements and temporary easements for the performance of the Work may not be available at the time of the bid opening or when Notice to Proceed is issued. The Contractor shall verify the status of permits. Access agreements and temporary easements prior to the preparation of the Baseline Schedule. Work at these locations will not be available until the permit, access

agreement or temporary easement is acquired. The Baseline Schedule should reflect construction sequencing necessary to work only within available locations. The Contractor shall take all appropriate measures to ensure that construction operations do not encroach on parcels without approved access. The Contractor shall be required to adjust the work schedule as needed as locations become available.

Locations that may not be available at Notice to Proceed are listed below:

Location	Description of Work	Anticipated Acquisition Date	Reason for Unavailability
Drawing Nos. 240 thru 260	Work that affects ditches, ponds, basins, and rivers	July 7, 2018	USACE Permit (See SP 106.7)
Drawing Nos. 160,174 thru 176	Work that affects ditches	July 7, 2018	USACE Permit (See SP 106.7)

S.P. 105 LIQUIDATED DAMAGES FOR DELAY(S) AND INCENTIVE PLAN(S)

S.P. 105.1 Liquidated Damages

S.P. 105.1.1 Liquidated Damages for Non-Completion Per S.P. 103.1

In accordance with the provisions of Article 108.09 of the Illinois Tollway Supplemental Specifications, the Contractor shall pay to the Illinois Tollway the sum of $5,700.00 per day, as liquidated damages for each and every calendar day beyond the Completion Date stipulated in S.P. 103.1 that the work, or any part thereof, remains incomplete.

S.P. 105.1.2 Liquidated Damages for Non-Completion Per S.P. 103.2

In accordance with the provisions of Article 108.09 of the Illinois Tollway Supplemental Specifications, the Contractor shall pay to the Illinois Tollway the sum of $10,000.00 per day, as liquidated damages for each and every calendar day beyond the Substantial Completion Date stipulated in S.P. 103.2 that the work, or any part thereof, remains incomplete.

S.P. 105.1.3 Liquidated Damages for Non-Completion Per S.P. 103.3

In accordance with the provisions of Article 108.09 of the Illinois Tollway Supplemental Specifications, the Contractor shall pay to the Illinois Tollway the sum of $10,000.00 per day, as liquidated damages for each and every calendar day beyond the Interim Completion Date stipulated in S.P. 103.3 that the work, or any part thereof, remains incomplete.

S.P. 105.2 Completion Incentive Payment Plan(s)

NOT USED

S.P. 106 COOPERATION WITH UTILITIES AND OTHERS

S.P. 106.1 COORDINATION WITH UTILITIES

The Contractor is responsible for verifying the nature and status of all utility relocation work prior to preparation of the Baseline Schedule. The Contractor shall take appropriate measures to ensure that construction operations do not interfere with utility facilities and relocation work. The Baseline Schedule shall reflect construction sequencing which coordinates with all utility relocation work. The Contractor shall be required to adjust the order of its work from time to time, to coordinate same with utility relocation work, and shall prepare revised Baseline Schedule(s) in compliance therewith as directed by the Engineer.

The provisions of Articles 105.07 and 105.08 of the Illinois Tollway Supplemental Specifications shall apply.

The Illinois Tollway and the Engineer shall be notified in writing by the Contractor at least 96 hours prior to the start of any operation requiring cooperation with others. All other agencies, unless otherwise noted, will be notified in writing by the Contractor ten (10) days prior to the start of any such operation.

Where the Contractor is constructing new facilities for a utility, the utility shall be notified 5 days prior to start of this work.

The following persons have been contacted in reference to utilities they own and operate within the right of way limits for this project. All known data from these agencies has been incorporated into the plans. It is, however, the Contractor's responsibility to confirm or establish the existence of all utility facilities and their exact locations, whether contained in the data submitted by these agencies or not, and to safely schedule all utility relocations.

ADDESTA GROUP	**ATT**	**ATTD5A ATT**
CECIL KUHSE	DAVID HOFFMAN	ALEX BRYANT
630-920-1488	847-759-5524	630-573-6456
565 WILLOWBROOK CENTER PARKWAY WILLOWBROOK, IL 60527	ILLINOIS BELL TELEPHONE CO. DES PLAINES, IL 60016	1000 COMMERCE DRIVE OAKBROOK, IL 60523
cecil.kuhse@adestagroup.com	DH4581@att.com	ab8652@att.com

COMCAST	COMED	ISTHA - FIBER OPTICS
MARTHA GIERAS	KANDICE JANUSZ	MICHAEL S. CARAMELLA
630-600-6352	630-396-8225	630-241-6800, EXT.4129
688 INDUSTRIAL DRIVE ELMHURST, IL 60126	THREE LINCOLN CENTER OAKBROOK TERRACE, IL 60181	2700 OGDEN AVE. DOWNERS GROVE, IL 60515
martha_gieras@comcastcable.com	KandiceJanusz@usicllc.com	mscaramella@getipass.com

LEVEL 3 COMMUNICATIONS	MCI COMMUNICATIONS (VERIZON)	NICOR GAS
THOMAS LONGAN	THOMAS E. BUHER	BRUCE KOPPANG
720-878-6311	708-458-6410	630-388-3046
1305 E. ALGONQUIN ROAD ARLINGTON HEIGHTS, IL 60005	7719 WEST 60th PLACE SUMMIT, IL 60501	1011 WILEY ROAD SCHAUMBURG, IL 60173
thomas.longan@level3.com	thomas.buher@verizon.com	bkoppan@southernco.com

THE VILLAGE OF DEERFIELD	THE VILLAGE OF RIVERWOODS	VILLAGE OF LINCOLNSHIRE
DAN BUSSCHER	PATRICK GLENN	WALLY DITTRICH
847-719-7458	847-478-9700	847-913-2366
465 ELM STREET DEERFIELD, IL 60015	300 PORTWINE ROAD RIVERWOODS, IL 60015	ONE OLDE HALF DAY ROAD LINCOLNSHIRE, IL 60069
dbusscher@deerfield.il.us	pglenn@gha-engineers.com	bolsterb@naperville.il.us

S.P. 106.2 COORDINATION WITH ILLINOIS DEPARTMENT OF TRANSPORTATION

Coordination with the Illinois Department of Transportation (IDOT) shall be as follows:

For construction on or adjacent to any State Highways, the Contractor will be required to contact IDOT to secure necessary permits and obtain written authorization for any work or lane closures on the aforementioned roadway.

The Contractor shall give IDOT 14 calendar days' notice prior to commencement of any work on or affecting a State highway, so as to provide the opportunity to alert the motoring public of possible delays.

Where State highways will be affected by the construction of the Toll Highway, the Contractor shall have responsibility for the installation, maintenance, relocation and removal of temporary and permanent traffic control devices along the State highways in accordance with IDOT Standards and Specifications.

This contract **RR-16-4277** abuts and/or overlaps with other concurrent and future IDOT contracts as listed below. Each contract includes work items requiring close coordination between the various Contractors regarding the sequence and timing for execution of work items. This contract also includes critical work items that affect the future staging of traffic and the completion dates of other contracts. These critical items along with their completion dates are listed after each contract.

1. IDOT Contract No.
    a. **None known at this time**

    Critical Items affecting the above contract:
    a. **None known at this time**

The Contractor shall be required to meet regularly with IDOT and Illinois Tollway representatives to keep them abreast of traffic phase changes and shall provide a minimum 24-hour notice of said changes. The Contractor shall be required to comply with all IDOT traffic control requirements, including the specifications for lane closures contained in the final plans and specifications. Such lane closures must be reviewed and approved by IDOT prior to implementation. The Contractor will be required to request written authorization through the Traffic Control Supervisor a minimum of two (2) weeks prior to any traffic pattern changes or lane closures, and provide detailed description of the traffic pattern revisions and respective durations in his/her authorization request. Upon receipt of the authorization, the Contractor shall submit a copy to the Engineer for recording. The IDOT Traffic Control Supervisor may be contacted at:

Cory Jucius
Illinois Dept. of Transportation
Region 1
201 West Center Court
Schaumburg, IL 60196-1096
Phone Number: (847) 705-4430 / (847) 705-4157
Facsimile: (847) 705-5498

Should the Contractor fail to install or maintain traffic control devices as provided for in the Contract, IDOT, after giving prior notice to the Contractor, shall have the right to perform the work in any reasonable manner or cause the work to be performed on a force account basis at the expense of the Contractor.

The Contractor shall be required to keep at least one lane open in each direction on the State highways continuously at all times during construction unless otherwise authorized.

The Contractor shall indemnify and hold harmless IDOT in accordance with the indemnification provided to IDOT in Article 107.26 of IDOT's Standard Specifications for Road and Bridge Construction in effect at the time of construction. Such indemnity shall not be limited to amounts recoverable in the Court of Claims or by any insurance or bonds to be provided by said Contractor.

IDOT and its authorized agents shall have all reasonable rights of inspection (including pre-final and final inspection) during the progress of the Work as it affects the State Highway System. All IDOT communications and correspondence with the Illinois Tollway's Contractor relating to the contract shall be through the Illinois Tollway, unless otherwise specifically approved by the Chief Engineer of the Illinois Tollway. The Contractor shall immediately perform such work or replace or repair such non-complying work.

IDOT will also make inspections upon completion of 70% and 100% of all work on each contract affecting a facility. Deficiencies thus identified shall be subject to re-inspection upon completion of corrective work. Payments for all work shall also be subject to IDOT inspections.

S.P. 106.3 COORDINATION WITH THE COOK COUNTY DEPARTMENT OF TRANSPORTATION AND HIGHWAYS

For construction on or adjacent to any county highway, the Contractor will be required to contact the Cook County Department of Transportation and Highways, as listed below, to secure necessary permits and obtain written authorization for any lane closures on the aforementioned roadway.

The Contractor is required to execute permit forms and provide a bond to Cook County to secure a Construction Permit for access to the Cook County right of way for the purpose of performing the contract work. The bond shall be furnished in the amount of **$20,000**.

A highway permit is required to be secured from Cook County for access to County right of way for the purposes of completing the work. The contractor will not be allowed access to County right of way prior to receiving the Construction Permit from Cook County. The contractor shall include the date of anticipated County Permit approval on the Baseline Progress Schedule and on the Revised Baseline Schedule submitted as required by Article 108.02 of the Tollway Supplemental Specifications. The County Construction Permit is anticipated to be secured no earlier than **July 16, 2018**. The Contractor will not be allowed access to County right of way prior to **July 16, 2018** and will not be due additional compensation nor will an extension of time be granted should access to County right of way not be allowed prior to **July 16, 2018.**

The Contractor shall give Cook County 14 calendar days' notice prior to commencement of any work on or affecting a Cook County highway, so as to provide the opportunity to alert the motoring public of possible delays by calling the Construction Bureau 312-603-1610.

Where County highways will be affected by the construction of the Toll Highway, the Contractor shall have responsibility for the installation, maintenance, relocation and removal of temporary and permanent traffic control devices along the Cook County highways in accordance with IDOT Standards and Specifications.

This contract **RR-16-4277** abuts and/or overlaps with other concurrent and future Cook County contracts as listed below. Each contract includes work items requiring close coordination between the various Contractors regarding the sequence and timing for execution of work items. This contract also includes critical work items that affect the future staging of traffic and the completion dates of other contracts. These critical items along with their completion dates are listed after each contract.

2. Cook County Contract No.
    a. **None known at this time**

    Critical Items affecting the above contract:
    b. **None known at this time**

The Contractor shall be required to meet regularly with Cook County and Illinois Tollway representatives to keep them abreast of traffic phase changes and shall provide a minimum 24-hour notice of said changes. The Contractor shall be required to comply with all Cook County traffic control requirements, including the specifications for lane closures contained in the final plans and specifications. Such lane closures must be reviewed and approved by Cook County prior to implementation. The Contractor will be required to request written authorization through the Cook County Superintendent of Highways a minimum of two (2) weeks prior to any traffic pattern changes or lane closures, and provide detailed description of the traffic pattern revisions and respective durations in his/her authorization request. Upon receipt of the permit and authorization, the Contractor shall submit a copy to the Engineer for recording.

Should the Contractor fail to install or maintain traffic control devices as provided for in the Contract, Cook County, after giving prior notice to the Contractor, shall have the right to perform the work in any reasonable manner or cause the work to be performed on a force account basis at the expense of the Contractor.

The Contractor shall be required to keep at least one lane open in each direction on the County highways continuously at all times during construction unless otherwise authorized.

The Contractor shall indemnify and hold harmless Cook County in accordance with the indemnification provided to Cook County in Article 107.26 of IDOT's Standard Specifications for Road and Bridge Construction in effect at the time of construction. Such indemnity shall not be limited to amounts recoverable in the Court of Claims or by any insurance or bonds to be provided by said Contractor.

Cook County and its authorized agents shall have all reasonable rights of inspection (including pre-final and final inspection) during the progress of the

Work as it affects the County Highway System. All Cook County communications and correspondence with the Illinois Tollway's Contractor relating to the contract shall be through the Illinois Tollway, unless otherwise specifically approved by the Chief Engineer of the Illinois Tollway. The Contractor shall immediately perform such work or replace or repair such non-complying work.

Cook County will also make inspections upon completion of 70% and 100% of all work on each contract affecting a facility. Deficiencies thus identified shall be subject to re-inspection upon completion of corrective work. Payments for all work shall also be subject to Cook County inspections.

The Contractor is responsible for meeting all requirements of the Cook County Department of Transportation and Highways in connection therewith:

Mr. John Yonan P.E.
Superintendent of Highways
Cook County Department of Transportation and Highways
69 West Washington Street, 24th Floor
Chicago, Illinois 60602
(312) 603-1601
Facsimile Number: (312) 603-9945
Attn: Mr. Michael Sterr, Permits Engineer

S.P. 106.4 COORDINATION WITH THE LAKE COUNTY DIVISION OF TRANSPORTATION

For construction on or adjacent to any county highway, the Contractor will be required to contact the Lake County Division of Transportation, as listed below, to secure necessary permits and obtain written authorization for any lane closures on the aforementioned roadway.

The Contractor is responsible for meeting all requirements of the Lake County Division of Transportation in connection therewith:

Mr. Shane Schneider, P.E.
Director of Transportation, County Engineer
Lake County Division of Transportation
600 W Winchester Road
Libertyville, IL 60048
Phone 847-377-7400

S.P. 106.5 COORDINATION WITH OTHER CONTRACTORS

The Contractor is advised that certain operations will involve cooperation with Illinois Tollway personnel and Contractors performing work on or adjacent to this contract for the Illinois Tollway. The Contractor shall cooperate to the fullest extent with the Illinois Tollway and the Contractors working on adjacent projects in compliance with the provisions of Article 105.08 of the Illinois Tollway Supplemental Specifications.

The following Illinois Tollway projects in the vicinity of Contract **RR-16-*4277*** may be under construction during the term of this Contract:

RR-17-4350 I-94 Ramp Rehabilitation Grand Avenue to Half Day Road.

RR-17-4370 I-94 Bridge Sealing Russell Road to Half Day Road.

RR-17-4341 Tri-State Tollway Preservation and Rehabilitation Russell Road to Half Day Road.

I-18-4372 Edens Spur (I-94) Roadway Rehabilitation Plaza 24 (M.P. 26.25 to 26.9); Frontage Road (M.P. 27.5 TO M.P. 27.9); Beam Fabrication (Bridge NO. 347, 348, 353, & 354)

I-18-4373 Edens Spur (I-94) Roadway and Bridge Reconstruction for M.P. 26.8 to 28.9.

RR-17-4345 Tri-State Tollway LED Retrofit and ITS Device Replacement Belvidere Road to Half Day Road for M.P. 11.5 to M.P. 22.0.

Contract (TBD): “Pavement and Bridge Preservation, I-294 Balmoral Ave to Lake Cook Rd”

S.P. 106.6 COORDINATION WITH TOLLWAY FOR WATER NEEDS

NOT USED

S.P. 106.7 COORDINATION WITH PERMITTING AGENCIES

This project requires permits from the United States Army Corps of Engineers (USACE).

The applications for the permits is scheduled to be submitted by April 1, 2018 to the USACE by the Tollway. Prior to issuance of the permit, the Contractor shall not disturb or otherwise impact the jurisdictional wetlands and waters of the US as noted within the contract plans until these permits are received. No removals, temporary or permanent construction activities or other work that would impact these resources will be allowed until the permits are approved by the USACE. This includes, but is not limited to work within waterways, cleaning of ditches, cleaning pipes and structures or any embankment modifications within the jurisdictional areas.

TABLE of USACE Permits

- A Regional Permit 9 for maintenance activities

The plans have been developed to be in accordance with the permit requirements. After issuance with the permits, the Contractor shall comply with all permit conditions. The cost of complying with the permit conditions shall be included in the various items or work associated with the Contract.

The Contractor is responsible for meeting all requirements of these agencies in connection therewith and in coordination with:

Bryan Wagner
Senior Environmental Planner
Illinois Tollway
2700 Ogden Ave
Downers Grove, Il 60515
(630) 241-6800

S.P. 107 INSURANCE

This provision supplements Article 107.27 of the Illinois Tollway Supplemental Specifications.

J. ADDITIONAL INSURED PROTECTION

The work under this contract includes work upon, above, adjacent to and/or along the right-of-way and facilities of **Illinois Department of Transportation (IDOT), Cook County, Lake County, Vernon Township, West Deerfield Township, Village of Northbrook, Village of Deerfield, Village of Bannockburn, Village of Lincolnshire, Village of Riverwoods and the Metropolitan Water Reclamation District of Greater Chicago**. The Contractor's Insurance coverage, required by and in conformance with Article 107.27(j) of the Illinois Tollway Supplemental Specifications, shall include the agencies specified herein, its agents and employees as additional insureds, or provide a separate owner's protection policy of equal limits of coverage for each agency.

S.P. 107.1 ENGINEERING PROFESSIONAL LIABILITY

Engineering Professional Liability insurance shall be maintained during the design-build period of the contract and then provide a discovery period of no less than 5 years after project completion. The discovery period requirement may be met by either an endorsement to the Engineering Professional Liability policy indicating the 5 year discovery period or, alternatively, a letter from the Engineering Professional warrantying that Engineering Professional Liability insurance shall be maintained continuously for a period of not less than five years after project completion. The policy may be written on a claims-made basis. Insurance documentation is required of the engineering firm providing the actual design-build plans. Primary professional liability for the engineering firm should be for a minimum of $2 million per claim and in aggregate.
This would apply to the following:

Pay Item No.	Description
JI999787	MAST ARM CABLE ASSEMBLY, TWIN MAST ARM (SPECIAL)
JI999788	MAST ARM CABLE ASSEMBLY, SINGLE MAST ARM (SPECIAL)
JT132040	DYNAMIC MESSAGE SIGN – TYPE 1
JT485012	STANDARD PRECAST CONCRETE PAVEMENT SLABS, 12.5'
JT485014	STANDARD PRECAST CONCRETE PAVEMENT SLABS, 13.5'
JT485015	CUSTOM PRECAST CONCRETE PAVEMENT SLABS
JT503040	STRUCTURAL REPAIR OF CONCRETE (DEPTH EQUAL TO OR LESS THAN 5 IN)
JT503100	FIBER WRAP REPAIR

S.P. 107.2 ENVIRONMENTAL PROTECTION

NOT USED

S.P. 107.3 RAILROAD PROTECTIVE LIABILITY INSURANCE

NOT USED

S.P. 108 INDEMNIFICATION

In addition to indemnifying the Illinois Tollway under Article 107.26 of the Illinois Tollway Supplemental Specifications, the Contractor shall also indemnify and save harmless the Illinois Department of Transportation (IDOT), Cook County, Lake County, Vernon Township, West Deerfield Township, Village of Northbrook, Village of Deerfield, Village of Bannockburn, Village of Lincolnshire, Village of Riverwoods, Metropolitan Water Reclamation District of Greater Chicago, HBM Engineering, LLC and all subconsultants, Midwest Engineering Associates, Inc., Wynndalco Enterprises, LLC and all subconsultants, Construction Manager and all subconsultants, the Program Management Office (PMO), HNTB Corporation, General Engineering Consultant (GEC) WSP, Inc. and all their officers, agents and employees, in accordance with the indemnification requirements of Article 107.26 of said Illinois Tollway Supplemental Specifications.

S.P. 109 WORKING HOURS AND PROSECUTION OF THE WORK

The Contractor is to refer to Section 108 - PROSECUTION AND PROGRESS in the Illinois Tollway Supplemental Specifications.

Regardless of progress, the Contractor shall be required to prosecute the work without undue delays or extended time intervals between activities. The Contractor is expected to utilize a seven-day work week and double shifts as required to complete the Work by the Contract Completion Date specified in S.P.

103.1 and by the substantial completion date specified in S.P. 103.2 and in accordance with the hour restrictions provided in the Contract Documents.

S.P. 110 LIST OF INCIDENTALS TO THE PAY ITEMS

The Contractor's attention is called to several specific incidental work items as noted on the Contract Plans and Special Provisions and in addition to the lists in the Standard Specifications. Listed below is a listing of these items for general information only. The list is not intended to be all-inclusive and, therefore, the Contractor is responsible to perform all work according to the Plans, Special Provisions and the Standard Specifications.

Pay Item No.	Description	Incidental Work
JT132621	DMS ELECTRICAL WORK - TYPE 1	Ground Busbars, Exothermic Welding, Ground Well, Ground Rods and all other items needed to complete the Grounding Electrode system as detailed on Sheet ITS08 "DMS TYPE I SITE GROUNDING PLAN"

S.P. 111 EROSION AND SEDIMENT CONTROL

The Illinois Tollway, in order to comply with various environmental regulations, has included Bid Items from Section 280 of the Illinois Tollway Supplemental Specifications, which implement such compliance. The Contractor shall make his/her employees and subcontractors aware that the Illinois Tollway will strictly enforce these requirements.

The National Pollutant Discharge Elimination System (NPDES) program of the Federal Clean Water Act imposes erosion and sediment control requirements on construction projects that involve a land disturbance of one (1) acre or more. The procedures in this section are applicable to all Illinois Tollway projects that fall into these parameters.

Erosion and sediment control must be provided on all projects which will expose areas of soil or other material to potential displacement by precipitation and/or wind events such that sediment and other pollutants could adversely affect operations on the highway or associated rights-of-way, could be introduced into receiving waters, or could affect adjacent properties, sensitive environmental resources, or other resources which the Illinois Tollway has committed to protect from pollutant impacts. The nature and extent of the control measures should be appropriate to address the specific conditions involved and the measures must be properly maintained to ensure continued effective operation.

Projects which involve no roadway reconstruction, clearing and grubbing, excavation, stockpiling of soil and aggregates, borrow, or construction of embankment normally will not require erosion and sediment control measures. Projects that involve only isolated excavation normally will not require erosion and sediment control measures. The following are examples of actions which normally will not require erosion and sediment control measures:

- installation of lighting fixtures, signing, traffic signals or guardrail,
- weed spraying,
- pavement marking,
- seal coating,
- pavement patching,
- planting of woody landscaping materials, and
- ditch and pond cleanings if the soil is not redeposited on the site.

If a single project involves a cumulative land disturbance of one (1) acre or more, such as building demolition or building/facility construction at multiple locations, an erosion control plan and an NPDES permit is required.

All projects have evaluated the need for erosion and sediment control (and any additional right-of-way necessary to accommodate their implementation) as part of the preparation of the Contract Documents and have incorporated the appropriate information to address the identified needs in the Plans. Included in the Plans are information identifying the types of erosion and sediment control practices to be used, the locations in which they will be applied, and when they should be applied in relation to the sequence of construction operations. The sequence of construction operations may not have been specified in the Contract Documents. Rather, the application of erosion and sediment control measures in relation to the specific stages of construction that may expose soil wherever those stages occur can be described. Locations for use of practices such as perimeter silt fence and ditch checks may be specified or shown as appropriate. The location and design for non-routine practices are indicated in the Plans.

S.P. 111.1 NPDES PERMIT NO. ILR10

NOT USED

S.P. 111.2 STORM WATER POLLUTION PREVENTION PLAN

The construction activity planned for the project area is to clean and televise all storm sewer structures and associated pipes as indicated in the plans. Incidental work includes re-establishing grades at storm water ditches and at the inlets and outlets of culverts to improve flow as shown on the plans and as required by the Standard Specifications and these Special Provisions.

According to the cleaning special provisions, the Contractor shall implement “Best Management Practices” (BMP’s) for the control of sediment that will be removed during the cleaning operation. Flushing of the material downstream is

not authorized and discharges of any materials into wetlands or WOUS is strictly prohibited.

The following is a description of the intended sequence of major activities which will disturb soils for major portions of the construction site, such as clearing, excavation, grading and on-site or off-site stockpiling of soils or storage of materials

1. Installation of soil erosion and sediment control measures including perimeter silt fencing, inlet protection, temporary ditch checks, and locating temporary stock pile areas as shown on the drainage plans or as directed by the Engineer.
2. Cleaning of storm sewers and removal of sediments to temporary stock pile area.
3. Temporary damming and dewatering of end sections, where required.
4. Ditch cleaning and removal of sediments shall be completed along the work site to re-establish storm water flows.
5. Placement and maintenance of temporary erosion control measures including heavy duty erosion control blanket, temporary ditch checks, inlet and pipe protection, etc.
6. Final grading, landscaping, and other miscellaneous items.
7. Removal of all temporary erosion control measures and placement of permanent erosion control, such as seeding, sod, erosion control blanket or stabilizing blanket, riprap, etc.

Regraded ditch areas shall be permanently seeded or sodded within 7 days of final grading. If not, these areas shall be temporarily seeded by the 14th day if no construction activity in the area is planned for 21 days or more.

Other Controls.

(i) Non Hazardous Waste Disposal shall conform to Article 202.03 of the Standard Specifications. No solid materials, including building materials, shall be discharged into Waters of the State, except as authorized by a Section 404 permit.

(ii) Non-storm water discharges are prohibited, including concrete, wastewater from concrete washout areas; release of oils, curing compounds, or other construction materials; fuels; other pollutants used in vehicle and equipment operation and maintenance; soaps, solvents; detergents; or any other pollutant that could cause water pollution.

(iii) Hazardous Waste Disposal shall conform to Article 107.19(a) of the Illinois Tollway Supplemental Specifications.

(iv) Sanitary Waste Materials. The provisions of this plan shall ensure and demonstrate compliance with applicable State and/or local waste disposal, sanitary sewer or septic system regulations. The Contractor shall not create or allow unsanitary conditions.

(v) Off-Site Vehicle Tracking. Each site shall have one or more stabilized construction entrance(s) in conformance with Standard Specifications and Standard Design Details. Where the contractor's equipment is operated on any portion of the traveled surface or structures used by traffic on or adjacent to the section under construction, the contractor shall clean (not flushing) the traveled surface of all dirt and debris at the end of each day's operations, or more frequently if directed by the Engineer.

Inventory for Pollution Prevention Plan.

The materials or substances listed below are expected to be present on site during construction. **(To be filled in by Contractor).**

Spill Prevention - Material Management Practices.

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

Good Housekeeping:

The following good housekeeping practices will be followed on site during the construction project:

- An effort will be made to store on-site only enough product required to do the job.
- All materials stored on site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with original manufacturer's label.
- Substances will not be mixed with another unless recommended by the manufacturer.
- The site superintendent will inspect daily to ensure proper use and disposal of materials on-site.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.

Hazardous Products:

These practices are used to reduce the risks associated with hazardous materials.

- Products will be kept in original containers unless they are not re-sealable.
- Original labels and material safety data sheets will be retained.
- If surplus product must be disposed of, manufacturer's or local and state recommended methods for proper disposal will be followed.
- Manufacturer's recommendations for proper use and disposal will be followed.

Spill Control Practices:

In addition to the good housekeeping and material management practices discussed above, the following practices will be followed for spill prevention and cleanup:

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and location of the information and cleanup supplies.

- Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust and plastic and metal trash containers specifically for this purpose.

- All spills will be cleaned up immediately after discovery.

- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance.

- Spills of toxic or hazardous material will be reported to the appropriate state or local government agency, regardless of size.

- The spill prevention plan will be adjusted to include measures to prevent this type of spill from recurring and how to clean up the spill if there is one. A description of the spill, what caused it and the cleanup measures will also be included.

- The Contractor shall be responsible for day-to-day operations and will be the spill prevention and cleanup coordinator. He/She will designate at least two (2) other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel, listed below, will be posted in the material storage area and in the office trailer on-site.

Name	Contractor
Name	Contractor

S.P. 112 QUALIFIED PRODUCTS

S.P. 112.1 Multi-Polymer Pavement markings

1. **Epoplex's LS-65 Multi-Polymer marking Product.**
2. **PolyCarb's mark 55.4 multi-Polymer marking Product.**

S.P. 112.2 Paint

Qualified Paint Products List for New Shop Fabricated Structural Steel for Bridges and Toll Plaza Canopy Structures (a)

USE: COMPLETE SHOP COATING

ORGANIC ZINC SYSTEM

Producer	Coats	Products	Min. Dry Film Thickness Mils(b),(d),(f)	Color (g)
PPG Protective and Marine Coatings One PPG Place Pittsburg, Pennsylvania 15272	1st 2nd 3rd	Amercoat 68 HS Amercoat 399 Amercoat 450H	3.0 4.0 3.0	Tinted White (c)
Carboline Company 2150 Schuetz Road St. Louis, MO 63146	1st 2nd 3rd	Carbo Zinc 859 Carboguard 888 Carbothane 133 HB	3.0 5.0 3.0	Tinted White (c)
Sherwin-Williams Company 101 West Prospect Ave. Cleveland, OH 44115	1st 2nd 3rd	Zinc Clad III H.S. Macropoxy 646 Acrolon 218	3.0 4.0 3.0	Tinted White (c)

(a) This paint products list is not to be used for communications tower painting. Refer to Project Special Provisions for communications tower painting requirements.

(b) The intermediate coat and the urethane topcoat shall be of sufficient dry film thickness to completely cover the prime coat and the intermediate coat respectfully and produce a uniform color and appearance.

(c) Urethane top coat color shall be Munsell number 5B 7/1 as shown on the Plans.

(d) The minimum on the faying surfaces shall be in accordance with the approved coating supplier's product data sheet.

(e) Minimum Curing Time Between Coats

1. Primer
   The minimum curing time between the prime coat and the intermediate coat shall be 6 hours at a minimum of 50 degrees, F, unless a longer recoat interval is deemed necessary by the manufacturer's product data sheet.
2. Intermediate Coat
   The minimum curing time between the intermediate coat and the top coat shall be in accordance with the times and conditions listed on the manufacturer's product data sheet.

(f) Minimum dry film thicknesses are the minimum values required by the Standard Specifications, Article 506.04 and the Special Provisions concerning shop coating of new structural steel for bridges and toll plaza canopy structures respectively. Current manufacturer's product data sheets shall be submitted to the Illinois Tollway at time of coating system approval.

(g) Intermediate coat may be half strength tint of top coat if proposed to the Illinois Tollway for approval.

S.P. 113 RESERVED

S.P. 114 DELIVERY OF SALVAGEABLE MATERIAL TO THE ILLINOIS TOLLWAY

The Plans and Special Provisions require the Contractor to deliver various items, which have been removed and deemed salvageable, "to the Illinois Tollway's Maintenance facility stipulated in the Special Provisions." The following is a list of those references and the assigned location the material is to be delivered for this Contract, as applicable.

Item	**Location**
Aluminum Pipe Handrail	NA
Guardrail, terminal end sections	M-14
Energy Attenuators	M-14
Removed structural steel breakaway posts	NA
Removed right-of-way fence	NA
Temporary fence	NA

Luminaires, ballasts, aluminum pole fitters, aluminum mast arms, and aluminum poles	M-6 Maintenance Yard (I-90 at U.S. Route 20 (M.P. 36.8)
Outdoor roadway lighting control consoles	M-6 Maintenance Yard (I-90) at U.S. Route 20 (M.P. 36.8))

S.P. 115 ILLINOIS TOLLWAY OPERATIONAL FACILITIES (PROCEDURES, PROTECTION, AND LIQUIDATED DAMAGES)

Illinois Tollway operational facilities include but are not limited to roadways, bridges, overhead sign structures, cantilever sign structures, overhead pedestrian walkways, plaza canopies, buildings, Electronic Toll Collection (ETC) monotubes and frame structures, fiber optic cable, multi-mode cable, Digital Message Signs (DMS), cameras, Vehicle Detection Sensors, telecommunication cable, electrical (overhead and underground), water and sewer. Illinois Tollway Operational Facilities are installed along and across the rights-of-way of the Illinois Tollway system.

S.P. 115.1 Facilities Locate Process

The Contractor or Sub-Contractor performing the work shall have all known Illinois Tollway facilities located at all times in the general area of the facility. The location of the Illinois Tollway's fiber optic cable, as well as other Illinois Tollway facilities, is not available through the J.U.L.I.E. system. The contractor shall coordinate with the Illinois Tollway to determine the location of these facilities.

The Contractor shall initiate the locate process for the Illinois Tollway facilities by completing an online Locate Request Form A-36. To submit an Illinois Tollway Locate, log onto www.illinoisvirtualtollway.com/utilitylocates. The completed A-36 form, valid for 28 days, shall be transmitted, at least two (2) business days prior to starting any underground operations, excavations or digging of any type in the general area of the Illinois Tollway facility. If outside factors (weather, construction activity or vandalism) at the dig site have caused the markings to become disturbed and/or indistinguishable, a request for remarks/refresh is required. The request shall be electronically transmitted, at least two (2) business days prior to starting any underground operation. After remarking, the locate request is valid for another 28 days. A copy of all completed A-36 forms sent to the Illinois Tollway shall be provided to the contract Engineer.

For assistance in completing a locate request, please refer to:

- Click for Contractor Manual or Click for Video Tutorial for instructions
    - First time users **MUST** click this button: Click to Create Account
        - follow instructions and complete
- Click Submit Request:

- Fill-in all required fields*
- All sketches **MUST** be in .pdf and all lower case
- **MUST** have the full eight digit project number or the complete permit number

Any questions or problems please direct to:

Illinois Tollway Utility / Permit Section
Michael Scaramella - Utility Intergovernmental Agreement
Phone: 630.241.6800 Extension: 4129 Fax: 630.271.7568
Email: mscaramella@getipass.com

S.P. 115.2 Contractors Responsibilities

The Contractor shall take reasonable action to determine the location of any underground utility facilities in and near the area for which such excavation operation is to be conducted; and shall plan the excavation or demolition to avoid or minimize interference with underground utility facilities within the tolerance zone by utilizing such precautions that include, but are not limited to, hand excavation, vacuum excavation methods, and visually inspecting the excavation while in progress until clear of the existing marked facility; This work is covered under the Special Provision, EXPLORATION TRENCH – UTILITIES.

During and following excavation and/or demolition, the Contractor shall protect existing underground utility facilities in and near the excavation or demolition area as required to avoid damage to the facility.

The Contractor shall backfill all excavations in such manner and with such materials as may be reasonably necessary for the protection of existing underground utility facilities in and near the excavation or demolition area.

In addition to establishing the approximate location of the facility, the Contractor shall be required to fully expose the facility to verify its horizontal and vertical location, if underground operations are contemplated within the Tolerance Zone, which is defined to mean the approximate location of underground utility facilities defined as a strip of land at least 3 feet wide, but not wider than the width of the underground facility plus 2.0 feet on either side of the outside edge of such facility based upon the markings made by the Illinois Tollway or operator of the facility. Excavation within the tolerance zone requires extra care and precaution.

S.P. 115.3 Illinois Tollway's Fiber Optic System

The Illinois Tollway's fiber optic system is a Utility Facility providing service to the Illinois Tollway and other telecommunication companies. The Contractor is responsible for coordinating and scheduling its work with all necessary work on the fiber optic system, so as not to interfere with any fiber optic system adjustment or relocation work to be done by or on behalf of the Illinois Tollway.

The Contractor is responsible for coordinating and scheduling its work in a manner that such work to be done by or on behalf of the Illinois Tollway will not cause interference with the Contractor's completion of The Work by the Completion Date. All aspects of the Contractor's responsibilities as they relate to the Illinois Tollway facilities are specified in Article 105.07 of the Illinois Tollway Supplemental Specifications.

The Contractor shall immediately notify the Illinois Tollway Project Manager, Illinois Tollway Fiber Optic Manager and Utility Administrator in the event the fiber optic cable is damaged or in danger of being damaged. The Contractor shall be responsible for all costs incurred in connection with the repair, restoration, and testing of the system to insure it is operational and in the same condition as prior to the Contractor-caused damage.

In addition, for the interruption in service and the administrative burden, The Contractor shall pay to the Illinois Tollway the amount of $10,000.00 for each occurrence of Contractor-caused damage to the fiber optic cable. The Illinois Tollway reserves the right to identify each strand of fiber individually as Contractor-caused damage.

S.P. 115.4 Illinois Tollway's Miscellaneous Utility Facilities

Should damage occur to any other Illinois Tollway utility within the contract limits, the Contractor shall immediately notify the Illinois Tollway Project Manager. The Contractor shall repair and be responsible for all costs incurred in connection with the repair, restoration, and testing to insure it is operational and in the same condition as prior to the Contractor-caused damage in accordance with Article 107.30 of the Illinois Tollway Supplemental Specifications.

In addition, for the interruption in service and the administrative burden, The Contractor shall pay to the Illinois Tollway the amount of $1,000.00 for each occurrence of Contractor-caused damage to any other Illinois Tollway facility not including the fiber optic cable.

S.P. 115.5 Illinois Tollway's Operational Facilities

The Contractor is responsible for coordinating and scheduling its work so as not to interfere with the operation or function of Illinois Tollway Facilities.

The Contractor shall immediately notify the Illinois Tollway Project Manager, Illinois Tollway Fiber Optic Manager and Utility Administrator in the event of any damages to these Operational Facilities within the Illinois Tollway Right-of-Way.

The Contractor shall be responsible for all costs incurred in connection with the repair, restoration, replacement and testing of the system to insure it is operational and in the same condition as prior to the Contractor-caused damage. The Contractor shall also be charged liquidated damages.

Actual damages are difficult or impossible to define with certainty prior to an actual event, therefore, liquidated damages shall be assessed for each direction of traffic impacted based on the below schedule:

(6 AM to 10 PM)

Jane Addams Memorial (I-90)	West of MP 53.75	$4,000/hr
Jane Addams Memorial (I-90)	East of MP 53.75	$9,000/hr
Reagan Memorial (I-88)	West of MP 117.8	$4,000/hr
Reagan Memorial (I-88)	East of MP 117.8	$9,000/hr
Tri-State (I-94/I-294)		$10,000/hr
Veterans Memorial (I-355)		$5,000/hr
Elgin O'Hare (IL-390)		$2,000/hr

(10 PM to 6 AM)

All roadways	$2,000/hr

For extraordinary events, in addition to the liquidated damages the Contractor may be responsible for itemized costs associated with Emergency Responders and the Illinois Tollway's loss of collected revenue for the duration of the affected period as calculated by recent revenues, which are indicative of the period in which the event occurred.

S.P. 116 APPROVING A PART or PORTION OF THE WORK FOR BENEFICIAL USE

NOT USED

S.P. 117 RESERVED

S.P. 118 RIGHT-OF-WAY

NOT USED

S.P. 119 AVAILABLE GEOTECHNICAL INFORMATION

The following is a listing of the geotechnical reports prepared by Wang Engineering that are available for review at the office of the Illinois Tollway.

- Wang Engineering - Pavement Coring Investigation for Tollway Contract R-16-4277; Geotechnical Data Report, Wang Job No. 493-02-01 Pavement and Structural Rehabilitation, Tri-State Tollway (I-94) from Half Day Rd. to Lake Cook Rd. (MILE POST 21.86 to MILE POST 26.25)

S.P. 120 AVAILABLE REPORTS

NOT USED

S.P. 121 ELECTRONIC DATA FILES AVAILABLE

NOT USED

S.P. 122 COMMITMENTS

NOT USED

S.P. 123 RESERVED

S.P. 124 RESERVED

S.P. 125 RESERVED

S.P. 126 QUALIFICATIONS AND CERTIFICATIONS

NOT USED

ASPHALT PAVEMENT SURFACE REMOVAL (Illinois Tollway)

Effective: September 21, 2011
Revised: April 1, 2016

Description. This work shall consist of removal of the existing asphalt pavement surface for subsequent resurfacing with asphalt mixtures in accordance with Section 440 of the Standard Specifications except as modified herein.

Revise the Article 440.04 of the Standard Specifications to read:

"Asphalt Surface Removal for Subsequent Resurfacing. The existing asphalt pavement surface shall be removed to the depth specified on the plans with a self-propelled milling machine. The machine shall be equipped with a means to control dust and other particulate matter created by the cutting action. The temperature at which the work is performed, the nature and condition of the equipment, and the manner of performing the work shall be such that the milled surface is not torn, gouged, shoved or otherwise damaged by the milling operation. Sufficient cutting passes shall be made so that all irregularities or high spots are eliminated to the satisfaction of the Engineer. The removal shall provide a milled surface that has uniform texture and a smooth riding surface for traffic. When tested with a 16 ft. (5 m) straightedge, the milled surface shall have no surface variations in excess of 3/16 in. (5 mm). The 16 ft. (5 m) straightedge shall be supplied by the Contractor.

No transverse vertical edges will be allowed. Transverse milled surface tie-ins to existing pavement shall be tapered to not less than a 50:1 slope. Transverse tapered joints may be tapered with the milling machine, a temporary asphalt wedge, or other methods approved by the Engineer. No longitudinal joint between the milled and existing surfaces shall fall between 1 to 5 feet of any lane line.

If the transverse joint is tapered with a temporary asphalt wedge, the milled surface at the joint shall be constructed as a butt joint the full depth of the lift of asphalt to be placed on the milled surface. The Contractor shall be responsible for maintaining this asphalt wedge until all corresponding asphalt mixture is placed. All work associated with this joint will not be paid for separately, but shall be included in the cost of milling.

If the transverse joint is tapered with a milling machine, a butt joint shall be cut into the taper the full depth of the lift of asphalt to be placed on the milled surface prior to commencement of resurfacing. All work associated with this joint will not be paid for separately, but shall be included in the cost of milling.

All debris and milled material, including that removed by other means, shall be immediately removed from the milled surfaces and adjacent surfaces. Surfaces shall be cleaned of all fines and dust prior to opening to traffic and to the satisfaction of the Engineer. Vacuum trucks, street sweepers or pick-up brooms shall be used to clean the milled surfaces. The Contractor shall conduct operations in such a manner that dust is controlled and is not objectionable.

When working adjacent to traffic, the Contractor shall immediately remove material that is spilled on the traveled way.

Removing the existing asphalt pavement surface to the required depth adjacent to structures in the pavement surface such as drain castings and utility covers shall be accomplished in a manner satisfactory to the Engineer using either machine or hand methods. Castings for existing utility or drainage structures within the pavement which are exposed to traffic after the pavement has been milled shall be protected according to Article 603.07 of the Standard Specifications.

The roadway shall be left in a safe and usable condition at the end of each work day. Property damage due to the asphalt surface removal activities is the responsibility of the Contractor, as indicated in Article 107.38 of the Tollway Supplemental Specifications.

Milled pavement shall be resurfaced within four calendar days."

Add the following to Article 1101.16 of the Standard Specifications:

"Operation of a milling machine with broken or missing teeth will not be allowed. Worn teeth shall be replaced if the milling machine does not produce a uniform surface. The milling machine shall be capable of picking up the removed asphalt in a single operation. A self-loading conveyer shall be an integral part of the milling machine"

CLEANING OF CATCH BASINS, END SECTIONS, INLETS AND DRAINAGE STRUCTURES

Description. This work shall consist of cleaning existing catch basins, manholes, restrictor manholes, inlets, end sections and drainage structures (some drainage structure may have multiple chambers) which have accumulated silt, debris and vegetation over time, at locations shown in the plans, and as directed by the Engineer.

Equipment. Cleaning of catch basins, manholes, restrictor manholes, inlets, end sections and drainage structures shall be performed by truck-mounted vacuum method, or other methods as approved by the Engineer.

CONSTRUCTION REQUIREMENTS

After the work is completed, the entire catch basins, manholes, inlets, end sections and drainage structures shall be free and clear of all silt, debris, and vegetation. Any damage to the existing items due to the Contractor's operations shall be removed and replaced at no additional expense to the Illinois Tollway.

Disposal shall be offsite and shall be in accordance with Article 107.19 of the Illinois Tollway Supplemental Specifications.

Prior to cleaning of catch basins, manholes, restrictor manholes, inlets, end sections and drainage structures, it may be necessary to remove the existing steel grating. The existing steel grating which is suitable for use under proposed conditions and are not scheduled for removal and replacement shall be handled with care. Any damage to the steel grating to be reused, or to the drainage structure, due to the Contractors operations, shall be repaired or replaced at no additional expense to the Illinois Tollway.

The Contractor shall implement “Best Management Practices” (BMP’s) for the control of sediment that will be removed during the cleaning operation. Flushing of the material downstream is not authorized and discharges of any materials into wetlands or WOUS is prohibited unless noted in the plans, approved by USACE Permit and/or approved by the Engineer.

Where an End Section and associated pipe requiring cleaning and televising is completely or partially submerged, temporary damming and dewatering may be required. Contractor shall submit damming/dewatering plan to Engineer for approval prior to beginning work. The Contractor shall control the runoff water generated by the cleaning activity in such a manner as to prohibit the discharge of visible debris and sediment into wetlands and WOUS, and without causing erosion. Dewatering operations shall be contained within the existing structures, and shall not extend into any wetland or WOUS.

Precautions shall be taken to ensure that the operations do not cause any damage or flooding to public or private property. The Contractor shall perform the work so there is adequate drainage of the roadway at all times.

Method of Measurement. This work will be measured for payment in units of each for CATCH BASINS TO BE CLEANED, CLEAN EXISTING END SECTION, CLEANING EXISTING MANHOLE OR HANDHOLE, CLEANING EXISTING INLETS and for DRAINAGE STRUCTURES TO BE CLEANED.

Basis of Payment. This work will be paid at the contract unit price per each for CATCH BASINS TO BE CLEANED, per each for CLEAN EXISTING END SECTION, per each for CLEANING EXISTING MANHOLE OR HANDHOLE, per each for CLEANING EXISTING INLETS and per each for DRAINAGE STRUCTURES TO BE CLEANED.

Pay Item Number	Designation	Unit of Measure
60255410	CATCH BASINS TO BE CLEANED	EACH
X0325893	CLEAN EXISTING END SECTION	EACH
Z0010614	CLEANING EXISTING MANHOLE OR HANDHOLE	EACH
Z0010615	CLEANING EXISTING INLETS	EACH
Z0018500	DRAINAGE STRUCTURES TO BE CLEANED	EACH

DETECTOR LOOP REPLACEMENT

Description. This work shall consist of replacing the existing loop detectors located within the mill and overlay areas at the ramp approaches to Deerfield Rd. The Contractor shall coordinate this work with Lake County. The loop detectors shall be constructed in accordance with Section 886 of the Standard Specifications and applicable IDOT and Lake County Standard Details.

This work shall include all labor, equipment and materials necessary to re-establish the loop detectors including but not limited constructing new loop detectors of the type specified and approved by the County, adjusting loop detector risers, splicing, saw cuts, sealing and testing of the detector loop. The detector loops are to be fully functioning and accepted by the County.

Method of Measurement. This work shall be measured for payment in accordance with Art. 886.05.

Basis of Payment. This work will be paid for at the contract unit price per foot for DETECTOR LOOP REPLACEMENT regardless of the type specified.

Pay Item Number	Designation	Unit of Measure
89502300	DETECTOR LOOP REPLACEMENT	FOOT

REVETMENT MAT REMOVAL

Description. This work shall include the removal of existing concrete revetment mat at the locations indicated on the plans. The Engineer shall approve the removal limits of the existing concrete revetment mat based on field conditions at the time of construction. Any uneven or broken edges or undermined areas shall be removed. Any portion of revetment mat to be removed adjacent to existing revetment mat to remain in place shall be full depth saw cut which shall be included in the cost of REVETMENT MAT REMOVAL. This work shall be in accordance with Section 440 of the Standard Specifications.

Method of Measurement. This work shall 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 yards for REVETMENT MAT REMOVAL which shall include all labor and equipment necessary to remove the existing concrete revetment mat as indicated in the plans and approved by the Engineer.

Pay Item Number	Designation	Unit of Measure
X0322584	REVETMENT MAT REMOVAL	SQ YD

CLEANING AND PAINTING EXPOSED REBAR

Description
This work shall consist of cleaning and painting all exposed reinforcement bar at locations indicated on the plans; furnishing application and protection of the paint coatings and all other work described herein.

General Requirements
All exposed rebar and adjacent concrete surfaces on the substructure and superstructure shall be cleaned and painted. All surfaces to be painted shall be power washed at 2500 psi prior to abrasive blasting. After washing, the exposed rebar shall be abrasive blasted per SSPC-SP6 Commercial Blast Cleaning followed by the Aluminum Epoxy Mastic Paint System.

Weather Conditions
The surfaces to be painted after cleaning must remain free of moisture and other contaminants. The Contractor shall control their operations to insure that dust, dirt or moisture do not come in contact with surfaces cleaned or painted that day.

In addition to the paint system manufacturer's written instructions for cleaning and painting, the following conditions shall apply. (When in conflict, the most restrictive conditions shall govern).

1) Cleaning and painting shall be done between April 15 and November 15.
2) The minimum temperature of the air and steel shall be 50 °F unless otherwise specified. Coatings shall not be applied to surfaces hotter than 130 °F or when the air temperature exceeds 100 °F.
3) The surface temperature shall be at least 5 °F above the dew point of the air surrounding the surface. In addition, the relative humidity of this air shall be less than 85%.
4) Spray painting will not be permitted when wind velocities are greater than 15 MPH.

These conditions will be determined by the Engineer at locations representative of the surfaces to be cleaned and painted. Work accomplished under unfavorable weather conditions will be considered unacceptable and complete re-cleaning and repainting of these areas will be required at no additional cost to the Illinois Tollway.

Equipment
All cleaning and painting equipment shall include gauges capable of accurately measuring fluid and air pressures and shall have valves capable of regulating the flow of air, water or paint as recommended by the equipment manufacturer. The equipment shall be maintained in proper working order.

Spray painting and cleaning equipment shall utilize filters, traps or separators recommended by the manufacturer of the equipment and shall be kept clean to prevent oil, water, dried paint and other foreign materials from being deposited on the surface. The filters, traps and separators shall be cleaned or drained by means, and at intervals, recommended by the manufacturer of the equipment. Paint pots shall be equipped with air operated continuous mixing devices.
Pressure type abrasive air blasting equipment shall be capable of supplying a minimum of 100-psi pressure and 250 CFM capacity with all air blast nozzles being used. If blast nozzle orifice sizes larger than 3/8” are being used, the minimum capacity of the equipment shall be increased according to the recommendations of SSPC Good Painting Practice, Volume 1, Chapter 2.4,

Table 1. The pressure will be measured at the blast nozzle. The equipment shall be capable of providing the minimum required pressure and volume, free of oil, water and other contaminants. Diesel or gasoline powered equipment shall be positioned or vented in a manner to prevent deposition of combustion contaminants on any part of the structure.
Prior to beginning all painting operations, air equipment shall pass the requirements of ASTM D 4285. This test will be repeated as determined by the Engineer.

Cleaning
The Contractor shall notify the Engineer 24 hours in advance of beginning surface preparation operations. Power washing shall be completed as the initial surface preparation. As directed by the Engineer, washing shall be completed on surfaces to receive second or third coats when foreign matter has accumulated on previously painted surfaces.

Power washing shall be accomplished by using potable water meeting the requirements of Section 702 of the Standard Specifications with a flow rate of at least 4 gallons/minute, a nozzle fan angle between 15 and 30 degrees and a minimum pressure of 2500 psi.

Surface Preparation
The surface preparation Method is defined as outlined below:

The surface preparation shall be accomplished according to the requirements of SSPC Surface Preparation Specifications SP6, for Commercial Blast Cleaning. A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining.
Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Slight residues of rust and paint may also be left in the bottoms of pits if the original surface is pitted. Unless otherwise specified, the surface preparation in these areas shall result in 1.0 to 3.5-mil blast profile as determined by the Engineer. The Contractor shall be careful not to damage sound paint adjacent to paint removal areas by his/her abrasive blasting operations.
Abrasive suppliers shall certify that abrasives shall not be oil contaminated and shall have a water extract pH value within the range of 6 to 8. All surfaces prepared with abrasives, which are oil contaminated or have a pH outside the specified range shall be cleaned with solvent cleaner or low pressure water as directed by the Engineer and reblasted by the Contractor at no additional cost to the Illinois Tollway. Silica sand shall not be used as an abrasive.
All portions of the structure, which could be damaged by the blast cleaning operations, shall be protected by covering or shielding. Tarpaulins, drop cloths, or other approved materials shall be employed. The Contractor shall be responsible for any damage caused to persons, vehicles, or property. Whenever the intended purposes of the protective devices are not being accomplished, as determined by the Engineer, work shall be immediately suspended until corrections are made.

Painting
All exposed rebar and surrounding concrete surfaces adjacent to the rebar shall be painted. The limits of the area to be painted shall be 3 inches beyond the exposed reinforcement in all directions. Painting shall be accomplished according to these specifications and as specified in the paint manufacturer's written instructions and product data sheets for the paint system used. The prime and finish coat shall all be supplied by the same paint manufacturer.

All ingredients in any container of paint shall be thoroughly mixed by mechanical power mixers in original containers before use or mixing with other containers of paint. The paint shall be power mixed in a manner, which will break up all lumps, completely disperse pigment and result in a uniform composition. Paint shall be carefully examined after mixing for uniformity and to verify that no unmixed pigment remains on the bottom of the container. Excessive skinning or partial hardening due to improper or prolonged storage will be cause for rejection of the paint, even though it may have been previously inspected and accepted. Paint shall not remain in spray pots, painters' buckets, etc. overnight. Paint components shall not be stored at temperatures below 40 °F. The unit weight shall be the same as the manufactured unit weight in pounds per gallon, plus or minus 1.0 percent. If the unit weight does not fall within this range, the Contractor must take corrective action.
The Contractor may try additional mixing to correct the problem. If additional mixing cannot correct the paint, it shall be rejected. Any paint that has been applied that does not meet the weight per gallon requirements shall be removed and the area shall be inspected and repainted at no additional cost to the Illinois Tollway.
Each coat of paint shall be applied as a continuous film of uniform thickness free of pores. Each coat of paint shall be in a proper state of cure before the application of the succeeding coat. Dry film thickness shall be measured according to SSPC PA2.

Aluminum Epoxy Mastic System
All exposed rebar and surrounding concrete surfaces shall be painted with two coats of Aluminum Epoxy Mastic Paint. The dry film thickness shall be between 5.0 and 10.0 mils per coat. The wet film thickness shall be between 6.0 and 12.0 mils per coat. The total dry film thickness of the two coats shall be between 10.0 and 20.0 mils.

Application
The aluminum epoxy mastic coating shall not be applied when the surface temperature is below 50 °F and shall not be applied when the ambient temperature is expected to drop below the manufacturer's minimum application temperature before the coating has cured. The paint manufacturer shall provide curing times at various temperatures.

The aluminum epoxy mastic shall be applied by spray, brush or roller according to the paint manufacturer's printed instructions. Thinning of the aluminum epoxy mastic shall be according to the manufacturer's instructions. If brushes and/or rollers are used, two applications, applied at least 8 hours apart, may be required to obtain the required dry film thickness for each of the specified coats. The first application shall be tinted according to the manufacturer's guidance to produce a distinct contrast with the second application. When topcoat is applied, the recommendations of the coating manufacturer shall be followed as to surface preparation of the aluminum epoxy mastic. When the humidity exceeds 75% during the application of the epoxy mastic, the surface shall be washed off with potable water prior to application of the topcoat.
If a paint coating is too thin or if portions of the steel are not coated completely, such portions of the work shall be corrected as directed by the Engineer. If the paint coat wrinkles or shows evidence of having been applied under unfavorable conditions, or if the workmanship is poor, the Engineer may order it removed and the steel cleaned and repainted at no additional cost to the Illinois Tollway. The Contractor using approved methods, at no additional cost to the Illinois Tollway, shall correct all areas where the paint film exceeds the maximum thickness.

Aluminum Epoxy Mastic Material Requirements
The aluminum epoxy mastic paint system shall be a two-component epoxy containing aluminum pigment. The aluminum epoxy mastic shall be designed as a one-coat high-build complete

protective coating system with excellent adhesion to rusted steel, inorganic zinc and old paint after such surfaces have been properly cleaned. The aluminum epoxy mastic shall be compatible with a wide range of topcoats including waterborne acrylics, alkyds, and polyurethanes.

The material for aluminum epoxy mastic primer shall conform to the following requirements:

1) Pigment - The primary pigment shall be either a leafing or non-leafing aluminum pigment. Secondary pigmentation shall contain no toxic heavy metals.

2) Vehicle - The vehicle shall be a modified epoxy and curing agent, which is suitably insensitive to moisture to allow trouble free application.

3) Packaged Components - The epoxy coating shall be supplied as a two-component material at a one-to-one volume mix ratio. It shall be well ground, free of caking, skins, gelation and excessive settling. The shelf life of each component shall be no less than twelve months.

4) Properties of Aluminum Epoxy Mastic
   a) The mixed epoxy shall contain a minimum of 89 percent solids by weight, when tested according to ASTM D 1644, Method A, except that the sample shall be heated for 72 hours at 100 ° ± 2 °F.
   b) The weight per gallon (mass/liter) of the unmixed components shall not vary more than 0.2 pounds from the weight (mass) of the original qualification samples.
   c) The viscosity of the coating shall be a minimum of 90 KU at 77 ° ± 2 °F. Viscosity must be checked immediately after addition and mixing of components.
   d) The pot life of the epoxy coating shall be no shorter than 2 hours at 75 °F or one hour at 90 °F.
   e) The epoxy coating shall air cure at a temperature of 75 °F or above to a hard tough film within 5 days by evaporation of solvent and chemical reaction. It shall be dry to the touch in 24 hours at 75 °F, and be able to withstand foot traffic in 48 hours at 75 °F.
   f) The mixture, when thinned per manufacturer's recommendations, shall exhibit no runs or sags when applied by conventional or airless spray to produce dry film thicknesses in the 5 to 10 mil range.

5) Resistance Tests of Cured Aluminum Epoxy Mastic - Test panels of steel meeting the requirements of ASTM D 609, having dimensions of 2 X 5 X 1/8 inch, shall be prepared by abrasive blasting all surfaces to a white metal finish according to SSPC-SP5. The cleaned panels shall then be exposed to outdoor weather for 30 days or until uniform rusting occurs. They shall then be hand cleaned with a wire brush according to SSPC-SP2. A 6 mil dry coating of the epoxy mastic shall then be applied in one coat according to the manufacturer's current printed instructions. The coating shall be cured as recommended by the manufacturer. Each of the following tests shall be performed on one or more test panels. Test panels to be scribed shall be prepared according to the requirements in ASTM D 1654. The material will not be accepted if any individual test panel fails any of the following tests:

a) ASDF Fresh Water Resistance. Panels shall be scribed down to base metal with an X of at least 2-inch legs and shall be immersed in fresh tap water at 75 ° ± 5 °F. The panels shall show no rusting, blistering, or softening beyond 1/16 inch from the scribe mark, when examined after 30 days. Discoloration of the coating will be allowed.
b) ASDF Salt Water Resistance. Panels shall be scribed down to base metal with an X of at least 2-inch legs and immersed in 5 percent sodium chloride at 75 ° ± 5 °F. The panels shall show no rusting, blistering or softening beyond 1/16 inch from the scribe mark upon examination after 7, 14 and 30 days. Discoloration of the coating will be allowed. The sodium chloride solution shall be replaced with fresh solution after each examination.
c) ASDF Salt Fog Resistance. Panels shall be scribed down to base metal with an X of at least 2-inch legs. The panels shall then be tested according to ASTM B 117. After 1,000 hours of continuous exposure, the coating shall show no loss of bond, nor shall it show rusting or blistering beyond 1/16 inch from the center of the scribed mark.
d) ASDF Weathering Resistance. Panels shall be tested in accelerated weathering using either the light and water exposure apparatus (fluorescent UV-condensation type) as specified in ASTM G154 for 1000 hours with a cycle consisting of eight hours UV exposure at 140 °F followed by four hours of condensation at 104 °F or the weather meter according to ASTM G154, Type D for 1000 hours beginning the test at the start of the wet cycle. After this period, the panels shall show no loss of bond, nor shall it show rusting, softening or blistering.

6) Packaging and Labeling - The aluminum epoxy mastic coating shall be packaged in two containers. The components shall be prepackaged such that mixing in a one-to-one ratio, by volume, utilizes a complete container of each component. Each container shall have a label on which shall be clearly shown the manufacturer and brand name of paint, the lot number, the date of manufacturer and shelf life. The label on the vehicle container shall also include complete instructions for the use of this paint. The container shall be coated, if necessary, to prevent attack by the paint components.

7) Qualification Samples and Tests – The manufacturer shall supply to an independent test laboratory, and to the Illinois Tollway, duplicate samples of the aluminum epoxy mastic paint for evaluation. Prior to approval and use, the manufacturer shall submit a notarized certification of the independent laboratory, together with the results of all tests, stating that the materials meet the requirements as set forth herein. The certified test report shall state lot tested, manufacturers name, product name, and date of manufacture. New certified test results shall be submitted any time the manufacturing process or paint formulation changes. All costs of testing shall be borne by the manufacturer.

8) Acceptance Certification samples of each lot of paint produced for use on state or local agency projects shall be submitted to the Engineer for acceptance, together with a manufacturers' certification. Their certification shall state that the formulation for the lot represented is essentially identical to that used for qualification testing.

Method of Measurement:
This work will be measured in square feet, determined by the exposed reinforcement after the loose concrete has been removed. The limits of the area to be painted and measured for payment shall be 3 inches beyond the exposed reinforcement in all directions.

Basis of Payment:
This work will be paid for at the contract unit price per square foot for CLEANING AND PAINTING EXPOSED REBAR.

Pay Item Number	Designation	Unit of Measure
X0323818	CLEANING AND PAINTING EXPOSED REBAR	SQ FT

SLOTTED DRAINS TO BE ADJUSTED

Description. This work shall consist of the cleaning and surface preparation of the concrete slotted drain surface and the extension of the existing slotted drain to the grades indicated on the plans. This work shall be in accordance with the applicable requirements of Sections 501, 503 and 1020 of the Standard Specifications, Section 1203 of the Illinois Tollway Supplemental Specifications except as follows:

Remove only enough existing pavement to allow the tabs to inset into the pavement to align the grate slot extension directly over the existing slotted grate.

Cleaning. The existing concrete surface of the slotted drain shall be cleaned of dust and debris. Once the initial cleaning is completed, the areas shall be thoroughly blast cleaned to a roughened appearance free from all foreign matter. Particular attention shall be given to removal of concrete fines. Any method of cleaning which does not consistently produce satisfactory results shall be discontinued and replaced by an acceptable method. All debris, including water, resulting from the blast cleaning shall be confined and shall be immediately and thoroughly removed from all areas of accumulation. If concrete placement does not follow immediately after the final cleaning, the area shall be carefully protected with well-anchored polyethylene sheeting.

Install the grate slot extension before placing the concrete pavement. Center the extension above the existing slotted grate and align the cross bar spacers of the extension with the cross bar spacers of the existing slotted grate. Tack weld the tabs as indicated in the detail included in the plans. Cover the slot extension with a heavy-duty tape or other authorized covering during placement of pavement to prevent material from entering the slots. Reset the slot extension if it becomes dislodged or misaligned during paving operations.

Bonding Method. The patch area shall be cleaned to the satisfaction of the Engineer and shall be thoroughly wetted and maintained in a dampened condition with water for at least 12 hours before placement of the concrete. Any excess water shall be removed by compressed air or by vacuuming prior to the beginning of concrete placement. Water shall not be applied to the patch surface within one hour before or at any time during placement of the concrete.

Protective coat when required shall be constructed according to Article 420.18 of the Standard Specifications.

Method of Measurement. This work shall be measured along the centerline of the slotted pipe for payment in feet complete, in place and accepted.

Basis of Payment. Payment for SLOTTED DRAINS TO BE ADJUSTED will be made at the contract unit price per square yards, which shall constitute full compensation for all labor, equipment and materials required to complete the work as specified including but not limited to Class SI Concrete, plates, tabs, grating, saw cutting, pavement removal and disposal, shop drawings and all labor, equipment, tools and incidentals necessary to complete the work as specified.

Pay Item Number	Designation	Unit of Measure
X0324914	SLOTTED DRAINS TO BE ADJUSTED	FOOT

CURB REMOVAL (SPECIAL)

Description. This work shall consist of removing the existing curb portion of the monolithic concrete curb and shoulder as detailed in the plans and in accordance with Section 440 of the Standard Specifications.

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

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

Pay Item Number	Designation	Unit of Measure
X4402400	CURB REMOVAL (SPECIAL)	FOOT

GUTTER REMOVAL (SPECIAL)

Description. This work shall consist of the partial depth removal of the concrete gutter and shall be in accordance with Section 440 of the Standard Specifications.

The existing gutter shall be partially removed to a depth sufficient for the placement of the new gutter overlay as detailed in Illinois Tollway Standard B1.

Method of Measurement. GUTTER REMOVAL (SPECIAL) will be measured for payment in feet.

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

Pay Item Number	Designation	Unit of Measure
X4402720	GUTTER REMOVAL (SPECIAL)	FOOT

CONCRETE HEADWALL REMOVAL SPECIAL

Description. This work shall consist of the removal of existing concrete headwalls as designated in the plans.

CONSTRUCTION REQUIREMENTS

Materials that are to be salvaged under the contract and which the Engineer deems fit for reuse shall be carefully removed in transportable sections and stockpiled near the site at a location designated by the Engineer. If the material for reuse is unfit, through no fault of the Contractor, the material shall be disposed of according to Article 202.03 of the Standard Specifications. When the Contractor damages or destroys such material, the Contractor shall repair or replace the material in a manner satisfactory to the Engineer.

Existing concrete headwalls shall be removed fully as designated in the plans.

At locations designated by the Engineer, all earth and debris shall be removed from the invert of the portions of existing storm sewers and/or culverts which are to remain in service after the concrete headwall has been removed.

Method of Measurement. This work will be measured for payment in units of each at the location designated on the plans regardless of size, type or material.

Excavation of earth necessary to perform the removal of end treatments will not be measured for payment, but shall be included in the cost of the concrete headwall removal.

Basis of Payment. This work will be paid for at the contract unit price per each for CONCRETE HEADWALL REMOVAL.

When the Engineer directs that earth and debris be removed from existing storm sewers and/or culverts, such removal will not be measured for payment, but shall be included in the cost of the CONCRETE HEADWALL REMOVAL.

Pay Item Number	Designation	Unit of Measure
X5012650	CONCRETE HEADWALL REMOVAL SPECIAL	EACH

STORM SEWERS TO BE CLEANED

Description. This work shall consist of cleaning storm sewers necessary in order to televise the pipe due to accumulated silt, debris and vegetation over time, at locations directed by the Engineer.

Materials. Cleaning of all culverts and sewers shall be performed by water jet method, or other methods as approved by the Engineer.

CONSTRUCTION REQUIREMENTS

After the work is completed, the entire culverts and sewers shall be free and clear of all silt, debris, and vegetation. Any damage to the existing items due to the Contractor's operations shall be removed and replaced at no additional expense to the Illinois Tollway.

The Contractor shall implement “Best Management Practices” (BMP’s) for the control of sediment that will be removed during the cleaning operation. Flushing of the material downstream is not authorized and discharges of any materials into wetlands or WOUS is strictly prohibited.

Disposal shall be offsite and meet all applicable legal requirements.

Prior to cleaning of sewers, it may be necessary to remove the existing steel grating from catch basins and end sections. The existing steel grating which is suitable for use under proposed conditions and are not scheduled for removal and replacement shall be handled with care. Any damage to the steel grating to be reused, or to the end section, due to the Contractors operations, shall be repaired or replaced at no additional expense to the Illinois Tollway. Where a sewer requiring cleaning and televising is completely or partially submerged, temporary damming and dewatering may be required. Such damming and dewatering shall be included in this work. Contractor shall submit damming/dewatering plan to Engineer for approval prior to beginning work.

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

Basis of Payment. This work will be paid at the contract unit price per foot for STORM SEWERS TO BE CLEANED of the size specified.

Pay Item Number	Designation	Unit of Measure
X5537800	STORM SEWERS TO BE CLEANED 12"	FOOT
X5537900	STORM SEWERS TO BE CLEANED 15"	FOOT
X5538000	STORM SEWERS TO BE CLEANED 18"	FOOT
X5538100	STORM SEWERS TO BE CLEANED 21"	FOOT
X5538200	STORM SEWERS TO BE CLEANED 24"	FOOT
X5538300	STORM SEWERS TO BE CLEANED 27"	FOOT
X5538400	STORM SEWERS TO BE CLEANED 30"	FOOT
X5538600	STORM SEWERS TO BE CLEANED 36"	FOOT
X5538700	STORM SEWERS TO BE CLEANED 42"	FOOT
X5538800	STORM SEWERS TO BE CLEANED 48"	FOOT
JT553A24	STORM SEWERS TO BE CLEANED, EQUIVALENT ROUND-SIZE 24"	FOOT
JT553A30	STORM SEWERS TO BE CLEANED, EQUIVALENT ROUND-SIZE 30"	FOOT
JT553A36	STORM SEWERS TO BE CLEANED, EQUIVALENT ROUND-SIZE 36"	FOOT
JT553A42	STORM SEWERS TO BE CLEANED, EQUIVALENT ROUND-SIZE 42"	FOOT
JT553A48	STORM SEWERS TO BE CLEANED, EQUIVALENT ROUND-SIZE 48"	FOOT
JT553A54	STORM SEWERS TO BE CLEANED, EQUIVALENT ROUND-SIZE 54"	FOOT
JT553A60	STORM SEWERS TO BE CLEANED, EQUIVALENT ROUND-SIZE 60"	FOOT

CONCRETE CURB, TYPE B (SPECIAL)

Description. This work shall consist of constructing a concrete curb as detailed in the plans and in accordance with Section 606 of the Standard Specifications.

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

Basis of Payment. This work will be paid for at the contract unit price per foot for CONCRETE CURB, TYPE B (SPECIAL) which price shall include all labor, equipment and material necessary to construct the concrete curb.

Protective coat will be paid for at the contract unit price per square yard for PROTECTIVE COAT.

Pay Item Number	Designation	Unit of Measure
X6061005	CONCRETE CURB, TYPE B (SPECIAL)	FOOT

SLOPE REPAIR (SPECIAL)

Description. This work shall consist of repairing the foreslope of the ditch where slope failure or erosion has occurred at the locations shown on the plans and as directed by the Engineer. This work shall be in accordance with the Standard Specifications and plan details.

Foreslopes shall be regraded to conform to Tollway Standards and as shown in the plans. All regraded material shall be redistributed and regraded within the existing right of way.

Where Ditch Cleaning is called out adjacent to Slope Repair (Special), the pay limits of the Slope Repair (Special) shall be limited to between the Ditch Cleaning Limits and the edge of shoulder as detailed in the plans. Where no Ditch Cleaning is called out adjacent to Slope Repair (Special), the limits may extend to the ditch flowline.

The final limits of slope repair should be approved by the Engineer prior to beginning work.

TOPSOIL FURNISH AND PLACE, 4" shall be provided if the remaining topsoil within the repair area is less than 4”.

Method of Measurement. SLOPE REPAIR (SPECIAL) will be measured for payment in square yards.

Basis of Payment. This work will be paid for at the contract unit price per square yard for SLOPE REPAIR (SPECIAL).

Topsoil, seeding, erosion control blanket and fertilizer shall be paid for separately.

Pay Item Number	Designation	Unit of Measure
Z0065600	SLOPE REPAIR (SPECIAL)	SQ YD

SLOPE WALL REPAIR

Description. This work shall consist of filling holes in the existing slope wall as a result of the removal of guardrail posts.

CONSTRUCTION REQUIREMENTS

1. Surface Preparation: All loose, disintegrated and unsound concrete shall be removed from the area to be repaired as designated by the Engineer. The Contractor shall take care not to damage reinforcement bars or concrete that is to remain in place. The exposed concrete shall be thoroughly cleaned.

2. Holes shall be filled and the surface leveled with the adjacent concrete surface. Portland Cement Concrete shall be used to fill the holes in accordance with Section 1020 of the Standard Specifications

Method of Measurement. This work will be measured in place, and the area computed in square yards. The area of measurement will include the upper surface of the finished concrete.

Basis of Payment. SLOPE WALL REPAIR will be paid for at the contract unit price per square yard which shall include all labor, equipment and material necessary to complete this work.

Pay Item Number	Designation	Unit of Measure
Z0065700	SLOPE WALL REPAIR	SQ YD

TEMPORARY TRAFFIC SIGNAL TIMING

Description. This work shall consist of developing and maintaining appropriate traffic signal timings for the specified intersection for the duration of the temporary signalized condition, as well as impact to existing traffic signal timings caused by detours or other temporary conditions.

All timings and adjustments necessary for this work shall be performed by an approved Consultant who has previous experience in optimizing Closed Loop Traffic signal Systems for Cook County. The Contractor shall contact the Traffic Signal Engineer at (312) 603-1730 for a listing of approved Consultants.

The following tasks are associated with TEMPORARY TRAFFIC SIGNAL TIMINGS.

(a) Consultant shall attend temporary traffic signal inspection (turn-on) and/or detour meeting, if needed and conduct on-site implementation of the traffic signal timings.

(b) Make fine-turning adjustments to the timings in the field to alleviate observed adverse operating conditions and to enhance operations.

(c) Consultant shall provide monthly observation of traffic signal operations in the field.

(d) Consultant shall provide on-site consultation and adjust timings as necessary for construction stage changes, temporary traffic signal phase changes, and any other conditions affecting timing and phasing, including lane closures, detours, and other construction activities.

(e) Consultant shall make timing adjustments and prepare comment responses as directed by the Traffic Signal Engineer.

(f) Return original timing plan once construction is complete.

Basis of Payment. The work shall be paid for at the contract unit price EACH for TEMPORARY TRAFFIC SIGNAL TIMING, which price shall be payment in full for performing all work described herein per intersection. When the temporary traffic signal installation is turned on and/or detour implemented, 50 percent of the bid price will be paid. The remaining 50 percent of the bid price will be paid following the removal of the temporary traffic signal installation and/or detour.

Pay Item Number	Designation	Unit of Measure
Z0073510	TEMPORARY TRAFFIC SIGNAL TIMING	EACH

EXPLORATION TRENCH, UTILITIES (Illinois Tollway)

Effective: January 1, 2007
Revised: April 1, 2016

Description. This work shall consist of locating and excavating, by methods of hand excavation or vacuum excavation approved by the Engineer, to verify the horizontal and vertical location of existing regulated (e.g., electric, natural gas, telephone) unregulated (e.g., water, sewer, oil) and Illinois Tollway-owned (e.g., roadway lighting, fiber optic cables) utilities within the Contract Limits shown on the Plans and/or as directed by the Engineer.

Materials. The Materials used for Porous Granular Embankment and backfill shall consist of coarse aggregate meeting the gradation of CA-18 in accordance with Article 1004.05 of the Standard Specifications.

GENERAL REQUIREMENTS

In non-emergency conditions and unless specified elsewhere, the Contractor shall contact the owner of the utility at least seventy-two (72) hours prior to exploratory digging, to provide the anticipated location and to be available during exploration activities. The depth and width of the exploration shall be sufficient to allow positive identification of the type, size and depth of the utility(s). The number of exploration trenches for utilities running along the Illinois Tollway shall be as directed by the Engineer.

When an existing utility is encountered, the Contractor shall verify the type of facility, obtain the horizontal and vertical (to the top of conduit or pipe) data, and transmit a copy of this data to the Engineer. Located utilities shall be marked with lath, flags or any other suitable method which will provide positive identification throughout construction.

Any costs resulting from damage incurred to any utility (including interruption of service provided) shall be the sole responsibility of the Contractor, per Article 105.07 of the Illinois Tollway Supplemental Specifications. Costs relating to damaging the Illinois Tollway facilities on Illinois Tollway right-of-way are as specified in S.P. 115.

After positive location, the Engineer will direct the Contractor as follows:

- Backfill and/or restore the excavated area.

- Leave the excavated area open and protected. The excavated material shall either be stockpiled in an acceptable location and provided with suitable erosion control measures, or disposed of off-site in accordance with Article 202.03 of the Standard Specifications.

Method of Measurement. Exploration trench, utilities (hand excavation) will be measured for payment in feet based on the actual horizontal length along the utility line. Exploration trench, utilities (vacuum excavation) will be measured for payment in feet based on the actual vertical length from the ground down to the top of the utility.

Basis of Payment. This work will be paid for at the contract unit price per foot for EXPLORATION TRENCH, UTILITIES (HAND EXCAVATION) or EXPLORATION TRENCH, UTILITIES (VACUUM EXCAVATION).

Pay Item Number	Designation	Unit of Measure
JI213004	EXPLORATION TRENCH, UTILITIES (HAND EXCAVATION)	FOOT

ASPHALT BINDER AND SURFACE COURSE MIXTURES (Illinois Tollway)

Effective: December 13, 2011
Revised: February 15, 2018

Description. This work shall consist of constructing either hot-mix asphalt (HMA) or warm mix asphalt (WMA) binder and/or surface course on a prepared base as required by contract design. When WMA pay items are required by design, an HMA mix 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 Illinois Tollway. When HMA pay items 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 Illinois Tollway. Work shall be according to Sections 406, 407, 1030 and 1032 of the Standard Specifications except as modified herein.

Materials. Article 406.02 of the Standard Specifications shall govern the requirements for materials except as modified herein and in the Illinois Tollway's special provision ASPHALT-TACK COAT.

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

"(c) RAP Material…… Illinois Tollway special provision for Reclaimed Asphalt Pavement"

Replace Article 1030.02(i) of the Standard Specifications with the following:

"(i) Warm Mix Additives / Processes. When a WMA is specified or permitted, the warm mix technology used shall be a recognized additive / process with successful project(s) constructed nationally or internationally that allow for a reduction in the temperature at which the HMA is produced and placed. Warm mix additives/processes that may be considered for Illinois Tollway approval and Contractor use include the following:

(1) Organic Additives (requiring minor plant modifications)

(2) Chemical Additives (requiring minor plant modifications)

(3) Water Injection Foaming Processes (requiring major plant modifications)

The Illinois Tollway maintains an approved list of warm-mix asphalt technologies or processes.

For Binder or Surface mixtures containing more than 20 percent binder replacement, a chemical additive shall be used as the WMA technology.

The Contractor shall ensure that a Technical Representative from the approved warm mix asphalt additive or process manufacturer is present during the first day of production and placement of HMA produced with warm mix technology."

Add the following to Article 1030.02 of the Standard Specifications:

"(k) RAS Material…… Illinois Tollway special provision for Reclaimed Asphalt Shingles"

Revise note 2 or Article 1030.02 of the Standard Specifications to read as follows:

"Note 2. The Contractor shall use the asphalt binder grade as shown below:

N50 Binder

Reclaimed Material	**Binder Replacement %**	**Asphalt Binder Grade**
RAS/RAP/FRAP	0-20	PG 64-22
Category 1 or 2 FRAP only or with RAS	21-40	PG 58-28
Category 1 or 2 FRAP with RAS	41-60[1]	PG 52-34[2,3]

1/ DCT (ASTM D7313) value as tested both in design and 1st day of production after an approved Test Strip shall meet or exceed 400 J/m² when tested at -12 °C. DCT test to be performed by an AMRL certified Laboratory.
2/ PG 46-34 shall be considered an equivalent to PG 52-34
3/ Alternate Grades or Modifiers may be considered with approval of the engineer for mixtures to be used on the shoulder.

N70 Binder and N90 Binder

Reclaimed Material	**Binder Replacement %**	**Asphalt Binder Grade**
RAS/RAP/FRAP	0-20	PG 64-22
RAS by itself or with Category 1 or 2 FRAP	21-30	PG 58-22
RAS with Category 1 FRAP	31-40	PG 58-28

N70 Surface

Reclaimed Material	**Binder Replacement %**	**Asphalt Binder Grade**
RAS/RAP/FRAP	0-20	PG 64-22
RAS by itself or with Category 1 or 2 FRAP	21-40	PG 58-28

Add the following to Article 1032.05(b) of the Standard Specifications:

"At the contractor's option, the modified asphalt binder shall be either an SBS/SBR polymerized PG 76-22 binder, or a GTR modified PG 64-22 GTR 12 binder that complies with the requirements defined herein. For any mixture only FRAP / RAP with no RAS, the asphalt binder shall be either an SBS/SBR polymerized PG 70-28 binder or a PG 58-28 GTR 12 binder when the mix design's binder replacement is between 20 percent and 25 percent. For any mixture containing RAS, the asphalt binder shall be an SBS/SBR polymerized PG 70-22 binder or a GTR modified PG 58-22 GTR 12 binder that complies with requirements defined herein when the mix design's binder replacement is 20 percent or less; or shall be an SBS/SBR polymerized PG 70-28 binder or a GTR modified PG 58-28 GTR 12 binder that complies with requirements defined herein when the mix design's binder replacement is greater than 20 percent. This table summarizes these options:

Reclaimed Material	Binder Replacement, %	Asphalt Binder Options
None	0	SBS/SBR PG 76-22 PG 64-22 GTR 12
FRAP / RAP only	Less than 20	SBS/SBR PG 76-22 PG 64-22 GTR 12
	20 to 25	SBS/SBR PG 70-28 PG 58-28 GTR 12
RAS By itself, or with Category 1 or 2 FRAP	Less than 20	SBS/SBR PG 70-22 PG 58-22 GTR 12
	20 to 40	SBS/SBR PG 70-28 PG 58-28 GTR 12

(1) SBS/SBR PG 76-22, PG 70-22, or PG 70-28 Binder. The SBS/SBR PG 76-22, PG 70-22, or PG 70-28 binder shall meet the requirements of Article 1032.05(b) of the Standard Specifications. In addition, the elastic recovery of the Asphalt Binder used shall be a minimum of 80.

(2) Ground Tire Rubber (GTR) Binder. The base asphalt cement (AC) that is blended with the Ground Tire Rubber (GTR) shall be a PG 64-22 performance-grade (PG) when used in mix designs with a binder replacement of 20 percent or less, or shall be a PG 58-28 performance-grade (PG) when used in a mix design with a binder replacement greater than 20 percent, meeting the requirements of Article 1032.05 of the Standard Specifications. The GTR shall be produced from processing automobile and/or truck tires by the ambient grinding method. Heavy equipment tires, uncured or de-vulcanized rubber will not be permitted. The GTR shall not exceed 1/16 in. in length and shall contain no free metal particles. Detection of free metal particles shall be determined by thoroughly passing a magnet through a 2 oz. sample. Metal embedded in rubber particles will be permitted.

The GTR shall be stored in a dry location protected from the rain. When the GTR is combined with the asphalt cement, the moisture content of the GTR shall not cause foaming of the blend.

When tested in accordance with ASTM C-136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates, (Illinois-modified AASHTO T-27, Sieve Analysis of Fine and Coarse Aggregates) a 2 oz. sample of the GTR shall conform to the following gradation requirements:

Sieve Size	Percent Passing
No. 8 (2.36 mm)	100
No. 16 (1.18 mm)	98 ± 2
No. 30 (600 μm)	95 ± 5
No. 50 (300 μm)	50 ± 10
No. 100 (150 μm)	10 ± 5
No. 200 (75 μm)	2 ± 2

A mineral powder (such as talc) meeting AASHTO M17, Mineral Filler for Bituminous Paving Mixtures, requirements may be added, up to a maximum of 4% by weight of GTR particles, to reduce sticking and caking of the GTR particles.

GTR shall have a specific gravity of 1.15 ± 0.05 when tested in accordance with ASTM D-1817, Standard Test Method for Rubber Chemicals-Density.

Extender Oils or Polymeric Additions With approval of the Engineer, compatible extender oils and/or polymers may be added to the GTR or to the asphalt-rubber blend. The additional costs for the extender oils and/or polymer additions shall be borne by the Contractor. The Contractor shall provide material product information along with usage rates for approval."

Equipment. Add the following to the list of specific references of Article 406.03 of the Standard Specifications.

"(j) RAP Processing Equipment	Illinois Tollway special provision for Reclaimed Asphalt Pavement
(k) RAS Processing Equipment	Illinois Tollway special provision for Reclaimed Asphalt Shingles"

Add the following to Article 406.02 of the Standard Specifications.

"For the production of WMA binder and surface course mixes, use equipment and WMA technologies capable of producing an asphalt mixture that is workable at the minimum placement and compaction temperature desired, regardless of storage or haul distance considerations."

Add the following to Article 1030.03 of the Standard Specifications.

"When a mix is produced using an approved warm mix asphalt technology, the asphalt mixing plant shall be modified as required by the additive or process manufacturer to introduce the technology and produce a WMA mixture meeting the volumetric properties specified herein. Plant modifications may include additional plant instrumentation, the installation of asphalt binder foaming systems and/or WMA additive delivery systems, tuning the plant burner and adjusting the flights in order to operate at lower production temperatures and/or reduced tonnage.

All metering devices will meet the current IDOT requirement for liquid or mineral additives. Document the integration of plant controls and interlocks when using WMA additive metering devices."

Mixture Design. 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.

Sieve Size	IL-19.0 mm[3/]		IL-12.5 mm		IL-9.5 mm	
	min	max	min	max	min	max
1 in. (25 mm)		100				
3/4 in. (19 mm)	90	100		100		
1/2 in. (12.5 mm)	69	89	90	100		100
3/8 in. (9.5 mm)				89	90	100
#4 (4.75 mm)	45	60	28	65	32	69
#8 (2.36 mm)	30	45	28	48	32	52 [2/]
#16 (1.18 mm)	20	35	10	32	10	32
#50 (300 µm)	8	16	4	15	4	15
#100 (150 µm)	6	9	3	10	3	10
#200 (75 µm)	3	6	4	6	4	6
Ratio Dust/Asphalt Binder		1.0		1.0		1.0

1/ Based on percent of total aggregate weight.

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

3/ For mixture IL-19-0 Ndesign = 90, the fine fraction shall consist of at least 67% manufactured sand meeting the FA 20 gradation. The manufactured sand shall be stone sand, slag sand, steel slag sand, or combinations thereof.

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

"VOLUMETRIC REQUIREMENTS High ESAL					
	Design Air Voids Target %	Voids in the Mineral Aggregate (VMA), % minimum			Voids Filled with Asphalt Binder (VFA), %
Ndesign		IL-19.0	IL-12.5	IL-9.5	
50	3.0	13.5	14.0	15.0	65 – 80
70	4.0				65 - 75
90	4.0				

Revise the first and second paragraphs of Article 1030.04(c) of the Standard Specifications to read:

"(c) Determination of Need for Anti-Stripping Additive. The mix designer shall determine if an additive is needed in the mix to prevent stripping. The determination will be made on the basis of moisture sensitivity testing (IL Modified AASHTO T 283) on production ingredient materials sampled at the HMA plant. The results will inform the contractor of the need for an anti-strip additive in the mix based on the following minimums:

1) for polymer modified asphalt mix have a conditioned tensile strength of 115 psi or better with no TSR requirements, for non-modified asphalt mix have a conditioned tensile strength of 100 psi or better for 6 in. specimens;
2) for polymer modified asphalt mix have a conditioned tensile strength of 100 psi or better with a TSR of 0.85 or better for 6 in. specimens, for non-modified asphalt mix have a conditioned tensile strength of 80 psi or better with a TSR of 0.85 or better for 6 in. specimens;
3) any asphalt mix with anti-strip (liquid or lime) conditioned tensile strength may not be lower than the original mix conditioned tensile strength without anti-strip and no visual stripping of the coarse or fine aggregate in the broken faces shall be observed.

If it is determined that an additive is required, the additive may be hydrated lime, slaked quicklime, or a liquid additive, at the Contractor's option."

Add the following to Article 1030.04 of the Standard Specifications:

"(e) Warm Mix Technology. A Warm Mix Technology shall be used with an approved HMA mix design.

The mixture design for any WMA binder or surface course shall be developed based on a lab produced HMA mix design modified as a WMA mix design through trial batch

production of the WMA mixture and test strip placements. The original HMA mix design to be modified shall be designed and submitted to the Engineer without including the WMA additive or technology. When a WMA surface or binder course mix using an additive is to be used, document the additive used and recommend the dosage rate on a resubmittal of the original HMA mix design that is to be modified as a WMA mix design. The Illinois Tollway Material Engineer and Contractor will verify the original HMA mix design with any WMA technology based on plant produced samples taken from the WMA test strip. Any needed mix design adjustments will apply to the development of the WMA binder course or surface course mix design.

In addition to the HMA mix design, for WMA mix designs proposed using organic or chemical additives, Hamburg Wheel testing according to Illinois Modified AASHTO T324 shall be conducted on a laboratory mixed sample at the recommended dosage rate. The Hamburg Wheel testing requirements from this sample are:

Asphalt Binder Grade	# Wheel Passes	Maximum Rut Depth, in.
PG 76-XX	20,000	½ inch
PG 70-XX	15,000	½ inch
PG 64-XX	10,000	½ inch
PG 58-XX	10,000	½ inch
PG 52-XX	10,000	½ inch
PG 46-XX	10,000	½ inch

The final adjusted design for the WMA mix design shall be submitted for acceptance with the following information included:

1) All information required for Superpave HMA.
2) WMA technology and/or WMA additives information.
3) WMA technology manufacturer's established recommendations for usage.
4) WMA technology manufacturer's established target rate for water and additives, the acceptable variation for production, and documentation showing the impact of excessive production variation.
5) WMA technology material safety data sheets (MSDS).
6) Documentation of at least 3 past WMA technology field applications including project type, project owner, tonnage, location, mix design, mixture volumetrics, field density, and performance.
7) Temperature range for mixing.
8) Temperature range for compacting.
9) Asphalt binder performance grade test data over the range of WMA additive percentages proposed for use.
10) WMA mixture QC/QA test results measured from the test strip samples specific to the Contractor's proposed WMA technology.
11) Laboratory test data, samples and sources of all mixture components, and asphalt binder viscosity-temperature relationships.
12) Mix production Hamburg test results from WMA test strip.

The Illinois Tollway may accept an existing WMA mixture design with a WMA additive / process previously used on an Illinois Tollway project and may waive the test strip trial batch required to verify the WMA mix design."

Quality Control / Quality Assurance. Article 1030.05 of the Standard Specifications shall govern the requirements for Quality Control / Quality Assurance (QC/QA) of HMA and WMA mixtures, with this revision: the correlation coefficient ("r" value) for correlating nuclear gauge densities with core densities shall be greater than 0.85.

WMA Production. WMA shall be produced at a temperature range recommended by the additive / process manufacturer and verified through a QC/QA mixture test strip. It may be necessary to initially produce HMA mixes at conventional HMA temperatures immediately before WMA production at lower temperatures in order to prime the plant for proper operating temperatures.

A QC/QA mixture test strip will be required for all WMA mixes. The test strip shall be constructed at a location approved by the Engineer to determine the mix properties, density, and laydown characteristics, and as needed to finalize any proposed mix design. These test results and visual inspections on the mixture shall be used to make corrective adjustments if necessary. For all mixtures produced with a WMA technology, the QC/QA WMA mixture test strip shall be constructed at an approved off-site location to determine the mix properties, density, production temperature target, compaction procedure, and laydown characteristics. A field TSR test of the mix produced for any WMA test strip will be required.

Prior to the start of mix production and placement, The Illinois Tollway Materials Engineer will review and approve all test strip results, WMA mix designs, and rolling pattern.

The test strips will be performed as follows:

(a) Team Members. The start-up team, if required, shall consist of the following:

(1) Resident Engineer
(2) Illinois Tollway Project Manager, or representative
(3) Illinois Tollway Materials Engineer, or representative
(4) Engineer's Nuclear Density Gauge Specialist
(5) Contractor's QC Manager
(6) Engineer's QA representative
(7) Contractor's QC technician
(8) AC Supplier representative (Required for GTR, optional for other AC types)
(9) Illinois Tollway Independent Assurance Engineer

(b) Communication. The Contractor shall advise the team members of the anticipated start time of production for the test strip. The QC Manager shall direct the activities of the test strip team. An Illinois Tollway-appointed representative from the start-up team will act as spokesperson for the Illinois Tollway.

(c) The Test Strip(s) for HMA mixtures shall be in accordance with Article 406.06 of the Standard Specifications. The Test Strip(s) for WMA mixtures shall consist of approximately 300 tons. It shall contain two growth curves which shall be compacted by a static steel-wheeled roller and tested as outlined herein.

(1) Mix Information. On the day of construction of the Test Strip, the Contractor shall provide the start-up team documentation of test data showing the combined hot-bin or the combined aggregate belt sample and mineral filler at a drier-drum plant.

(2) Mix and Gradation Test Strip Samples. The first and second sets of mixture and gradation samples shall be taken by the Contractor at such times as to represent the mixture between the two growth curves and the rolling pattern area, respectively. All test strip samples shall be processed by the Contractor for determination of mix composition and Superpave properties including air voids. This shall include washed gradation tests. This information shall then be compared to the JMF and required design criteria. Prepare and test any WMA test strip mixtures, including Superpave gyratory compacted specimens for QC/QA using the same test methods, procedures and frequencies as specified for HMA, except that the WMA mixture shall be aged at the production temperature for a period of 2 hours before gyratory or performance based test specimens are compacted.

Hamburg Wheel testing according to Illinois Modified AASHTO T324 shall be conducted from the test strip production mixture. The Hamburg Wheel testing requirements from this sample are:

Asphalt Binder Grade	# Wheel Passes	Maximum Rut Depth, in.
PG 76-XX	20,000	½ inch
PG 70-XX	15,000	½ inch
PG 64-XX	10,000	½ inch
PG 58-XX	10,000	½ inch
PG 52-XX	10,000	½ inch
PG 46-XX	10,000	½ inch

(3) Construction of the Test Strip. After the Contractor has produced the mix, transported the mix, and placed approximately 100 to 150 tons of mix, placement of the mix shall stop, and a growth curve shall be constructed. After completion of the first growth curve, paving shall resume for 50 to 100 tons of mix, placement shall stop, and the second growth curve shall be constructed within this area. Additional growth curves may be required if an adjustment/plant change is made during the test strip. The Contractor shall use the specified rolling procedures for all portions of the test strip except for the growth curve areas which shall be compacted as directed by the Engineer.

(4) Location of Test Strip. The test strip shall be located on a pavement type similar to the contract pavement and acceptable to the Engineer. It shall be on a relatively flat portion of the roadway. Descending/Ascending grades or ramps shall be avoided.

(5) Compaction Temperature. For WMA mixtures, the temperature of the mix at the beginning of the growth curve shall be within the additive / process manufacturer's recommended temperature range for compaction.

(6) Compaction and Testing. The QC Manager will specify the roller(s) speed and number of passes required to obtain a completed growth curve. The nuclear gauge shall be placed near the center of the hot mat and the position marked for future reference. With the bottom of the nuclear gauge and the source rod clean, a 15 seconds nuclear reading (without mineral filler) shall be taken after each pass of the roller. Rolling shall continue until the maximum density is achieved and three consecutive passes show no appreciable increase in density or no evidence of destruction of the mat. The growth curve shall be plotted.

(7) Evaluation of Growth Curves. Mixtures which exhibit density potential less than 94 percent or greater than 97 percent of the maximum theoretical density (D) shall be considered as sufficient cause for mix adjustment. If a mix adjustment is made, an additional test strip may be constructed. The Illinois Tollway will pay half the cost of the contract unit price for a test strip if additional one is required. The information shall then be compared to the AJMF and required design criteria.

If the nuclear density potential of the mixture does not exceed 91 percent, the operation will cease until all test data is analyzed or a new mix design is produced.

In addition, other aspects of the mixture, such as appearance, segregation, texture, or other evidence of mix problems, should be noted and corrective action taken at this time.

(d) Documentation. The WMA test strip and rolling pattern information (including growth curves) will be tabulated by the contractor with copies provided to each team member, and the original submitted to the Engineer. Any change to the rolling pattern shall be approved by the Engineer.

CONSTRUCTION REQUIREMENTS

Placing. Article 406.06 of the Standard Specifications shall govern the requirements of HMA and WMA placement except as modified herein:

Revise the first and second paragraphs of Article 406.06(b) of the Standard Specifications to read:

"General. HMA and WMA shall be placed on a clean, dry base and when weather conditions are suitable. The HMA leveling binder and HMA binder courses shall be placed only when the temperature in the shade is at least 40°F and the forecast is for rising temperatures. The HMA surface course shall be placed only when the air temperature in the shade is at least 45°F and the forecast is for rising temperatures. The WMA leveling binder and WMA binder courses shall be placed only when the temperature in the shade is at least 32°F and the forecast is for rising temperatures. The WMA surface course shall be placed only when the air temperature in the shade is at least 35°F and the forecast is for rising temperatures.

The HMA shall be delivered at a temperature of 250 to 350°F. The WMA shall be delivered on dates when the ambient air temperatures during placement will be at least 50° F and rising within a temperature range as established by the WMA additive / process

manufacturer and reported by the Contractor to the Engineer with the WMA mix design submittal. The temperature of WMA shall not exceed the manufacturer's recommended maximum placement temperature when measured immediately behind the paver when the air temperature is 50°F and rising. The WMA shall be delivered at a temperature of 250 to 350°F on dates when the ambient air temperatures during placement will be between the WMA specified minimum temperature and 50°F."

Revise the first paragraph of Article 406.06(d) of the Standard Specifications to read:

(d) Lift Thickness. The minimum compacted lift thickness for constructing HMA binder and surface courses shall be as follows, unless otherwise noted on the plans.

Compaction. Article 406.07 of the Standard Specifications shall govern the requirements of HMA and WMA compaction except as modified herein:

Add the following paragraph to Article 406.07 of the Standard Specifications:

"Compact WMA immediately after spreading and before the WMA mixture temperature falls below the minimum job mix compaction temperature as recommended by the manufacturer of the WMA technology used. Discontinue paving if the Contractor is unable to achieve the specified density before the mixture cools below the minimum recommended WMA job mix design compaction temperature."

Method of Measurement. This work will be measured in accordance with Article 406.13 of the Standard Specifications.

Basis of Payment. This work will be paid for in accordance with Article 406.14 of the Standard Specifications except as modified herein:

Add the following to the second paragraph of Article 406.14 of the Standard Specifications:

"The WMA surfacing will be paid for at the contract unit price per ton for WARM MIX ASPHALT BINDER COURSE, of the mixture composition and Ndesign specified; and WARM MIX ASPHALT SURFACE COURSE, of the friction aggregate mixture and Ndesign specified."

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

"The HMA surfacing in which polymer or GTR modified asphalt binders are required, will be paid for at the contract unit price per ton for MODIFIED HOT-MIX ASPHALT BINDER COURSE, of the mixture composition and Ndesign specified; and MODIFIED HOT-MIX ASPHALT SURFACE COURSE, of the friction aggregate mixture and Ndesign specified.

The WMA surfacing in which polymer or GTR modified asphalt binders are required, will be paid for at the contract unit price per ton for MODIFIED WARM-MIX ASPHALT BINDER COURSE, of the mixture composition and Ndesign specified; and MODIFIED WARM-MIX ASPHALT SURFACE COURSE, of the friction aggregate mixture and Ndesign specified."

Add the following to Article 406.14 of the Standard Specifications:

"WMA test strips will be evaluated for payment at the contract unit price each for CONSTRUCTING WARM MIX ASPHALT TEST STRIP, according to the following:

(a) If the WMA placed during the initial test strip is determined to be acceptable, the mixture and test strip will be paid at the contract unit prices.

(b) If the WMA placed during the initial test strip (1) is determined to be unacceptable to remain in place by the Engineer, and (2) was not produced within the tolerances of the JMF, the initial mixture and test strip will not be paid for and shall be removed at no additional cost to the Illinois Tollway. An additional test strip will be paid for in full, if produced within the JMF tolerances.

(c) If the WMA placed during the initial test strip (1) is determined to be unacceptable to remain in place by the Engineer, and (2) was produced within the tolerances of the JMF, the mixture shall be removed. Removal will be paid for according to Article 109.04 of the Tollway Supplemental Specifications. This initial mixture and test strip will be paid for at the contract unit price, and any additional test strips will be paid for at one half the unit price of each test strip.

(d) If the WMA placed during a test strip is determined to be acceptable to remain in place by the Engineer and the Engineer deems a new start-up is required for any reason, the initial mixture and test strip will be paid for at the contract unit prices. The additional mixture will be paid for at the contract unit price and any additional test strips will be paid for at one-half the unit price for each test strip.

(e) If the Contractor requests and is granted approval for a mix design other than the initial approved WMA mix design, he/she shall construct a test strip for the new mix design at no additional cost to the Illinois Tollway.

Add the following to Article 406.14 of the Standard Specifications:

"HMA and WMA mixtures 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
JI355133	WARM-MIX ASPHALT BASE COURSE, 12"	SQ YD
JI406510	WARM-MIX ASPHALT SURFACE COURSE, MIX "D", N70	TON
JI406900	CONSTRUCTING WARM MIX ASPHALT TEST STRIP	EACH

RECLAIMED ASPHALT PAVEMENT (RAP) (Illinois Tollway)

Effective: October 6, 2011
Revised: January 25, 2018

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 re-stockpiling. 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. With the approval of the Engineer, a certified and calibrated Asphalt Analyzer or similar technology may be used to perform the extraction. 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 an 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 an 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	25	15	10
70	25	10	10
90	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	40	35
70	40	35
90	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. For IL-4.75 Level Binder the amount of FRAP shall not exceed 35% 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	30
70	40	30
90	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. For IL-4.75 Level Binder the amount of FRAP shall not exceed 25% 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 resulting gradation shall vary by no more than 25% Cumulative Retained when screened across 1 ½”, 1”, ¾”, 5/8”, ½”, 3/8”, ¼” #4, #16, #30, #40, #50, #100, and #200. Gradations may be performed dry, without the need for washing, per ASTM C 136.

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: January 26, 2018

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. With the approval of the Engineer, a certified and calibrated Asphalt Analyzer or similar technology may be used to perform the extraction.

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 Mixes:

(1) The maximum allowable RAS usage in SMA 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). If Category 2 Fractionated Reclaimed Asphalt Pavement (FRAP) is used, the Fine Aggregate Angularity (FAA) of the Category 2 FRAP as tested in accordance with AASHTO T 304 method A, must be ≥ 45.0.

c. If used in conjunction with Category 1 FRAP the contribution of asphalt binder from the RAS and FRAP combined in any dense graded 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.

d. If used in conjunction with Category 1 FRAP, the contribution of asphalt binder from RAS and FRAP combined in any WMA SMA mixture shall not exceed 50%[1] of the total asphalt binder content in the mix design.

.

(2) The virgin asphalt binder grade shall be per the Illinois Tollway Stone Matrix Warm Mix Asphalt Special Provision based on Recycle Type/Amount.

(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 50 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/FRAP Asphalt Binder Replacement
Mix Type	< 20%
N70 Shoulder Surface Mixes	No grade bump [1/]

	Percent RAS/FRAP Asphalt Binder Replacement	
Mix Type	21-40%	41– 50%[2]
N70 Shoulder Surface Mixes	Reduce High and Low temperature by one grade[1]	Reduce high & low temperature by two grades[1/]

1/One asphalt binder grade bump represents a change of 6°C.

2/40% Max allowed unless DCT criteria is met per Asphalt Shoulder Special Provision.

(c) N70/N90 Binder and N70/N90 Leveling Binder Mixes:

(1) The maximum allowable RAS usage in N70/N90 Binder and IL-19.0 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%
N70/N90 Binder or N70/N90 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%
N70/N90 Binder or N70/N90 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%
N70/90 Binder or N70/N90 Leveling Binder	No grade bump¹	Reduce high & low temperature by one grade 1/

1/One asphalt binder grade bump represents a change of 6°C.

(d) N50 IL-4.75 mm Leveling Binder Mix:

(1) The maximum allowable RAS usage in the N50 IL-4.75 Leveling Binder Mix 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 FRAP the contribution of asphalt binder from the RAS and RAP combined shall not exceed 50 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 30 percent of the total asphalt binder content in the mix design.

(2) The virgin asphalt binder grade shall be per Illinois Tollway Asphalt Mixture IL-4.75 Special Provision based on Recycle Type/Amount.

(e) N50 Asphalt Binder Mixes:

(1) The maximum allowable RAS usage in N50 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 30 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.

d. If used in conjunction with Category 1 or 2 FRAP the contribution of asphalt binder from the RAS and FRAP combined shall not exceed 60%[1] of the total asphalt content of the mix design.
1/ 40% Max allowed unless DCT criteria is met per Asphalt Binder and Surface course or Asphalt Shoulder Special Provision.

(2) Virgin asphalt binder grade shall be as follows:

	Percent RAS/Standard RAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 30%
N50 Binder	No grade bump 1/	Reduce high and low temperature by one grade 1/

	Percent RAS/ FRAP Asphalt Binder Replacement	
Mix Type	< 20%	20 – 40%
N50 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.

	Percent RAS/ FRAP Asphalt Binder Replacement	
Mix Type	< 20%	41-60%[2]
N50 Binder	No grade bump [1/]	Reduce high & low temperature by two grades [1/]

1/ One asphalt binder grade bump represents a change of 6°C.
2/ 40% Max allowable unless DCT criteria is met per Asphalt Binder and Surface course or Asphalt Shoulder Special Provision.

(f) 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/FRAP 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**

SURFACE SMOOTHNESS TESTING FOR PAVEMENT (Illinois Tollway)

Effective: August 22, 2014
Revised: January 26, 2018

Description. This work shall consist of measuring pavement smoothness. Mainline and ramp pavements will be measured for smoothness. The Illinois Tollway will be responsible to perform the work for final acceptance for newly-placed concrete or asphalt pavements, or existing concrete pavements with complete diamond grinding. The Contractor shall be responsible to perform the work when otherwise required by a special provision or plan set.

Definitions.

1. Smoothness. Pavement smoothness shall be the International Roughness Index (IRI) value of the pavement in each wheel path per smoothness segment or sublot.
2. Smoothness Segment. If a pavement sublot is not defined, a smoothness segment shall be defined as:
    a. One lane of pavement wide and a length of 0.1 mile for mainline.
    b. One lane of pavement wide for the length of a blockout on the mainline constructed under the Illinois Tollway special provision for Performance Related Special Provision for Portland Cement Concrete Pavement, Jointed or the Illinois Tollway special provision Performance Related Special Provision for Continuously reinforced Portland Cement Concrete Pavement.
    c. One lane of pavement wide for the length of a ramp if the continuous paving length is less than 0.2 miles.
    d. One lane of pavement wide and a maximum length of 0.1 mile for a ramp exceeding 0.2 miles. These ramps will have multiple segments.
    e. Toll plaza paving, and the associated pavement 50 feet prior to and following toll plaza paving, shall be considered as individual paving segment for either mainline or ramp paving.
3. Wheelpath. When pavement lane markings are present, the wheelpath shall be the location of the IRI transducers when the data collection vehicle is centered between the lane markings. When lane markings are not present, the wheelpath shall be defined as follows.
    a. For mainline concrete pavement or ramp concrete pavement without a longitudinal joint near the center of the lane, the wheelpath shall be the location of the IRI transducers when the data collection vehicle is centered between longitudinal joints.
    b. For ramp concrete pavement with a joint near the center of the lane - the wheelpath shall be the location of the IRI transducers when the data collection vehicle is centered over the center longitudinal joint.
    c. For asphalt pavement – the wheelpath shall be the location of the IRI transducers when the data collection vehicle is centered between longitudinal construction joints.

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 displacement transducers (lasers). The IP shall be outfitted with transducers to simultaneously measure the left and right wheelpath IRI. The left and right transducers shall be centered on the vehicle. The distance between the outer edge of the left wheelpath laser and the outer edge of the right wheelpath laser, as shown on the pavement, shall be 70 inches. 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 must 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 individual IRI for each wheelpath and the average IRI for both wheel paths in each segment or sublot. During collection high-pass and low-pass filters shall be set at zero.

Collection of smoothness data used to calculate the IRI will occur after the Contractor elects to perform any corrective work on measured pavements. Smoothness data collection will occur no less than 7 days prior to opening a pavement to traffic. Smoothness data collection will occur

prior to the first lift of an asphalt overlay of a new composite pavement. In all cases, smoothness data shall be collected prior to placement of raised pavement lane markers or permanent pavement markings, so that required corrections can be applied without omission of areas where these items are installed. In the event that more than one set of smoothness data are collected by the Tollway, 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 of each mainline traffic lane. Operate the IP within the speed range recommended by the manufacturer. Avoid harsh braking or large speed variations to maintain a consistent speed.

ANALYSIS

Obtain IRI values in a segment or sublot using the ProVAL “Smoothness Assurance” analysis with the 250mm filter or equivalent method demonstrated to provide the same result.

Obtain the Localized Roughness (LR) values in each segment or sublot using the ProVAL “Ride Quality” analysis with a segment length of 25 feet and 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 shall submit all documentation of IP calibration. All smoothness testing results shall be reported to the Engineer within two business 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

MATERIAL TRANSFER DEVICE (Illinois Tollway)

Effective: September 21, 2011
Revised: March 23, 2018

Description. This work shall consist of placing HMA or WMA binder and surface course stone matrix asphalt mixtures according to Section 406 of the Standard Specifications, except that these materials shall be placed using a material transfer device.

Materials and Equipment. The material transfer device shall have a minimum surge capacity of 15 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.

(b) Paver Hopper Insert. The paver hopper insert shall have a minimum capacity of 14 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 material transfer device shall be used for the placement of HMA or WMA binder and surface course stone matrix asphalt mixtures placed with a paver including ramps. The material transfer device speed shall be adjusted to the speed of the paver to maintain a continuous, non-stop paving operation.

Use of a material transfer device with a roadway contact pressure exceeding 25 psi will be limited to partially completed segments of full-depth asphalt pavement where the thickness of binder in place is 7 inches or greater. A material transfer device can be used on partially completed segments of full-depth asphalt pavement where the thickness of binder in place is 6.25 inches or greater with the following conditions;

(a) MTD tire pressure is less than 80psi.
(b) Total axle load (fully loaded) is less than 64,000 lbs.

If the materials transfer device is operating on a concrete pavement, it shall remain 4 feet away from the free edge of the concrete pavement. A free edge is defined as a longitudinal pavement joint not tied to a concrete pavement lane or shoulder.

Structures. The material transfer device 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 asphalt mixture 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 for all HMA or WMA binder and surface course stone matrix asphalt mixture materials placed with a material transfer device. Tonnage measurement for the material items paid for at the contract unit price per square yard shall be calculated according to the fifth paragraph of Article 406.13(b) of the Standard Specifications.

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

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

Pay Item Number	Designation	Unit of Measure
JI406037	MATERIAL TRANSFER DEVICE	TON

STONE MATRIX WARM MIX ASPHALT (SMA) (Illinois Tollway)

Effective: January 11, 2012
Revised: March 21, 2018

Description. This Special Provision establishes and describes the responsibilities of the Contractor in producing and constructing Stone Matrix Asphalt (SMA) surface friction course, surface course and binder course, produced as a warm mix asphalt (WMA) mixture. This work shall be according to the applicable portions of Section 406, Section 1030, and Section 1032 of the Standard Specifications, and of the contract Illinois Tollway special provisions for Reclaimed Asphalt Pavement and Recycled Asphalt Shingles, and Surface Smoothness Testing for Pavement; except as modified herein.

Materials.

(a) Aggregates.

(1) Coarse Aggregate.
The coarse aggregate for the SMA surface friction course shall be crushed steel slag, quartzite, granite, or diabase / trap rock with the option to use up to 15% coarse portion Category 1 FRAP or up to 25% coarse portion of Category 1 FRAP from a friction SMA source.
The coarse aggregate for the SMA surface course shall be crushed steel slag, quartzite, granite, diabase / trap rock or crushed gravel with the option to use up to 15% coarse portion Category 1 FRAP or up to 25% coarse portion of Category 1 FRAP from a friction SMA source.
The coarse aggregate for the SMA binder course shall be crushed gravel, quartzite, granite, diabase / trap rock or up to 25% Dolomite with the option to use up to 15% coarse portion Category 1 FRAP containing no steel slag or up to 25% coarse portion of Category 1 FRAP from a SMA source, containing no steel slag.

Blending of aggregates shall be allowed. All coarse aggregate shall meet the following additional requirements:

Gradation. No individual coarse aggregate gradation is specified. Blending of coarse aggregate shall be permitted. The coarse aggregate gradation(s) used shall be capable of being combined with FA 20 or FA 22 stone sand and mineral filler, or with the fine portion Category 1 FRAP to meet the approved mix design and the material and mix requirements noted herein.

Quality. All coarse aggregate shall be Class B Quality or better.

Coarse aggregate crushed gravel shall be as defined in Article 1004.01 (a) (3) of the Standard Specifications. Crushed gravel coarse aggregate shall meet the following additional requirements.

Crushed particle content (%) shall comply with the current Bureau of Materials and Physical Research Policy Memorandum, “Crushed Gravel Producer Self-Testing Program” for category I/II coarse aggregate products. When tested in accordance with ASTM D 5821, the coarse aggregate angularity shall have a minimum of 100%

"two fractured faces" per AASHTO M323-04. When tested in accordance with ASTM D 4791, the percentage of flat and elongated particles of the crushed gravel shall be no more than 10% when tested at 5 to1 elongation ratio.

Crushed gravel in an SMA surface or binder course shall meet the following requirements:

(a) LA Abrasion (ASTM C131) for the gravel source shall be less than 28.0 as determined by the Illinois Department of Transportation.
(b) Micro-Deval (ASTM D6928, Illinois Modified)
    (1) No individual coarse aggregate shall have a Micro-Deval value greater than 12.0
    (2) The weighted average discussed below is by weight of all coarse aggregates in the mixture (including Category 1 Coarse FRAP).
    (3) If the Micro-Deval weighted average of design proportions is greater than 11.5, the aggregate combination will be considered unacceptable.
    (4) If the Micro-Deval weighted average of design proportions is less than 9.5, the aggregate combination shall be considered acceptable.
    (5) If the Micro-Deval weighted average of design proportions is between 9.5 and 11.5, a mix design must be performed and a sample gyrated at optimal AC to N225. The Air Voids at N225 must be ≥ 2.0%

Coarse aggregate dolomite shall be defined in Article 1004.01 (a) (4) of the standard specifications. Crushed dolomite shall meet the following additional requirements:

(a) When tested in accordance with ASTM D 4791, the percentage of flat and elongated particles shall be no more than 10% when tested at 5 to1 elongation ratio.

(b) When tested in accordance with ASTM C131, the LA Abrasion value shall be no greater than 28.0.

(c) When tested in accordance with ASTM D6928 (Illinois Modified), the Micro-Deval value shall be no greater than 10.0

If the coarse portion Category 1 FRAP Friction SMA percentage is greater than 10.0 percent, the Micro-Deval (ASTM D6928) value for the coarse FRAP must be less than 9.0, and the Category 1 FRAP Friction SMA results must be included in the Micro-Deval weighted average design criteria. All Micro-Deval testing must be performed by a laboratory with AASHTO aggregate accreditation. The Engineer reserves the right to verify Micro-Deval testing.

Water Absorption. Each individual natural coarse aggregate shall have water absorption of no more than 2.5 percent based on the AASHTO T85 test method as performed by an AASHTO accredited laboratory. The total coarse aggregate blend in the mixture shall have water absorption of no more than 2.0 percent. Steel Slag sources shall follow the "Slag Producer Self-Testing Program" as established by the Illinois Department of Transportation. All steel slag aggregate shall have water absorption of no more than 2.0 percent.

(2) Fine Aggregate. Fine aggregate shall be Class B Quality stone sand meeting gradation FA 20 or FA 22 in accordance with Section 1003 of the Standard Specifications, or when using FRAP, the fine portion Category 1 FRAP may be used separately or as proportioned with the stone sand. The fine portion of the FRAP shall be the portion of the processed FRAP passing the No. 4 sieve from a Category 1 source.

(3) Mineral Filler. Mineral filler shall be commercially manufactured mineral filler meeting Article 1011.01 of the Standard Specifications.

As an option, collected baghouse dust may be used in lieu of manufactured mineral filler, provided: 1) there is enough available for the production of the SMA mix for the entire project, and 2) a mix design was prepared with collected bag-house dust.

(b) Fiber Additive. If the SMA mix design drain down measured in accordance with AASHTO T 305 exceeds the 0.3% maximum, a fiber additive shall be added to the SMA mixture. The drain down shall be determined at the job mix formula asphalt binder content at the mixing temperature of 350° F. A fiber additive shall be included in all SBS/SBR Polymerized SMA mixtures. The actual dosage rate will be determined by the Engineer.

(1) Cellulose or Mineral Fiber. The fiber additive shall comply with the requirements of AASHTO MP-8.

The dosage rate for cellulose shall be approximately 0.4% by total mixtures mass and sufficient to prevent draindown from exceeding 0.3%. For mineral fiber, the dosage rate shall be approximately 0.5% by total mixture mass and sufficient to prevent draindown.

(2) Reclaimed Asphalt Shingles (RAS). RAS may be used as a fiber additive in Stone Matrix Asphalt (SMA) mixtures if the mix design with RAS prevents draindown from exceeding 0.3%. The RAS shall be from a certified source that produces either pre-consumer or post-consumer RAS material in accordance with the special provision for RAS. The percent RAS to be added to the mix shall not exceed 5.0% by mass or an amount that will maintain the binder replacement of the mix design at 40 percent or less.

(c) Reclaimed Asphalt Pavement (RAP). The coarse portion Category 1 FRAP will be permitted at a maximum of 15 percent in binder, surface, or surface friction course SMA mixtures. The coarse portion Category 1 FRAP from a friction SMA source will be permitted up to 25% in binder, surface, or surface friction course SMA, as long as it meets Micro-Deval criteria. When used in SMA mixtures containing RAS, or RAS and fine portion Category 1 FRAP, the amount of coarse portion Category 1 FRAP shall be to maintain the binder replacement 50 percent or less. When used in SMA mixtures containing fine portion Category 1 FRAP with no RAS, the amount of coarse portion Category 1 FRAP shall be to maintain the binder replacement of the mix design at 30 percent or less.

The fine portion Category 1 FRAP having a minimum average asphalt content of 6.0 percent by weight shall be permitted at a maximum of 20 percent.

(d) Asphalt Binder (AB). At the contractor's option, the contractor shall use a SBS/SBR polymer, a terminal blend ground tire rubber (GTR), or a dry process GTR to modify the asphalt mixture. The asphalt binder requirements for the mixture will vary depending upon the amount and type of recycled asphalt binder contained in the mix design. This table summarizes these requirements:

Reclaimed Material	Binder Replacement, %	Asphalt Binder Options
Category 1 FRAP only	0 - 20	SBS/SBR PG 76-22 GTR PG 76-22 PG 64-22 10% Dry GTR
Category 1 FRAP only or with RAS	21 to 30	SBS/SBR PG 70-28 GTR PG 70-28 PG 58-28 10% Dry GTR
Category 1 FRAP & RAS	31 - 50	SBS/SBR PG 64-34 GTR PG 64-34 PG 52-34[1] 10% Dry GTR

1/ PG 46-34 shall be considered an equivalent to PG 52-34

The asphalt binder modification technology shall be on the Illinois Tollway's Approved List of Stone Matrix Asphalt Modification Technologies.

(1) SBS/SBR PG 76-22, PG 70-22, PG 70-28, or PG 64-34 Binder. The SBS/SBR PG 76-22, PG 70-22, PG 70-28 or PG 64-34 binder shall meet the requirements of Article 1032.05(b) of the Standard Specifications. In addition, the elastic recovery of the Asphalt Binder used shall be a minimum of 80.

(2) Terminal Blend GTR Binder. The base asphalt binder that is blended with the GTR shall be a performance-grade (PG) binder that is at least two high temperature grades lower than the required high temperature grade, as based on the recycled binder type and amount included in the mix design. The required base PG binder shall meet the requirements of Article 1032.05 of the Standard Specifications. The GTR shall be produced from processing automobile and/or truck tires by the ambient grinding method. Heavy equipment tires, uncured or de-vulcanized rubber will not be permitted. The GTR shall not exceed 1/16 in. in length and shall contain no free metal particles. Detection of free metal particles shall be determined by thoroughly passing a magnet through a 2 oz. sample. Metal embedded in rubber particles will be permitted.

The GTR shall be stored in a dry location protected from the rain. When the GTR is combined with the asphalt cement, the moisture content of the GTR shall not cause foaming of the blend.

When tested in accordance with Illinois-modified AASHTO T-27, a 2 oz. sample of the GTR shall conform to the following gradation requirements:

Sieve Size	Percent Passing
No. 8 (2.36 mm)	100
No. 16 (1.18 mm)	98 ± 2
No. 30 (600 μm)	95 ± 5
No. 50 (300 μm)	50 ± 10
No. 100 (150 μm)	10 ± 5
No. 200 (75 μm)	2 ± 2

A mineral powder (such as talc) meeting AASHTO M17, Mineral Filler for Bituminous Paving Mixtures, requirements may be added, up to a maximum of 4% by weight of GTR particles, to reduce sticking and caking of the GTR particles.

GTR shall have a specific gravity of 1.15 ± 0.05 when tested in accordance with ASTM D-1817, Standard Test Method for Rubber Chemicals-Density.

Extender Oils or Polymeric Additions. With approval of the Engineer, compatible extender oils and/or polymers may be added to the GTR or if the material is compounded into a homogenous blend before the modification additive is added to the asphalt. The additional costs for the extender oils and/or polymer additions shall be borne by the Contractor. The Contractor shall provide material product information along with usage rates for approval.

The GTR blended asphalt shall comply with the specified PG Grade in accordance Table 1 of Article 1032.05 (b) of the Standard Specifications with exception to the Tests on Residue from Rolling Thin Film Oven Test (AASHTO T 240), and separation of polymer test. Dynamic Shear Rheometer tests shall use a 2.00mm gap for 25mm plates. In addition, the elastic recovery shall be a minimum of 75.

(3) Dry Process GTR. The base asphalt binder that is used in a dry process GTR mix shall be a performance-grade (PG) binder as based on the recycled binder type and amount included in the mix design. The required base PG binder shall meet the requirements of Article 1032.05 of the Standard Specifications.

The dry process GTR shall be produced from processing automobile and/or truck tires by ambient or cryogenic grinding methods. Heavy equipment tires, uncured or de-vulcanized rubber will not be permitted. The GTR shall not exceed 1/20 in. in diameter and shall contain no free metal particles. Detection of free metal particles shall be determined by thoroughly passing a magnet through a 2 oz. sample. Metal embedded in rubber particles will be permitted.

The dry process GTR shall be packaged and shipped in closed-top, water resistant bulk bags. The dry process GTR bags shall be stored in a dry location protected from the rain before use in the field. When the GTR is combined with the asphalt cement and aggregate, the moisture content of the GTR shall not cause foaming of the blend.

When tested in accordance with Illinois-modified AASHTO T-27, a 2 oz. sample of the dry process GTR shall conform to the following gradation requirements:

Sieve Size	Percent Passing
No. 20	100
No. 30 (600 μm)	99 ± 1
No. 40 (300 μm)	60 ± 10
No. 100 (150 μm)	10 ± 5

A mineral powder (such as talc) meeting AASHTO M17, Mineral Filler for Bituminous Paving Mixtures, requirements may be added, up to a maximum of 4% by weight of GTR particles in order to reduce sticking and caking of the GTR particles.

The dry process GTR shall have a specific gravity of 1.15 ± 0.05 when tested in accordance with ASTM D-1817, Standard Test Method for Rubber Chemicals-Density.

No extender oils or polymeric additions (elastomers, plastomers) shall be included in the dry process GTR.

(e) Warm Mix Additives / Processes. The warm mix technology used shall be on the Illinois Tollway's Approved List of Warm-Mix Asphalt (WMA) Technologies. A recognized additive / process with at least three successful projects constructed nationally or internationally that allow for a reduction in the temperature at which the SMA mixtures are produced and placed. Warm mix additives/processes that may be considered for Illinois Tollway approval and Contractor use include the following:

(1) Organic Additives (requiring minor plant modifications)

(2) Chemical Additives (requiring minor plant modifications)

(3) Water Injection Foaming Processes

For SMA containing RAS or more than 20 percent binder replacement, a chemical additive shall be used as the WMA technology.

Equipment.

Sections 406 and 1030 of the Standard Specifications shall govern the requirements for equipment; the preparatory work; mix design criteria; and the preparation, transportation, placement and compaction of SMA mixtures, except as modified herein.

Add the following to the list of specific references to Article 406.03 of the Standard Specifications.

Material Transfer Device ..... Illinois Tollway special provision for Material Transfer Device

RAP Processing Equipment ..... Illinois Tollway special provision for Reclaimed Asphalt Pavement"

Rollers. The Contractor shall provide a minimum of two steel-wheeled tandem rollers for breakdown (TB) or two 3-wheeled rollers (3W), and one finish steel-wheeled roller (TF)

meeting the requirements of Articles 406.07 and 1101.01(e) of the Standard Specifications except the minimum compression for all of the rollers shall be 315 lb/in.

Upon approval of the Engineer, the Contractor may use a vibratory roller for the first 2 passes of the SMA. The vibratory roller (V_D) shall meet the requirements of Articles 406.07 and 1101.01(e) of the Standard Specifications and be operated at high frequency and low amplitude.

Pneumatic-tired rollers will not be permitted.

Plant Requirements.

(a) Asphalt Cement.

(1) SBS/SBR Polymerized PG 76-22, PG 70-22, PG 70-28, or PG 64-34 Binder. The polymer modified asphalt cement shall be shipped, maintained and stored at the mix plant according to the manufacturer's requirements. Polymer asphalt cement shall be placed in an empty tank and not blended with other asphalt cements.

(2) Terminal Blend GTR Binder. Terminal blend GTR binder shall be blended with the asphalt cement, forming a consistent, homogeneous blend, prior to being added to aggregates. The Terminal Blend GTR binder shall be blended and reacted with the asphalt cement at the asphalt refinery or terminal.
The GTR shall be blended with the asphalt cement and reacted for a minimum of 45 minutes at a temperature of 325°F to 375°F.

Terminal Processing and Storage

(i) At the asphalt production facility for Terminal Processing, a separate agitated storage tank shall be required, with continuous mixing and recirculation of the asphalt-rubber blend to react the GTR with the asphalt cement. This tank shall be heated and capable of maintaining the temperature of the homogeneous blend of asphalt cement and GTR at 325°F to 375°F for a minimum of 45 minutes.

(ii) Once the Terminal Processing of GTR and asphalt cement produces a homogeneous blend at the production facility, test samples shall be obtained by the Illinois Tollway for testing.

(iii) Terminal Blended GTR modified asphalt may be stored at the asphalt production facility for up to 30 days at 300°F to 350°F with continuous mixing.

(iv) If Terminal Blended GTR modified asphalt cement is used, a dedicated storage tank for "terminal blended GTR" shall be required at the hot mix plant. The GTR binder shall be placed in an empty tank and not blended with other asphalt cements. This tank shall be equipped with a mechanical agitator, capable of providing continuous mixing and/or recirculation of the asphalt-rubber blend. This tank shall be heated and capable of maintaining the temperature of the homogeneous blend of asphalt cement and GTR at 300°F to 350°F for a maximum of 3 days.

(v) During SMA production, monthly random split samples of the GTR asphalt shall be taken under Illinois Tollway supervision by the supplier from the port of the asphalt plant. The supplier shall submit the samples to both to the Illinois Tollway and to an independent ARML certified lab for testing to certify specification compliance.

The type of plant used for the manufacture of SMA mixtures may be either a batch or drier drum plant meeting the requirements of Article 1102.01 of the Standard Specification, with the following exceptions:

(b) Mineral Filler System. The mineral filler system shall accurately proportion the large amounts of mineral filler required for the mixture. Alteration or adjustment of the current system may be required. Positive dust control must be used.

(c) Fiber Additive. Adequate dry storage shall be provided for the fiber additive of any type. A separate feed system shall be provided to proportion the fiber into the mixture uniformly and in desired quantities. The feed system shall be interlocked with the aggregate feed or weigh system to maintain the correct proportions for all rates of production and batch sizes. The proportion of fibers shall be controlled accurately to within $\pm$ 10% of the amount of fibers required. Flow indicators or sensing devices for the fiber system shall be provided and interlocked with plant controls so mix production shall be interrupted if fiber introduction fails.

(1) Batch Plant. Loose fiber shall be pneumatically added through a separate inlet directly into the weigh hopper above the pugmill. The addition of fiber shall be timed to occur during the hot aggregate charging of the hopper. Adequate mixing time will be required to ensure proper blending of the aggregate and fiber additive. Both the wet and dry mixing times shall each be increased a minimum of 5 seconds. The actual mixing time increase shall be determined by the Engineer based on individual plant characteristics. The batch size shall not exceed 75% of pugmill size as rated by IDOT.

(2) Drum Mix Plant. Loose fiber shall be introduced using specialized equipment which mixes asphalt cement with the loose fiber at the time of introduction into the drum mixer. This equipment shall be approved by the Engineer. Care shall be taken to ensure the loose fiber does not become entrained in the exhaust system of the drier or plant.

(3) Fiber Supply System: When fiber stabilizing additives are required as an ingredient of the mixture, a separate feed system shall be utilized to accurately proportion by weight the required quantity into the mixture in such a manner that uniform distribution will be obtained. The fiber system shall be interlocked with the aggregate feed or weigh system so as to maintain the correct proportions for all rates of production and batch sizes. The proportion of fibers shall be controlled accurately to within plus or minus 10 percent of the amount of fibers required and the fiber system shall automatically adjust the feed rate to maintain the material within this tolerance at all times. The fiber system shall provide in-process monitoring consisting of either a digital display or output or a printout of feed rate, in pounds per minute to verify feed rate. Flow indicators or sensing devices for the fiber system shall be provided

and interlocked with plant controls so that mixture production will be interrupted if introduction of the fiber fails, or if the output rate is not within the tolerances given above.

When a batch type plant is used, the fiber shall be added to the aggregate in the weigh hopper or as approved and directed by the Engineer. The fibers are to be uniformly distributed prior to the injection of asphalt cement into the mixes.

When a continuous or drier-drum type plant is used, the fiber shall be added to the aggregate and uniformly dispersed prior to the injection of asphalt cement. The fiber shall be added in such a manner that it will not become entrained in the exhaust system of the drier or plant.

(d) Dry process GTR. Dry process GTR shall be controlled with a feeder system using a proportioning device that is accurate to within ± 3 percent of the amount required. The system shall automatically adjust the feed rate to maintain the material within this tolerance at all times, and shall have a convenient and accurate means of calibration. The system shall provide in-process monitoring, consisting of either a digital display of output or a printout of feed rate, in pounds per minute, to verify feed rate. The supply system shall report the feed in 1 lb increments using load cells that will enable the user to monitor the depletion of the GTR. Monitoring the system volumetrically will not be allowed. The feeder shall interlock with the aggregate weigh system and asphalt binder pump to maintain the correct proportions at all production rates.

Flow indicators or sensing devices for the system shall be interlocked with the plant controls to interrupt the mixture production if the GTR introduction output rate is not within the ±3 percent tolerance given above. This interlock will immediately notify the operator if the targeted rate exceeds introduction tolerances. All plant production will cease if the introduction rate is not brought back within tolerance after 30 seconds. When the interlock system interrupts production and the plant has to be restarted, upon restarting operations; the modifier system shall run until a uniform feed can be observed on the output display. All mix produced prior to obtaining a uniform feed shall be rejected.

With a drum mixing plant, introduce the dry process GTR prior to the injection of asphalt cement. The point of introduction in the drum mixer will be approved by the Engineer prior to production. Ensure the GTR will not become entrained in the exhaust system of the drier or plant and will not be exposed to the drier flame at any point after induction.

During operations, the asphalt plant shall record feed records daily from the feeder unit for the purposes of verifying dry process GTR inputs into the process.

(e) Warm Mix Additives/Processes. When a mix is produced using an approved warm mix asphalt technology, the asphalt mixing plant shall be modified as required by the additive or process manufacturer to introduce the technology and produce a WMA SMA mixture meeting the volumetric properties specified herein. Plant modifications may include additional plant instrumentation, the installation of asphalt binder foaming systems and/or WMA additive delivery systems, tuning the plant burner and adjusting the flights in order to operate at lower production temperatures and/or reduced tonnage.

All metering devices will meet the current IDOT requirement for liquid or mineral additives. Document the integration of plant controls and interlocks when using WMA additive metering devices.

(f) General

(1) Storage and Conveyance. Silo storage of SMA shall not exceed 6 hours. SMA containing steel slag aggregate shall have a minimum of two hour silo storage.

(2) Plant modification. The use of GTR modified asphalt may require additional plant modifications. The Engineer will have final approval of the plant.

(3) Plant Calibration. The asphalt plant shall be calibrated and approved by The Illinois Department of Transportation Bureau of Materials and Physical Research or the Illinois Tollway before production of the SMA.

Mix Design. The Contractor will provide mix designs for each type of required mixture. Mix designs shall be developed by a QC/QA Level III Technician in accordance with all IDOT mix design procedures and the following:

The draindown shall be determined at the Job Mix Formula asphalt binder content at 350°F mixing temperature. Draindown shall be measured using AASHTO T 305.

The SMA mix designer shall determine to what extent an additive is needed in the SMA mix to prevent stripping. The determination will be made on the basis of moisture sensitivity testing (IL Modified AASHTO T 283) on production ingredient materials sampled at the HMA plant. The results will inform the contractor of the amount or type of anti-strip additive in the SMA mix based on the following minimums that apply to any mix design: 1) have a conditioned tensile strength of 115 psi or better with no TSR requirements, or 2) have a conditioned tensile strength of 100 psi or better with a TSR of at least 0.85, or 3) no visual stripping of the coarse or fine aggregate in the broken faces shall be observed.

The additive may be hydrated lime, slaked quicklime, or a liquid additive, at the Contractor's option.

If Dry Process GTR is to be used, GTR binder to be used for the mix design shall be produced by adding the dry process GTR to the required PG binder preheated to 350°F, and blending using a high shear blender operating at 3,000 rpm for 30 minutes.

Each specific SMA mixture design shall be submitted to and verified by the Illinois Tollway as detailed in IDOT's current "Hot-Mix Asphalt Mixture Design Verification Procedure". The Contractor shall submit samples of all appropriate mixture design verification materials to the Illinois Tollway at least two weeks prior to production. Each specific SMA mixture design without the use of a WMA technology shall be identified as the HMA SMA mix design for the specific mix type.

The Contractor shall supply the average gradation and the gradation ranges (including the Master Band on the critical sieve, if required) for each aggregate designated for use in the mixture.

The Gsb of the fine portion of fractionated RAP, if used, shall be determined as defined in the contract special provision for Reclaimed Asphalt Pavement.

The mix design shall meet the following Gyratory Design (80-Gyration) parameters:

Design Air Voids	3.5 % @ 80 Gyrations
VFA	75-85%
VMA - for specific gravity of coarse aggregate < 2.76 VMA for specific gravity of coarse aggregate ≥ 2.76	16.0 % minimum 17.0 % minimum
Draindown (%)	0.3 maximum

The surface friction, surface and binder mixture gradation shall be according to the requirements in the following table for the mixture specified on the plans.

Stone Matrix Asphalt Gradation

Mixture Gradation Target Value Range		
Sieve	Percent Passing	
	IL-12.5 mm	IL-9.5 mm
3/4” (19.0 mm)	100	
1/2" (12.5 mm)	82 – 100	100
3/8” (9.5 mm)	65 max	90 – 100
No. 4 (4.75 mm)	20 – 30	36 – 50
No. 8 (2.36 mm)	16 – 24	16 – 32
No. 30 (600 μm)	12 – 16	12 – 18
No. 50 (300 μm)	10 – 15	
No. 200 (75μm)	8 – 10	7.5 – 9.5

The mixture design for the WMA SMA shall be developed based on a lab produced HMA SMA mix design modified as a WMA SMA mix design through trial batch production of the WMA mixture and test strip placements. The original HMA SMA mix design to be modified shall be designed and submitted to the Engineer without including the WMA additive or technology. When a WMA SMA using an additive is to be used, document the additive used and recommend the dosage rate on a resubmittal of the original HMA SMA mix design that is to be modified as a WMA mix design. The Illinois Tollway Engineer and Contractor will verify the original HMA SMA mix design with any WMA technology use based on plant produced samples taken from the WMA test strip. A field TSR test will be performed on a production sample of the proposed WMA SMA mix and compared to the HMA SMA TSR value. Any mix design

adjustments needed will apply to the finalization of the WMA SMA binder, surface, or surface friction course mix design.

In addition to the HMA SMA mix design, for WMA SMA mix designs proposed using organic or chemical additives, Hamburg Wheel testing according to Illinois Modified AASHTO T324 shall be conducted on a laboratory mixed sample at the recommended WMA additive dosage rate. The Hamburg Wheel testing requirements from this sample are a maximum of 6 mm rut depth at 20,000 passes. Also, WMA SMA mix designs proposed shall also conduct a Disk-Shaped Compact Tension Test (DCT) test per ASTM D7313. The result of the DCT test shall greater than 600 J/m^2 when tested at -12°C. The DCT test shall be performed by an AASHTO accredited laboratory.

For any WMA SMA mix design, additional draindown testing of the WMA SMA test strip sample will be required. The minimum TSR requirement shall be 0.85 for the design and production tests. Any mix design adjustments needed will apply to the development of WMA SMA mix design. The final design for the WMA SMA mix design shall be submitted for approval with the following information included:

1) All information required for HMA SMA mix design.
2) WMA technology and/or WMA additives information.
3) WMA technology manufacturer's established recommendations for usage.
4) WMA technology manufacturer's established target rate for water and additives, the acceptable variation for production, and documentation showing the impact of excessive production variation.
5) WMA technology material safety data sheets (MSDS).
6) Documentation of at least 3 past WMA technology field applications including project type, project owner, tonnage, location, mix design, mixture volumetrics, field density, and performance.
7) Temperature range for mixing.
8) Temperature range for compacting.
9) Asphalt binder performance grade test data over the range of WMA additive percentages proposed for use.
10) WMA mixture QC/QA test results measured from the test strip samples specific to the Contractor's proposed WMA technology.
11) Laboratory test data, samples and sources of all mixture components, and asphalt binder viscosity-temperature relationships.
12) Lab and/or production TSR results for WMA SMA mix.

The Illinois Tollway may accept an existing SMA mixture design with a WMA technology previously used on an Illinois Tollway project and may waive the test strip trial batch required to verify the WMA SMA mix design.

CONSTRUCTION REQUIREMENTS

Weather Requirements. The SMA mixtures shall be placed on a dry surface and when the temperature of the roadbed is above 50°F, and when the ambient air temperature in the shade is at least 50°F and rising unless the SMA mixture is produced using an approved WMA technology. The WMA SMA binder mixtures shall be placed on a dry and clean surface when the temperature of the roadbed is above 40°F, and when the ambient air temperature in the shade is at least 32°F and rising. The WMA SMA surface or surface friction mixtures shall be

placed on a dry and clean surface when the temperature of the roadbed is above 40°F and when the ambient air temperature in the shade is 35°F and rising.

Mix Production. SMA mixtures with a WMA technology shall be produced at a temperature range recommended by the technology manufacturer and verified through a QC/QA mixture test strip. It may be necessary to initially produce HMA mixes at conventional HMA temperatures immediately before WMA production at lower temperatures in order to prime the plant for proper operating temperatures.

When new equipment is provided for adding fibers or RAS into the mix, a representative from supplier/manufacturer of the equipment shall be present for calibration and first day of production (test strip).

When using GTR in the mix, the Contractor shall ensure that a Technical Representative from the GTR supplier is present during the first day of production and placement of a WMA SMA.

A WMA QC/QA mixture test strip will be required. The test strip shall be constructed at a location approved by the Engineer to determine the mix properties, density, and laydown characteristics. These test results and visual inspections on the mixture shall be used to make corrective adjustments if necessary. A field TSR test of the mix produced for any WMA SMA test strip will be required.

Prior to the start of mix production and placement, The Engineer will review and approve all test strip results and rolling pattern.

The test strip will be performed as follows:

(a) Team Members. The start-up team, if required, shall consist of the following:

(1) Resident Engineer
(2) Illinois Tollway Project Manager, or representative
(3) Illinois Tollway Materials Engineer, or representative
(4) Construction Manager’s Nuclear Density Gauge Specialist
(5) Contractor's QC Manager
(6) Construction Manager’s QA representative
(7) Contractor’s QC technician
(8) AC Supplier representative (Required for GTR, optional for other types)
(9) Illinois Tollway Independence Assurance Engineer

(b) Communication. The Contractor shall advise the team members of the anticipated start time of production for the test strip. The QC Manager shall direct the activities of the test strip team. An Illinois Tollway-appointed representative from the start-up team will act as spokesperson for the Illinois Tollway.

(c) The Test Strip shall consist of approximately 400 tons. It shall contain two growth curves which shall be compacted by a static steel-wheeled roller and tested as outlined herein.

(1) Mix Information. On the day of construction of the Test strip, the Contractor shall provide the start-up team documentation of test data showing the combined hot-

bin or the combined aggregate belt sample and mineral filler at a drier-drum plant.

(2) Mix and Gradation Test Strip Samples. The first and second sets of mixture and gradation samples shall be taken by the Contractor at such times as to represent the mixture between the two growth curves and the rolling pattern area, respectively. All test strip samples shall be processed by the Contractor for determination of mix composition and Superpave properties including air voids. This shall include washed gradation tests. This information shall then be compared to the JMF and required design criteria.

(3) Compaction Equipment. It shall be the responsibility of the start-up team to verify roller compliance before commencement of growth curve construction.

All paving and rolling equipment intended for use on a project shall be utilized on the test strip.

Upon approval of the Engineer, the Contractor may use a vibratory roller for the first 2 passes of the SMA. The vibratory roller (V_D) shall be operated at high frequency and low amplitude.

(4) Construction of the Test Strip. After the Contractor has produced the mix, transported the mix, and placed approximately 100 to 150 tons of mix, placement of the mix shall stop, and a growth curve shall be constructed. After completion of the first growth curve, paving shall resume for 50 to 100 tons of mix, placement shall stop, and the second growth curve shall be constructed within this area. Additional growth curves may be required if an adjustment/plant change is made during the test strip. The Contractor shall use the specified rolling procedures for all portions of the test strip except for the growth curve areas which shall be compacted as directed by the Engineer.

(5) Location of Test Strip. The test strip shall be located on a pavement type similar to the contract pavement and acceptable to the Engineer. It shall be on a relatively flat portion of the roadway. Descending/Ascending grades or ramps shall be avoided.

(6) Compaction Temperature. For WMA SMA mixtures, the temperature of the mix at the beginning of the growth curve shall be within the additive / process manufacturer's recommended temperature range for compaction, with the lowest compaction temperature no less than 250°F.

(7) Compaction and Testing. The QC Manager will specify the roller(s) speed and number of passes required to obtain a completed growth curve. The nuclear gauge shall be placed near the center of the hot mat and the position marked for future reference. With the bottom of the nuclear gauge and the source rod clean, a 15 seconds nuclear reading (without mineral filler) shall be taken after each pass of the roller. Rolling shall continue until the maximum density is achieved and three consecutive passes show no appreciable increase in density or no evidence of destruction of the mat. The growth curve shall be plotted.

(8) Evaluation of Growth Curves. Mixtures which exhibit density potential less than 94 percent or greater than 97 percent of the maximum theoretical density (D) shall be considered as sufficient cause for mix adjustment. If a mix adjustment is made, an additional test strip may be constructed. The Illinois Tollway will pay half the cost of the contract unit price for a test strip if additional one is required. The information shall then be compared to the AJMF and required design criteria.

If the nuclear density potential of the mixture does not exceed 91 percent, the operation will cease until all test data is analyzed or a new mix design is produced.

In addition, other aspects of the mixture, such as appearance, segregation, texture, or other evidence of mix problems, should be noted and corrective action taken at this time.

(d) Documentation. The Test Strip and rolling pattern information (including growth curves) will be tabulated by the contractor with copies provided to each team member, and the original submitted to the Engineer. Any change to the rolling pattern shall be approved by the Engineer. A letter, including mixture and density results, must be sent to the ISTHA Materials Engineer detailing the test strip mixture performance and any proposed changes to the JMF that the contractor wants to implement for the first day of full production. The ISTHA Materials Engineer will review all data and issue an acceptance or rejection of the Test Strip and changes to the JMF.

(e) Density. For acceptance, mat density shall be measured either by correlated nuclear gauge or from cores obtained by the Contractor at random locations. For SMA surface course containing steel slag aggregate, acceptance by coring may be required. The correlation coefficient ("r" value) for correlating nuclear gauge densities with core densities shall be greater than 0.85

(f) Tensile Strength Ratio (TSR). The WMA SMA mix shall be sampled and tested in accordance with AASHTO T 283 and comply with the following minimums: 1) have a conditioned tensile strength of 115 psi or better with no TSR requirements, 2) have a conditioned tensile strength of 100 psi or better with a TSR of at least 0.85, or 3) no visual stripping of the coarse or fine aggregate in the broken faces shall be observed. On the first day of production one split sample will be taken by the Contractor and compared with the samples taken from the test strip. If any TSR value falls below the minimums specified above, plant operations shall cease until corrective measures are taken. Should it become necessary for the Contractor to modify the SMA mix design due to low TSR values measured during field production or due to the occurrence of visual stripping during field production of the mix after the design tests indicated that the same mix met the aforementioned TSR minimum requirements, such work will be at no additional cost to the Illinois Tollway.

(g) Draindown. Draindown shall be measured using AASHTO T 305 on a sample obtained during production, and tested at the maximum recommended WMA production temperature. If the draindown of the production sample exceeds 0.3 percent, additional mix production shall not occur without a corrective action being submitted by the contractor and approved by the Engineer.

Placement and Compaction. Any modified SMA asphalt mixture produced with a WMA technology shall be placed at a minimum compaction temperature as recommended by the technology manufacturer after the WMA SMA test strip has been placed and tested. In no case shall SMA produced above 350°F be acceptable for placement.

The paver speed shall not exceed 25 ft/min during placement.

Compaction shall commence immediately after the mixture has been placed. Compaction for WMA SMA mixes shall be completed before the mix falls below the minimum WMA job mix design compaction temperature. Discontinue paving if the contractor is unable to achieve the specified density before the mixture cools below the minimum recommended WMA job mix design compaction temperature.

The addition of a non-foaming detergent to the roller water will be allowed to prevent sticking, if necessary.

During laydown, the contractor will determine the mat density in accordance with Illinois-modified ASTM D 2950, Standard Test Method for Determination of Density of Bituminous Concrete in Place by Nuclear Methods.

A Disk-Shaped Compact Tension Test DCT test per ASTM D7313 shall be performed on the 1st day of production following an accepted Test Strip. The result of the DCT test shall greater than 600 J/m^2 when tested at -12°C. The DCT test shall be performed by an AASHTO accredited laboratory.

Hauling/laydown Equipment. The Contractor shall provide a release agent that minimizes sticking to equipment and is acceptable to the Engineer. The Contractor shall furnish a laborer to ensure that all truck beds are clean and no excess release agent is used prior to being loaded. Do not use petroleum derivatives or other coating materials that contaminate or alter the characteristics of the SMA mix. All trucks shall be tarped when hauling the mixture to the paver.

Control Charts/Limits. Control charts/limits shall be according to QC/QA requirements except as follows:

Parameter	Individual Test	Moving Average
3/8 (9.5 mm)	± 4%	± 3%
No. 8 (2.36 mm)	± 4%	± 2%
Asphalt Content	± 0.2%	± 0.1%
Density	93.5 – 97.4%	
Air Voids	± 1.2% (of design)	± 1.0% (of design)

Opening To Traffic. Traffic will not be permitted on SMA until the temperatures of the mat has dropped below 140°F.

Penalties. The compacted SMA can be prone to bleeding or flushing if consistent production, delivery and placement do not occur. One or more of these factors has shown to cause this problem:

- Lack of mineral filler or fibers in the mix, at both production start-up and during mixture production switches between SMA and other HMA mixtures.
- Inconsistent delivery, often due to lack of trucks, causing delays in the paving operation.
- Excessive screed vibration.
- Overuse of release agents on paving equipment and trucks.
- Inconsistent mixture temperature.

The contractor shall address in the HMA QC Addendum the steps that will be taken to avoid this issue during construction. If bleeding or flushing occurs in any SMA course, regardless of the cause, areas of bleeding larger than one square foot within a five-foot length of pavement shall result in a deduction of 2 tons in the tonnage of SMA mixture measured for payment as specified. If bleeding or flushing occurs in any SMA course, regardless of the cause, areas of bleeding larger than 10 square feet within a five-foot length of pavement shall result in the entire area affected to be removed and replaced for the full width of the paving lane with a fresh SMA course mixture at no additional cost to the Illinois Tollway.

Pavement Surface Smoothness. The contractor shall provide smoothness testing of the finished construction asphalt surface according to the requirements of the Illinois Tollway Special Provision for Surface Smoothness Testing for Pavement, except where modified herein. Final acceptance shall be based on smoothness testing by the Illinois Tollway.

Acceptable Smoothness Limits. Each pavement segment shall be reported and compared to the acceptable smoothness limit based on International Roughness Index (IRI) and Localized Roughness (LR) as provided in the table below:

Pavement Surface	Maximum IRI (in/mi)	Maximum LR (in/mi)
Friction Course	80	125
Surface Course	80	125
Binder Course*	90	130
Ramp (design speed < 40 mph)	120	145
Ramp (design speed 40 to 50 mph)	110	140
Ramp (design speed > 50 mph)	100	135

*Only to be used if roadway is opened to traffic prior to placement of Friction or Surface Course

Corrective Actions. For each pavement segment that exceeds the maximum acceptable initial IRI value, there are two potential methods for proceeding:

(1) Remove and replace the pavement that exceeds the IRI limit, or
(2) Grind the segment to bring the IRI into conformance with the acceptable limits (without adversely affecting the required thickness of the pavement structure).

Either of the above options shall be applied to each rejectable segment as directed by the Engineer. Once remediation has been completed, smoothness testing will be performed again.

The Contractor shall notify the Engineer at least 24 hours prior to commencement of the corrective work. The Contractor shall not commence corrective work until the methods, procedures and limits have been approved in writing by the Engineer.

All smoothness corrective work shall be for the entire lane width. Pavement cross slope shall be maintained through areas where corrective action is performed.

Surface corrections shall be made prior to placing permanent pavement markings. In the event that permanent pavement markings are damaged or destroyed during corrective work, they will be replaced at no cost to the Illinois Tollway.

A sufficient length of pavement will be corrected to address areas of unacceptable smoothness without producing additional high or low points. Retesting of the segments after corrective action shall include the segment prior and four segments after the corrected segment.

The Engineer may require any portion of or the total project to be retested if the results provided by the Contractor are questioned. The Engineer will decide whether the Illinois Tollway, an independent testing firm, or the Contractor will retest the roadway surface.

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

Basis of Payment. This work will be paid at the contract unit price per ton for STONE MATRIX WARM MIX ASPHALT SURFACE FRICTION COURSE, IL12.5 N80, STONE MATRIX WARM MIX ASPHALT SURFACE COURSE, IL12.5 N80 and STONE MATRIX WARM MIX ASPHALT BINDER COURSE, IL-12.5 N80, STONE MATRIX WARM MIX ASPHALT SURFACE FRICTION COURSE, IL9.5 N80, STONE MATRIX WARM MIX ASPHALT SURFACE COURSE, IL9.5 N80 and STONE MATRIX WARM MIX ASPHALT BINDER COURSE, IL-9.5 N80.

The test strip will be paid for at the contract unit price per each for TEST STRIP (WMA STONE MATRIX ASPHALT), which price shall not include the 400 tons of mix, as well as the appropriate testing, which will be paid for at the unit price in the contract for the item being placed. If an additional test strip is required due to a mixture change, the additional test strip will be paid for in accordance with Article 406.14 of the Standard Specifications.

Pay Item Number	Designation	Unit of Measure
JI406046	STONE MATRIX WMA BINDER COURSE, IL-12.5, N80	TON
JI406048	STONE MATRIX WMA SURFACE FRICTION CSE, IL-12.5, N80	TON
JI406056	TEST STRIP (WMA STONE MATRIX ASPHALT)	EACH

ASPHALT MIXTURE IL-4.75 (Illinois Tollway)

Effective: December 11, 2017
Revised: January 18, 2018

Description. This work shall consist of constructing either a Hot-Mix Asphalt (HMA) or warm mix asphalt (WMA) surface course or leveling binder with an IL-4.75 mixture except as modified by the Illinois Tollway special provision for Asphalt Binder and Surface Course Mixtures. When WMA pay items are required by design, an HMA mix may be utilized for special or low tonnage application in lieu of WMA mixtures upon approval by the Engineer at no additional cost to the Illinois Tollway. When HMA pay items are required by design, a WMA mix may be utilized for special or low tonnage application in lieu of an HMA mixture upon approval by the Engineer at no additional cost to the Illinois Tollway. Work shall be according to Sections 406, 1030 and 1032 of the Standard Specifications except as modified herein.

Materials. Add the following to Article 406.02 of the Standard Specifications:

"(d) Warm Mix Additives / Processes. When a warm mix technology is specified or permitted, the warm mix technology used shall be a recognized additive / process with successful project(s) constructed nationally or internationally that allow for a reduction in the temperature at which the HMA is produced and placed. Warm mix additives/processes that may be considered for Illinois Tollway approval and Contractor use include the following:

(1) Organic Additives (requiring minor plant modifications)

(2) Chemical Additives (requiring minor plant modifications)

(3) Water Injection Foaming Processes (requiring major plant modifications)

The Contractor shall ensure that a Technical Representative from the approved warm mix asphalt additive or process manufacturer is present during the first day of production and placement with warm mix technology."

For IL-4.75 mixture containing more than 20 percent binder replacement, a chemical additive shall be used as the WMA technology.

Revise the first paragraph of Article 1003.03(b) of the Standard Specifications to read:

"(b) The fine aggregate quality shall be Class B. The total minus No. 200 (75 μm) material in the mixture shall be free from organic impurities."

Revise the first paragraph of Article 1003.03(c) of the Standard Specifications to read:

"(c) Gradation. The fine aggregate gradation for IL-4.75 shall be FA 1, FA 2, FA-20, or FA-22."

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

"(c) Reclaimed Asphalt Pavement (RAP) Material. Only processed RAP over a 3/8 in. (9.5 mm) or smaller screen will be permitted in the 4.75 mm mix.

Revise Article 1030.02(d) of the Standard Specifications to read:

"(d) Mineral Filler. Mineral filler shall conform to the requirements of Article 1011.01 of the Standard Specifications."

Asphalt Binder (AB).

At the contractor's option, the contractor shall use a SBS/SBR polymer, a terminal blend ground tire rubber (GTR), or a dry process GTR to modify the asphalt mixture. The asphalt binder requirements for the mixture will vary depending upon the amount and type of recycled asphalt binder contained in the mix design. This table summarizes these requirements:

Reclaimed Material	Binder Replacement, %	Asphalt Binder Options
Category 1 or 2 FRAP and RAS	Less than 20	SBS/SBR PG 76-22 GTR PG 76-22 PG 64-22 10% Dry GTR
	21 to 30	SBS/SBR PG 70-28 GTR PG 70-28 PG 58-28 10% Dry GTR
Category 1 FRAP and RAS	31- 50	SBS/SBR PG 64-34 GTR PG 64-34 PG 52-34[1] 10% Dry GTR

1/ PG 46-34 will be allowed in lieu of PG 52-34

The asphalt binder modification technology shall be on the Illinois Tollway's Approved List of Stone Matrix Asphalt Modification Technologies.

(1) SBS/SBR PG 76-22, PG 70-22, PG 70-28 Binder, or PG 64-34 Binder. The SBS/SBR PG 76-22, PG 70-22, PG 70-28 or PG 64-34 binder shall meet the requirements of Article 1032.05(b) of the Standard Specifications. In addition, the elastic recovery of the Asphalt Binder used shall be a minimum of 80.

(2) Terminal Blend GTR Binder. The base asphalt binder that is blended with the GTR shall be a performance-grade (PG) binder that is at least two high temperature grades lower than the required high temperature grade, as based on the recycled binder type and amount included in the mix design. The required base PG binder shall meet the requirements of Article 1032.05 of the Standard Specifications. The GTR shall be produced from processing automobile and/or truck tires by the ambient grinding method. Heavy equipment tires, uncured or de-vulcanized rubber will not be permitted. The GTR shall not exceed 1/16 in. in length and shall contain no free metal particles. Detection of free metal particles shall be determined by thoroughly passing a magnet through a 2 oz. sample. Metal embedded in rubber particles will be permitted.

The GTR shall be stored in a dry location protected from the rain. When the GTR is combined with the asphalt cement, the moisture content of the GTR shall not cause foaming of the blend.

When tested in accordance with Illinois-modified AASHTO T-27, a 2 oz. sample of the GTR shall conform to the following gradation requirements:

Sieve Size	Percent Passing
No. 8 (2.36 mm)	100
No. 16 (1.18 mm)	98 ± 2
No. 30 (600 μm)	95 ± 5
No. 50 (300 μm)	50 ± 10
No. 100 (150 μm)	10 ± 5
No. 200 (75 μm)	2 ± 2

A mineral powder (such as talc) meeting AASHTO M17, Mineral Filler for Bituminous Paving Mixtures, requirements may be added, up to a maximum of 4% by weight of GTR particles, to reduce sticking and caking of the GTR particles.

GTR shall have a specific gravity of 1.15 ± 0.05 when tested in accordance with ASTM D-1817, Standard Test Method for Rubber Chemicals-Density.

Extender Oils or Polymeric Additions. With approval of the Engineer, compatible extender oils and/or polymers may be added to the GTR or if the material is compounded into a homogenous blend before the modification additive is added to the asphalt. The additional costs for the extender oils and/or polymer additions shall be borne by the Contractor. The Contractor shall provide material product information along with usage rates for approval.

The GTR blended asphalt shall comply with the specified PG Grade in accordance Table 1 of Article 1032.05 (b) of the Standard Specifications with exception to the Tests on Residue from Rolling Thin Film Oven Test (AASHTO T 240), and separation of polymer test. Dynamic Shear Rheometer tests shall use a 2.00mm gap for 25mm plates. In addition, the elastic recovery shall be a minimum of 75.

(3) Dry Process GTR. The base asphalt binder that is used in a dry process GTR mix shall be a performance-grade (PG) binder as based on the recycled binder type and amount included in the mix design. The required base PG binder shall meet the requirements of Article 1032.05 of the Standard Specifications.

The dry process GTR shall be produced from processing automobile and/or truck tires by ambient or cryogenic grinding methods. Heavy equipment tires, uncured or de-vulcanized rubber will not be permitted. The GTR shall not exceed 1/20 in. in diameter and shall contain no free metal particles. Detection of free metal particles shall be determined by thoroughly passing a magnet through a 2 oz. sample. Metal embedded in rubber particles will be permitted.

The dry process GTR shall be packaged and shipped in closed-top, water resistant bulk bags. The dry process GTR bags shall be stored in a dry location protected from the rain before use in the field. When the GTR is combined with the asphalt cement and aggregate, the moisture content of the GTR shall not cause foaming of the blend.

When tested in accordance with Illinois-modified AASHTO T-27, a 2 oz. sample of the dry process GTR shall conform to the following gradation requirements:

Sieve Size	Percent Passing
No. 20	100
No. 30 (600 μm)	99 ± 1
No. 40 (300 μm)	60 ± 10
No. 100 (150 μm)	10 ± 5

A mineral powder (such as talc) meeting AASHTO M17, Mineral Filler for Bituminous Paving Mixtures, requirements may be added, up to a maximum of 4% by weight of GTR particles in order to reduce sticking and caking of the GTR particles.

The dry process GTR shall have a specific gravity of 1.15 ± 0.05 when tested in accordance with ASTM D-1817, Standard Test Method for Rubber Chemicals-Density.

No extender oils or polymeric additions (elastomers, plastomers) shall be included in the dry process GTR.

Plant Requirements.

(a) Asphalt Cement.

(1) SBS/SBR Polymerized PG 76-22, PG 70-22, PG 70-28 or PG 64-34 Binder. The polymer modified asphalt cement shall be shipped, maintained and stored at the mix plant according to the manufacturer's requirements. Polymer asphalt cement shall be placed in an empty tank and not blended with other asphalt cements.

(2) Terminal Blend GTR Binder. Terminal blend GTR binder shall be blended with the asphalt cement, forming a consistent, homogeneous blend, prior to being added to aggregates. The Terminal Blend GTR binder shall be blended and reacted with the asphalt cement at the asphalt refinery or terminal.
The GTR shall be blended with the asphalt cement and reacted for a minimum of 45 minutes at a temperature of 325°F to 375°F.

Terminal Processing and Storage

(i) At the asphalt production facility for Terminal Processing, a separate agitated storage tank shall be required, with continuous mixing and recirculation of the asphalt-rubber blend to react the GTR with the asphalt cement. This tank shall be heated and capable of maintaining the temperature of the homogeneous

blend of asphalt cement and GTR at 325°F to 375°F for a minimum of 45 minutes.

(ii) Once the Terminal Processing of GTR and asphalt cement produces a homogeneous blend at the production facility, test samples shall be obtained by the Illinois Tollway for testing.

(iii) Terminal Blended GTR modified asphalt may be stored at the asphalt production facility for up to 30 days at 300°F to 350°F with continuous mixing.

(iv) If Terminal Blended GTR modified asphalt cement is used, a dedicated storage tank for "terminal blended GTR" shall be required at the hot mix plant. The GTR binder shall be placed in an empty tank and not blended with other asphalt cements. This tank shall be equipped with a mechanical agitator, capable of providing continuous mixing and/or recirculation of the asphalt-rubber blend. This tank shall be heated and capable of maintaining the temperature of the homogeneous blend of asphalt cement and GTR at 300°F to 350°F for a maximum of 3 days.

(v) During IL-4.75 Level Binder production, monthly random split samples of the GTR asphalt shall be taken under Illinois Tollway supervision by the supplier from the port of the asphalt plant. The supplier shall submit the samples to both to the Illinois Tollway and to an independent ARML certified lab for testing to certify specification compliance.

The type of plant used for the manufacture of IL-4.75 Level Binder mixtures may be either a batch or drier drum plant meeting the requirements of Article 1102.01 of the Standard Specification, with the following exceptions:

(a) Mineral Filler System. The mineral filler system shall accurately proportion the large amounts of mineral filler required for the mixture. Alteration or adjustment of the current system may be required. Positive dust control must be used.

(b) Dry process GTR. Dry process GTR shall be controlled with a feeder system using a proportioning device that is accurate to within ± 3 percent of the amount required. The system shall automatically adjust the feed rate to maintain the material within this tolerance at all times, and shall have a convenient and accurate means of calibration. The system shall provide in-process monitoring, consisting of either a digital display of output or a printout of feed rate, in pounds per minute, to verify feed rate. The supply system shall report the feed in 1 lb increments using load cells that will enable the user to monitor the depletion of the GTR. Monitoring the system volumetrically will not be allowed. The feeder shall interlock with the aggregate weigh system and asphalt binder pump to maintain the correct proportions at all production rates.

Flow indicators or sensing devices for the system shall be interlocked with the plant controls to interrupt the mixture production if the GTR introduction output rate is not within the ±3 percent tolerance given above. This interlock will immediately notify the operator if the targeted rate exceeds introduction tolerances. All plant production will cease if the introduction rate is not brought back within tolerance after 30 seconds. When the interlock system interrupts production and the plant has to be restarted, upon

restarting operations; the modifier system shall run until a uniform feed can be observed on the output display. All mix produced prior to obtaining a uniform feed shall be rejected.

With a drum mixing plant, introduce the dry process GTR prior to the injection of asphalt cement. The point of introduction in the drum mixer will be approved by the Engineer prior to production. Ensure the GTR will not become entrained in the exhaust system of the drier or plant and will not be exposed to the drier flame at any point after induction.

During operations, the asphalt plant shall record feed records daily from the feeder unit for the purposes of verifying dry process GTR inputs into the process.

(c) Warm Mix Additives/Processes. When a mix is produced using an approved warm mix asphalt technology, the asphalt mixing plant shall be modified as required by the additive or process manufacturer to introduce the technology and produce a WMA IL-4.75 Level Binder mixture meeting the volumetric properties specified herein. Plant modifications may include additional plant instrumentation, the installation of asphalt binder foaming systems and/or WMA additive delivery systems, tuning the plant burner and adjusting the flights in order to operate at lower production temperatures and/or reduced tonnage.

All metering devices will meet the current IDOT requirement for liquid or mineral additives. Document the integration of plant controls and interlocks when using WMA additive metering devices.

(d) General

(1) Plant modification. The use of GTR modified asphalt may require additional plant modifications. The Engineer will have final approval of the plant.

(2) Plant Calibration. The asphalt plant shall be calibrated and approved by The Illinois Department of Transportation Bureau of Materials and Physical Research or the Illinois Tollway before production of the WMA.

Revise the second sentence of Note 3 of Article 1030.02 of the Standard Specifications to read:

"For mixtures with an Ndesign ≥ 90 and for mixture IL-4.75, at least 50 percent of the required fine aggregate fraction shall consist of either stone sand, slag sand, or steel slag meeting the FA/FM 20 gradation. When the 4.75 mix is used as leveling binder, steel slag sand will not be permitted."

Add the following to Article 1030.02 of the Standard Specifications:

(j) Recycled Asphalt Shingles (RAS). RAS may be used in an HMA IL-4.75 leveling binder mix. The percent to be added to the mix shall not exceed 5.0% of total mix.

Mixture design. Add the following to the list of Illinois Modified AASHTO references in Article 1030.04 of the Standard Specifications:

AASHTO T 305 Standard Method of Test for Determination of Draindown Characteristics in Uncompacted Asphalt Mixtures.

Add the following to Article 1030.04(a) of the Standard Specifications:

"(3) IL-4.75 Mixture. The Job Mix Formula (JMF) shall fall within the following limits

Sieve	Percent Passing
1/2 in. (12.5 mm)	100
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	90 - 100
No. 8 (2.36 mm)	70 - 90
No. 16 (1.18 mm)	50 - 65
No. 30 (600 μm)	35 - 55
No. 50 (300 μm)	15 - 30
No. 100 (150 μm)	10 -18
No. 200 (75 μm)	7 - 9
AB Content	7% to 9%

Add the following to Article 1030.04(b) of the Standard Specifications:

"(4) IL 4.75 Mixture.

Volumetric Parameter	Requirement
Design Air Voids	3.5 % at Ndesign 50
Voids in the Mineral Aggregate (VMA)	18.5% minimum
Voids Filled with Asphalt (VFA)	72 - 85%
Dust/AC Ratio	1.0
Density (% of Target Density)	95-102
Maximum Drain-down	0.3%

Hamburg Wheel (IL Mod AASHTO T324) – 15,000 passes with less than 9 mm rut depth Also, WMA IL-4.75 mix designs proposed shall also conduct a Disk-Shaped Compact Tension Test (DC(T)) test per ASTM D7313. The result of the DC(T) test shall greater than 450 J/m^2 when tested at -12°C. The DC(T) test shall be performed by an AMRL approved laboratory.

Mixture Production. Plant modifications may be required to accommodate the addition of higher percentages of mineral filler as required by the JMF.

During production, mineral filler shall not be stored in the same silo as collected dust. This may require any previously collected bag house dust in a storage silo prior to production of the IL-4.75 mixture to be wasted. Only metered bag house dust may be returned back directly to the

mix. Any additional minus No. 200 (75 μm) material needed to produce the IL-4.75 shall be mineral filler.

As an option, collected bag-house dust may be used in lieu of manufactured mineral filler, provided; 1) there is enough is available for the production of the IL-4.75 mix for the entire project and 2) a mix design was prepared with collected bag-house dust.

The mixture shall be produced within the temperature range recommended by the asphalt cement producer; but not less than 310°F.

The amount of moisture remaining in the finished mixture shall be less than 0.3 percent based on the weight of the test sample after drying.

Mixtures contain steel slag sand or aggregate having absorptions ≥ 2.5 percent shall have a silo storage plus haul time of not less than 1.5 hours.

Control Charts/Limits. Add the following to Control Limits table in Article 1030.04(d)(4) of the Standard Specifications:

Parameter	Individual Test	Moving Average
% Passing		
No. 16 (1.18 mm)	± 4%	± 3%
No. 200 (75 μm)	± 1.5%	± 1.0%
Asphalt Binder Content	± 0.3%	± 0.2%
Air Voids	± 1.2% (of design)	± 1.0% (of design)

Add the following to the Density Control Limits table in Article 1030.05(d)(4) of the Standard Specifications:

"DENSITY CONTROL LIMITS		
Mixture Composition	Parameter	Individual Test
IL-4.75 2/	Ndesign = 50	95-102% 2/

2/ The density of the IL-4.75 mixture shall be according to the following:

The Contractor shall perform a growth curve at the beginning of each day. QA shall be present for growth curve measurements. If an adjustment is made to the specific mix design, the Engineer reserves the right to request an additional growth curve and supporting tests at no additional cost to the Illinois Tollway.

Compaction of the growth curve shall commence immediately after the course is placed and at a temperature of not less than 300ºF. The growth curve, consisting of a plot of lb/cu ft. vs. number of passes with the project breakdown roller, shall be developed. This curve shall be established by use of a nuclear gauge. Tests shall be taken after each pass until the highest lb/cu ft. is obtained. This value shall be the target density provided the air voids are within acceptable limits. If air voids are not within the specified limits, corrective action shall be taken, and a new target density shall be established. A new growth curve is required if

the breakdown roller used on the growth curve is replaced with a new roller during production.

The target density shall apply only to the specific gauge used. If additional gauges are to be used to determine density specification compliance, the Contractor shall establish a unique minimum allowable target density from the growth curve location for each gauge. The Illinois Tollway will establish a target density for its Quality Assurance nuclear gauge from the growth curve location.

All lifts shall be compacted to an average density of not less than 95 percent nor greater than 102 percent of the target density obtained on the growth curve. The average density shall be based on tests representing one day's production.

Quality Control density tests shall be performed at randomly selected locations within ¼ mile intervals. In no case shall more than one half day's production be completed without density testing being performed.

If the Contractor is not controlling the compaction process and is making no effort to take corrective action, the operation shall stop as directed by the Engineer."

CONSTRUCTION REQUIREMENTS

Placing. Revise the table in Article 406.05(c) of the Standard Specifications to read:

Leveling Binder	
Nominal, Compacted, Leveling Binder Thickness, in. (mm)	Mixture Composition
≤ 1 1/4 (32)	IL-4.75, IL-9.5 or IL-9.5L
1 1/4 to 2 (32 to 50)	IL-9.5, IL-12.5, or IL-9.5L

Add the following to the end of the first paragraph of Article 406.05(c) of the Standard Specifications:

"Density requirements for IL-4.75 mixture shall apply when the nominal, compacted thickness is 3/4 in. (19 mm) or greater."

Revise the first and second paragraphs of Article 406.06(b) of the Standard Specifications to read:

"General. The mixture shall be placed on a clean, dry base and when weather conditions are suitable. To avoid blistering, the surface shall be dry for at least 24 hours prior to mixture placement. Work shall not begin when local conditions indicate rain is imminent. The mixture shall be placed when the temperature in the shade is at least 50ºF and the forecast is for rising temperatures. The HMA mixture temperature shall be 310 to 350ºF and shall be measured in the truck just prior to placement. The WMA mixture temperature shall be within the temperature range for placement recommended by WMA technology manufacturer, and shall be measured immediately behind the paver."

Compaction. Add the following after the first paragraph of Article 406.07(a) of the Standard Specifications:

"The compaction operation shall start immediately after the mixture has been placed. The Contractor shall provide a minimum of two steel-wheeled tandem rollers, two 3-wheeled rollers (3W) or combination for breakdown (T_B) and one finish steel-wheeled roller (T_F) meeting the requirements of Article 1101.01(e) of the Standard Specifications, except the minimum compression for all of the rollers shall be 280 lb/in. of roller width. Pneumatic-tired and vibratory rollers will not be permitted."

A Disk-Shaped Compact Tension Test DC(T) test per ASTM D7313 shall be performed on mixture taken from the 1st day of production of the IL-4.75 Level Binder following an accepted Test Strip. The result of the DC(T) test shall greater than 450 J/m^2 when tested at -12°C. The DCT test shall be performed by an AMRL approved laboratory.

Method of Measurement. This work will be measured in tons.

Basis of Payment. This work will be paid for at the contract unit price per ton for POLYMERIZED LEVELING BINDER (MACHINE METHOD), IL-4.75, N50 or POLYMERIZED WARM MIX LEVELING BINDER (MACHINE METHOD), IL-4.75, N50. 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
JI406064	POLYMERIZED WARM MIX LEVELING BINDER (MACHINE METHOD), IL-4.75, N50	TON

ASPHALT – TACK COAT (Illinois Tollway)

Revised: December 11, 2017

Effective: January 22, 2018

Description. This work shall consist of furnishing and applying bituminous tack coat material to exposed asphalt or concrete surfaces when constructing asphalt in multiple lifts or to existing pavement surfaces that are being overlaid. The work will be in accordance with Sections 406, 407, 1032, 1101, and 1102 of the Standard Specifications except as modified herein. Any references to HMA in the Standard Specifications or in this special provision shall be construed to include warm-mix asphalt (WMA) and stone matrix asphalt (SMA), as applicable.
Add the following to Note 1 of Article 406.02 of the Standard Specifications:

When ASPHALT TACK COAT (NON-TRACKING) is specified, the bituminous material used for tack coat shall be the SS-1vh type or a Tollway approved equivalent.

Revise Article 406.05(b) of the Standard Specifications to read:

"(b) Tack Coat. The bituminous material shall be prepared according to Article 403.05 and applied according to Article 403.10. The use of RC-70 shall be limited to air temperatures less than 60°F.

(1) Brick, Concrete or HMA Bases. The base shall be cleaned of all dust, debris and any substance that will prevent the tack coat from adhering to the base. Cleaning shall be accomplished by sweeping to remove all large particles and air blasting to remove dust. As an alternative to air blasting, a vacuum sweeper may be used to accomplish the dust removal. The base shall be free of standing water at the time of application. The tack coat shall be applied uniformly and at a rate that will provide a residual asphalt rate on the prepared surface as specified in the following table:

Type of Surface to be Tacked	Residual Asphalt Rate lb/sq ft.
Milled HMA, Aged Non-Milled HMA, Milled Concrete, Non-Milled Concrete & Tined Concrete	0.055
HMA Lifts, IL-4.75 & Brick	0.035

The bituminous material for the tack coat shall be placed one lane at a time. If a spray paver is not used, the tacked lane shall remain closed until the tack coat is fully cured and does not pick up under traffic. When placing tack coat through an intersection where it is not possible to keep the lane closed, the tack coat may be covered immediately following its application with fine aggregate mechanically spread at a uniform rate of 2 to 4 lb/sq yd.

(2) Aggregate Bases. The tack coat shall not be applied to aggregate bases.

The residual asphalt rate will be verified by the Tollway a minimum of once per week or 10,000 tons placed per type of mixture to be tacked as specified herein for which at least 2000 tons of HMA will be placed. The test will be according to the IDOT

"Determination of Residual Asphalt in Prime and Tack Coat Materials" test procedure. Residual asphalt rate shall be tested sufficiently to ensure proper application. If failing results are encountered, each application shall be tested until passing results are found. Payment deduction will be enforced for all pavement affected by failing results. A failing test applies to all areas from the beginning of the job or the most recent passing result. Payment for areas with less than required tack coat shall be applied according to the following table:

Tack Quantity less than Specified (lb/sq-ft)	Deduction from unit price of HMA lift above tack placement
0.001 – 0.010*	$1.00/ton
0.011 – 0.020*	$2.00/ton
0.021 – 0.030*	$5.00/ton
> 0.030*	Remove and replace HMA lift above tack placement at contractor's expense

*If tack quantity results are available before subsequent lift of HMA is placed, the contractor will have the opportunity to place additional tack in order to get the quantity within specification.

Tack coat shall be fully cured prior to placement of HMA to prevent pickup by haul trucks or paving equipment. If pickup occurs, paving shall cease in order to provide additional cure time, and all areas where the pickup occurred shall be repaired.

If after five days, loss of tack coat is evident prior to covering with HMA, additional tack coat shall be placed as determined by the Engineer at no additional cost to the Illinois Tollway."

Replace 406.14 of the Standard Specifications with the following:

"Basis of Payment. This work will be paid for at the contract unit price per pound of residual asphalt applied for ASPHALT TACK COAT, ASPHALT POLYMERIZED TACK COAT and ASPHALT TACK COAT (NON-TRACKING).

Pay Item Number	Designation	Unit of Measure
JI406107	ASPHALT TACK COAT	POUND

LONGITUDINAL JOINT SEALANT (Illinois Tollway)

Effective: January 18, 2018

Description. This work shall consist of providing and placing longitudinal joint sealant (LJS) on asphalt longitudinal construction joints. The LJS will be placed beneath paving lane joints as identified in the plans.

Materials. Longitudinal joint sealant (LJS) will be accepted according to the current IDOT Bureau of Materials and Physical Research Policy Memorandum, "Performance Graded Asphalt Binder Acceptance Procedure" with the following exceptions. Articles 3.1.9 and 3.4.1.4 of the policy memorandum will be excluded.

Add the following to Article 406.02 of the Standard Specifications.

"(d) Longitudinal Joint Sealant (LJS) (Note 2.)

Note 2. The bituminous material used for the LJS shall be according to the following table. Elastomers shall be added to a base asphalt and shall be either a styrene-butadiene diblock or triblock copolymer without oil extension, or a styrene-butadiene rubber. Air blown asphalt, acid modification, or other modifiers will not be allowed. LJS in the form of pre-formed rollout banding may also be used.

Test	Test Requirement	Test Method
Dynamic shear @ 82°C (unaged), G*/sin δ, kPa	1.00 min.	AASHTO T 315
Creep stiffness @ -18°C (unaged), Stiffness (S), MPa m-value	300 max. 0.300 min.	AASHTO T 313
Ash, %	1.0 - 4.0	AASHTO T 111
Elastic Recovery, 100 mm elongation, cut immediately, 25°C, %	65 min.	ASTM D 6084 (Procedure A)
Separation of Polymer, Difference in °C of the softening point (ring and ball)	3 max.	ITP Separation of Polymer from Asphalt Binder"

Add the following to Article 406.03 of the Standard Specifications.

"(j) Longitudinal Joint Sealant (LJS) Pressure Distributor (Note 2.)
(k) Longitudinal Joint Sealant (LJS) Melter Kettle (Note 3.)

Note 2. When a pressure distributor is used to apply the LJS, the distributor shall be equipped with a heating and recirculating system along with a functioning auger agitating system or vertical shaft mixer in the hauling tank to prevent localized overheating.

Note 3. When a melter kettle is used to transport and apply the LJS longitudinal joint sealant, the melter kettle shall be an oil jacketed double-boiler with agitating and recirculating systems. Material from the kettle may be dispensed through a pressure

feed wand with an applicator shoe or through a pressure feed wand into a hand-operated thermal push cart."

CONSTRUCTION REQUIREMENTS.

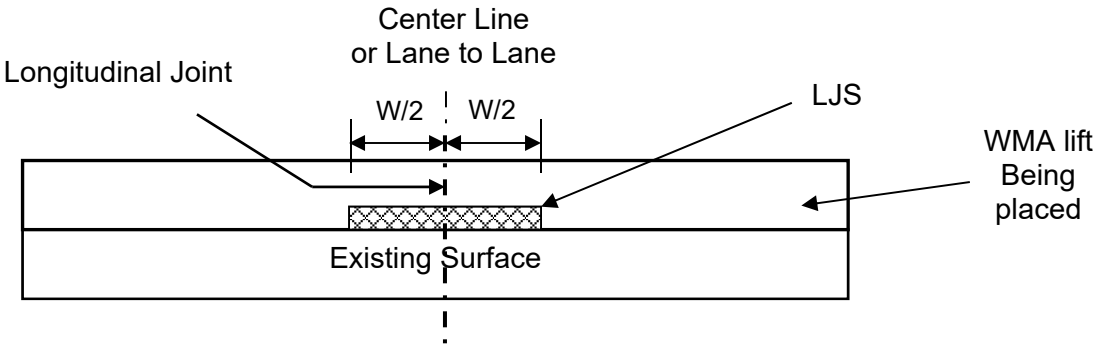
Revise Article 406.06(g)(2) of the Standard Specifications to read:

"(2) Longitudinal Joints. Unless prohibited by stage construction, any asphalt lift shall be complete before construction of the subsequent lift. The longitudinal joint in all lifts shall be at the centerline of the pavement if the roadway comprises two lanes in width, or at lane width if the roadway is more than two lanes in width.

When stage construction prohibits the total completion of a particular lift, the longitudinal joint in one lift shall be offset from the longitudinal joint in the preceding lift by not less than 3 in. (75 mm). The longitudinal joint in the surface course shall be at the centerline of the pavement if the roadway comprises two lanes in width, or at lane width if the roadway is more than two lanes in width.

The longitudinal joint sealant (LJS) shall be applied for the lifts of paving as shown on the plans. The surface to which the LJS is applied shall be dry and cleaned of all dust, debris, and any substances that will prevent the LJS from adhering. Cleaning shall be accomplished by means of a sweeper/vacuum truck, power broom, air compressor or by hand. The LJS may be placed before or after the tack or prime coat. When placed after the tack or prime coat, the tack or prime shall be fully cured prior to placement of the LJS.

The LJS application shall be centered under the joint of the asphalt lift being constructed within 2 in. of the joint.



The width and minimum application rate shall be according to the following table:

LJS Application Rate Table		
Overlay Thickness, in.	LJS Width "W", in.	Application Rate [1/] lb/ft.
WMA Dense Graded Mixtures [2/]		
3/4	18	0.88
1	18	1.15
1 1/4	18	1.31
1 1/2	18	1.47
1 3/4	18	1.63
2	18	1.80
2 1/4	18	1.96
2 1/2	18	2.12
2 3/4	18	2.29
3	18	2.45
3 1/4	18	2.61
3 1/2	18	2.78
3 3/4	18	2.94
4	18	3.10
SMA Mixtures [2/]		
1 1/2	12	0.83
1 3/4	12	0.92
2	12	1.00

1/ The application rate has a surface demand for liquid included within it. The nominal thickness of the LJS may taper from the center of the application to a lesser thickness on the edge of the application. The width and weight/foot (mass/meter) shall be maintained.

2/ In the event of a joint between an SMA and a dense graded asphalt mixture, the SMA application rate will be used.

The Contractor shall furnish to the Engineer a bill of lading for each tanker supplying material to the project. The application rate of LJS will be verified within the first 1000 ft. of the day's scheduled application length and every 6000 ft. the remainder of the day. For projects less than 3000 ft., the rate will be verified once. A suitable paper or pan shall be placed at a random location in the path of the placement for the LJS. After application of the LJS, the paper or pan shall be picked up and weighed. The weight per foot will be calculated. The tolerance from the plan target weight/foot from the LJS Application Rate Table shall be ± 15 percent. The Contractor shall replace the LJS in the area where the sample was taken.

A one quart sample shall be taken from the pressure distributor or melting kettle at the jobsite once for each contract and sent to Tollway Materials.

The LJS shall be applied in a single pass with a pressure distributor, melter kettle, or hand applied from a roll for dense graded asphalt or SMA lifts up to 2 in. in thickness. The LJS shall be applied in two passes for dense graded asphalt lifts between 2 and 4 in. in thickness. At the time of installation, the pavement surface temperature and the ambient temperature shall be a minimum of 40 °F and rising.

When traffic control restrictions prevent the placement of the full width of LJS, one-half of the width shall be placed before the placement of the first paving lane, and then the second one-half of the width shall be placed when traffic control permits it, prior to placement of the second paving lane. When placing the second one-half width of LJS, ensure that the LJS is placed up to the face of the first paving lane.

The LJS shall be applied at a width of not less than or greater than 1 ½ in. of the width specified. If the LJS flows more than 2 in. from the initial placement width, LJS placement shall stop and remedial action shall be taken.

When starting another run of LJS placement, suitable release paper shall be placed over the previous application of LJS to prevent doubling up of thickness of LJS.

The LJS shall be suitable for construction traffic to drive on without pickup or tracking of the LJS within 30 minutes of placement. If pickup or tracking occurs, LJS placement shall stop and damaged areas shall be repaired.

Prior to start of paving of pavement course, ensure the paver end plate and grade control device are adequately raised above the finished height of the LJS.

The LJS shall not flush to the final surface of the dense graded asphalt or SMA pavement."

When the LJS is specified, the longitudinal joint density testing for QC/QA will not be required on the joint(s) with the LJS and the pay adjustments will not be applied.

Method of Measurement. This work will be measured in feet.

Basis of Payment. This work will be paid for at the contract unit price per foot for LONGITUDINAL JOINT SEALANT.

Pay Item Number	Designation	Unit of Measure
JI420906	LONGITUDINAL JOINT SEALANT	FOOT

SHOULDER RUMBLE STRIP REMOVAL (Illinois Tollway)
Effective: January 1, 2012
Revised: April 1, 2016

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 have a bituminous tack coat applied in accordance with Article 406.05(b) 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 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.

Lane/ shoulder closures required for this work will not be paid for separately, but shall be included in the Contract unit price for MAINTENANCE OF TRAFFIC.

Pay Item Number	Designation	Unit of Measure
JI440022	SHOULDER RUMBLE STRIP REMOVAL	SQ YD

PAVEMENT PATCHING OF HOT MIX ASPHALT SHOULDERS (Illinois Tollway)

Effective: September 8, 2006
Revised : October 26, 2009

Description. This work shall consist of constructing Class D Pavement Patching of hot mix asphalt shoulders with the class and type of patch specified at designated locations or as directed by the Engineer. Removal and replacement of hot mix asphalt shoulders shall be in accordance with Section 442 of the Standard Specifications except as modified herein.

Revise Article 442.01 of the Standard Specifications to read.

442.01 Description. This work shall consist of the removal of the existing pavement, the necessary excavation and the replacement with the class and type of patch specified at designated locations.

This work will be classified as follows:

Class A Patches:	Pavement Removal and Continuously Reinforced Portland Cement Concrete Replacement.
Class B Patches:	Pavement Removal and Portland Cement Concrete Replacement Using Dowels or Tie Bars.
Class C Patches:	Pavement Removal and Portland Cement Concrete Replacement.
Class D1 Patches:	Pavement Removal and Hot Mix Asphalt Replacement with Hot Mix Asphalt Binder Course Below Top 2 in. and Hot Mix Asphalt Surface Course for the Top 2 in..
Class D2 Patches:	Pavement Removal Following Shoulder Scarification and Hot Mix Asphalt Replacement with Hot Mix Asphalt Binder Course up to the elevation of the scarified surface.
Class D3 Patches:	Pavement Removal and Hot Mix Asphalt Replacement with Hot Mix Asphalt Binder Course.

For each of the above classifications, the work on a lane width or less shall be further quantified by size as follows:

Type I	Less than 5 sq yd
Type II	5 sq yd or more, but less than 15 sq yd
Type III	15 sq yd or more, but less than 25 sq yd
Type IV	25 sq yd or more

Revise Article 442.08(a) of the Standard Specifications to read.

(a) Filling Holes. Each properly prepared hole shall be filled with at least two layers of hot mix asphalt binder course mixture. The hot mix asphalt mixture shall be placed only when the temperature in the shade is at least 40 ºF and the forecast is for rising temperature and when the subgrade is not frozen. Each layer shall be compacted with a mechanical tamper, a vibrating tamper, or a self-propelled roller. Trucks may be used to supplement the tampers or roller. If the required

density is not obtained, the Contractor shall increase the number of layers and/or compactive efforts.

For Class D1 Patching of shoulders, the top layer of hot mix asphalt surface course shall be not less than 2 in. compacted thickness. To facilitate possible extra Pavement Patching compaction and consolidation by traffic, the surface of the completed patch may be finished up to 1/2 in. above the existing pavement.

Revise the second paragraph of Article 442.11 of the Standard Specifications to read.

Where the Illinois Tollway requires a specific class of patch be used, this work will be paid for at the contract unit price per square yard for CLASS A PATCHES, CLASS B PATCHES, CLASS C PATCHES, CLASS D1 PATCHES, CLASS D2 PATCHES, or CLASS D3 PATCHES of the type and thickness specified.

Pay Item Number	Designation	Unit of Measure
JI442622	CLASS D3 PATCHES, TYPE IV, 6 INCHES	SQ YD

ACCELERATED PCC PAVEMENT PATCHING (Illinois Tollway)

Effective: May 28, 2014
Revised: November 1, 2016

Description. This work shall consist of the removal of existing concrete pavement, restoration of the subbase material, the replacement with type of patch specified at designated locations, and the sealing of joints at locations designated by the Engineer, or as shown in the Plans, or described in the Special Provisions. The removal and replacement patching shall be performed within weekend lane closures or within lane closures as specified in the contract to allow for the specified minimum cure time.

This work will be classified as follows.

Accelerated Class A Patches:	Pavement Removal and Continuously Reinforced Portland Cement Concrete Replacement
Accelerated Class B Patches:	Pavement Removal and Portland Cement Concrete Replacement Using Dowels or Tie Bars
Accelerated Class C Patches:	Pavement Removal and Portland Cement Concrete Replacement

Materials. The Illinois Tollway Class AX portland cement concrete used for this special provision shall be in accordance with the Performance Related Special Provision for High Early Strength Cast-In-Place Concrete. All other materials for cast-in-place patching shall comply with Article 442.02 of the Standard Specifications except as modified herein.

Add the following to Article 442.02 of the Standard Specifications:

"(k) Chemical Adhesive Resin System (Note 5) 1027.01
(l) Calcium Chloride (Note 6)..... 1013.01

Note 5. A plastic or nylon adhesive retention disk that fits tightly over the dowel and effectively seals the gap around the hole is required to prevent flowable adhesive from running out of the hole. This disk is essential to successful anchoring of a dowel bar. This disk may be about 2 inches larger in diameter than the dowel being used and should be manufactured to fit snugly over the bar and slide up against the face of the slab when the bar is being inserted into the hole. The retaining disk is inserted over the dowel bar and pushed to flush against the PCC surface to retain the adhesive. The disk will keep most of the material in the dowel hole and provide an excellent bearing surface at the face of the slab.

Note 6. The calcium chloride accelerator, when permitted by the Illinois Tollway, shall be Type L (Liquid) with a minimum of 32.0 percent by weight of calcium chloride."

Equipment. Equipment for any cast-in-place patching shall be in accordance with Article 442.03 of the Standard Specifications.

CONSTRUCTION REQUIREMENTS

The construction requirements for any cast-in-place patching shall be in accordance with Section 442 and 1020 of the Standard Specifications for Class A and Class B patching except as modified herein.

Revise the second paragraph of Article 442.05(c) of the Standard Specification to read:

"Non-reinforced pavement shall be scored by saw cutting. The scoring shall be at least 6 in. from the marked face of the patch. Marginal bars and tie bars shall be cut in a manner satisfactory to the Engineer. As an alternate, the Contractor may use an approved wheel saw to score the pavement full-depth on either standard reinforced or non-reinforced pavement. Should the wheel saw damage the pavement and/or reinforcement which are to remain in place, the Engineer will withdraw approval of this alternate."

Revise the third paragraph of Article 442.05(c) of the Standard Specification to read:

"The existing pavement shall be removed as shown on the plans. Ends of the patch shall be squared straight and perpendicular to the centerline of the pavement."

Add the following to Article 442.05 of the Standard Specifications:

(d) **Patching Barricades**

The openings resulting from concrete removal for pavement repair shall be protected with Type 1 barricades for the period beginning immediately after removal is completed and until the curing period for the new concrete has elapsed and all debris is cleared away.

A minimum of 2 barricades for each lane, in front of each opening, shall be provided. Where an opening is adjacent to a traffic lane, the barricade(s) shall be placed in the opening, (along the edge of the adjacent traffic lane) with a minimum of one barricade for every 12 feet of open excavation.

(e) **Penalties**

(1) **Non-compliance with Specifications**

The Contractor will be subject to a penalty of $500 per incident, to be deducted from the next pay estimate due the Contractor, for each occurrence when the Engineer determines that the Contractor or his Subcontractor is not in full compliance with Article 442.05(d).

(2) **Failure to Respond**

The Contractor shall be required to respond within ½ hour to any request from the Engineer for realigning, replacing or moving barricades or otherwise reestablishing compliance with Article 442.05(d). "Respond" is interpreted to mean on the job preparing to make repairs.

Failure by the Contractor to so respond shall be grounds for a penalty of $500 for each and every occurrence, to be deducted from the next pay estimate due the Contractor.

Revise the fourth sentence of the fourth paragraph of Article 442.06(a)(2) of the Standard Specifications to read:

"After the material has been positioned at the back of the hole, the dowel shall be fully inserted into the drill holes with retention disks against the face of the slab, using a back-and –forth twisting motion, leaving the proper length exposed as shown on the plans."

Revise the first paragraph of Article 442.06(g) of the Standard Specifications to read:

"(g) Curing and Protection. Concrete patches shall be cured by the Wetted Burlap or Wetted Cotton Mat Method according to Article 1020.13 (a)(3) or Article 1020.13 (a)(5). The curing period shall be from the time of final setting of the mix until the patch is exposed to traffic no less than 16 hours after placement for concrete. In addition to Article 1020.13, when the air temperature is less than 55 °F, the Contractor shall cover the patch with minimum R12 insulation until opening strength is reached. Insulation is optional when the air temperature is 55 °F - 90 °F. Concrete shall not be placed when the air temperature is greater than 90 °F."

Replace the first paragraph of Article 442.09 of the Standard Specifications with the following:

Opening Patches to Traffic. No traffic will be permitted on a patch of Illinois Tollway Class AX portland cement concrete until after the minimum curing time of 16 hours, and after the concrete has obtained a minimum compressive strength of 2,500 psi.

Method of Measurement. When specified, pavement removal and replacement with accelerated Portland cement concrete patching using Illinois Tollway Class AX Portland cement concrete will be measured for payment and computed in square yards.

If additional pavement, subbase, or subgrade material is removed due to negligence on the part of the Contractor, the additional quantity of pavement removal and replacement or subgrade material will not be measured for payment. Shoulder removal and replacement resulting from edge forming will not be measured for payment.

When expansion joints are to be included in Class B patches, as shown on the plans or as directed by the Engineer, the expansion joint will be measured for payment in place in feet.

Reinforcement bars will be computed in square yards of surface area of the pavement patch in which the pavement reinforcement is installed, and no allowance will be made for laps, splices, or portions of bars not used.

Pavement fabric will be computed in square yards of the surface area of the pavement patch in which the pavement reinforcement fabric is installed.

All mandatory saw cuts for removal operations for Class A or Class B patches will be measured for payment in place in feet. Optional saw cuts with a concrete saw or wheel saw to aid the Contractor's removal operation will not be measured for payment. Optional wheel saw cuts allowed in lieu of mandatory saw cuts will be measured for payment as though the mandatory saw cuts were performed.

Basis of Payment. This work will be paid for at the contract unit price per square yard for ACCELERATED PORTLAND CEMENT CONCRETE PAVEMENT PATCHING, of the class, type and thickness specified.

When expansion joints are included in Class B patches, the expansion joint will be paid for at the contract unit price per foot for CLASS B PATCH – EXPANSION JOINT. The deformed bars will be paid for at the contract unit price per each for DEFORMED BARS – EXPANSION JOINT.

Where unsuitable material is encountered in the subgrade or subbase and its removal and replacement is required by the Engineer, such removal and replacement will be paid for according to Article 109.04 of the Illinois Tollway Supplemental Specifications.

When additional pavement removal due to unsound concrete or deteriorated steel is directed by the Engineer, the additional quantities will be paid for according to Article 109.04 of the Illinois Tollway Supplemental Specifications.

Dowel bars will be paid for at the contract unit price per each for DOWEL BARS, of the diameter specified.

Pavement tie bars for Class A and Class B patches will be paid for at the contract unit price per each for TIE BARS FOR CLASS B PATCHES.

Reinforcement bars will be paid for at the contract unit price per square yard for PATCHING REINFORECMENT.

Mandatory saw cuts for Class A and Class B patches will be paid for at the contract unit price per foot for SAW CUTS.

When pavement reinforcement fabric is included in the contract it will be paid for at the contract unit price per square yard for PAVEMENT FABRIC. When pavement reinforcement fabric is required for patching, and a pay item is not included in the contract, the cost of the fabric will be paid for according to Article 109.04 of the Illinois Tollway Supplemental Specifications.

Pay Item Number	Designation	Unit of Measure
JI442873	ACCELERATED PORTLAND CEMENT CONCRETE PATCHING, CLASS B, TYPE I, 12 INCHES	SQ YD
JI442874	ACCELERATED PORTLAND CEMENT CONCRETE PATCHING, CLASS B, TYPE II, 12 INCHES	SQ YD
JI442875	ACCELERATED PORTLAND CEMENT CONCRETE PATCHING, CLASS B, TYPE III, 12 INCHES	SQ YD
JI442894	ACCELERATED PORTLAND CEMENT CONCRETE PATCHING, CLASS B, TYPE IV, 12 INCHES	SQ YD

EPOXY COATING ON REINFORCEMENT (Illinois Tollway)
Effective: April 29, 2013
Revised: June 17, 2015

Description. For work outside the limits of bridge approach pavement, all references in the IDOT Highway Standards and Standard Specifications for reinforcement shall be epoxy coated, unless noted on the plan. This includes dowel bars and tie bars in all pavement, shoulders, curb, gutter, combination curb and gutter and median; and chair supports for CRC pavement.

Reinforcement for IDOT Highway Standard drainage structures shall be as shown on the Standards, unless otherwise noted on the plans.

DOWEL BARS (Illinois Tollway)

Effective: June 9, 2008
Revised: November 2, 2016

Revise the fifth and sixth sentences of Article 1006.11(b) of the Standard Specifications to read:

"The bars shall be epoxy coated according to AASHTO M 284, except the thickness of the epoxy shall be 7 to 12 mils (0.18 to 0.30 mm) and patching of the ends will be required. The epoxy coating applicator shall be certified according to the current Bureau of Materials and Physical Research Policy Memorandum, "Epoxy Coating Plant Certification Procedure". The Illinois Department of Transportation will maintain an approved list."

Pay Item Number	Designation	Unit of Measure
JI442905	DOWEL BARS 1 1/2""	EACH

TIE BARS FOR CLASS B PATCHES

Description. This work shall consist of furnishing and installing the tie bars for class B patches in accordance with the Standard Specifications Section 442 and as detailed in the Illinois Tollway Standard A1. Per the Standard, tie bar size, length and spacing can vary depending on the patching conditions. This special provision allows for the different tie bars to be measured and paid for as the same pay item, TIE BARS FOR CLASS B PATCHES.

Method of Measurement. TIE BARS FOR CLASS B PATCHES will be measured for payment as each.

Basis of Payment. This work will be paid for at the contract unit price per each for TIE BARS FOR CLASS B PATCHES.

Pay Item Number	Designation	Unit of Measure
JI442910	TIE BARS FOR CLASS B PATCHES	EACH

JOINT FILLING CONCRETE PAVEMENT AND PRECAST CONCRETE PAVEMENT (Illinois Tollway)

Effective: January 15, 2014

Description. This work shall consist of cleaning and sealing longitudinal and transvers joints in existing concrete pavement and precast concrete pavement areas.

Materials. Materials shall be according to the following Article/Section of the Standard Specifications:

Item	Article/Section
(a) Hot-Poured Joint Sealer	1050.02
(b) Backer Rod (Note 1)	

Note 1. The backer rod shall be a closed-cell, plastic foam rod compatible with the sealant and the elevated temperatures of the joint sealant application.

Equipment. The kettle used for heating the sealer shall be double-jacketed boiler type, equipped with both agitation and recirculation systems capable of melting and applying the sealant through a pressure-fed hose and wand. The melter shall be capable of starting at ambient temperature and bringing the sealant material to application temperature within one hour, while continuously agitating and recirculating the sealant. The melter shall be equipped with automatic thermostatic controls and temperature gages to monitor the sealant temperature in the applicator lines and temperature of heat transfer oil in the kettle jacket.

The Contractor shall furnish, for use by the Engineer, an infrared temperature-measuring gun accurate to 1˚F at 400˚F. The Engineer may check the pouring temperature of the sealant at the point of discharge into the reservoir. If the sealant falls below the recommended application/pouring temperature, all production shall stop at that melting kettle until the recommended application/pouring temperature is obtained. Should the sealant temperature at the point of discharge exceed the maximum safe heating temperature, the melting kettle shall be emptied of all sealant, and the sealant shall be legally disposed of in an environmentally safe method. No payment will be made for this sealant material or its disposal.

CONSTRUCTION REQUIREMENTS

General. Longitudinal and transverse joints as specified by the Engineer shall be sealed.

A sealant reservoir at the transverse and longitudinal joints to be sealed shall be formed in the fresh concrete or sawed to the dimensions shown on the plans. If the reservoir is sawed, sawing shall not be performed until after the required curing period. The faces of the reservoir shall be cleaned of dust and debris with compressed air with a minimum pressure of 90 psi. The pneumatic tool lubricator must be bypassed and a filter installed on the discharge valve to keep water and oil out of the compressed air lines. The backer rod shall be uniformly placed at the depth shown on the plans or as directed by the Engineer.

The hot-poured joint sealer shall be continuously and mechanically agitated during heating. The sealer shall be applied using the methods and equipment recommended by the manufacturer, except it shall only be placed when the air temperature in the shade is 50 °F or greater.

Existing raised reflective pavement markers shall be protected during the joint sealing operations. Tracking of sealant material will not be allowed. If sealant materials are applied to the markers, such material shall be removed.

Sealant shall be placed in the clean, dry joint. The sealing material shall be applied to each joint opening according to the details shown on the plans or as directed by the Engineer, without spilling on the exposed concrete surfaces. Any excess material on the surface of the concrete shall be removed immediately and the pavement surface cleaned.

The sealant shall be allowed to cure before opening to traffic. When approved by the Engineer, the sealant may be dusted with fine sand, Portland cement, or mineral filler to prevent tracking.

Method of Measurement. This work will be measured for payment in feet of pavement sealed. Adjacent cracks filled during the operation will not be counted separately.

Basis of Payment. This work will be paid for at the contract unit price per foot for JOINT FILLING CONCRETE PAVEMENT AND PRECAST CONCRETE PAVEMENT.

Pay Item Number	Designation	Unit of Measure
JI452010	JOINT FILLING CONCRETE PAVEMENT AND PRECAST CONCRETE PAVEMENT	FOOT

COARSE AGGREGATE FOR BACKFILL, TRENCH BACKFILL, AND BEDDING (Illinois Tollway)

Effective: August 14, 2013

This work shall be according to Article 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 materials shall be crushed and screened. Unprocessed RAP grindings will not be permitted. 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.

COARSE AGGREGATE FOR PCC 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.

FINE AGGREGATE FOR ASPHALT MIXTURES (Illinois Tollway)

Effective: September 21, 2011
Revised: January 25, 2018

Revise Article 1003.03 of the Standard Specifications to read:

"1003.03 Fine Aggregate for Asphalt Mixtures. The aggregate shall be according to the Article 1003.01 and the following.

(a) Description. Fine aggregate for all binder course and surface course asphalt mixtures produced for mainline placement shall consist of natural sand, crushed stone sand, slag sand, or steel slag sand. Fine aggregate for all other asphalt mixes shall consist of natural sand, crushed stone sand, chats, slag sand, or steel slag sand. For gradation FA 22, uncrushed material will not be permitted.

(b) Quality. The fine aggregate for all asphalt mixtures shall be Class B Quality or better.

(c) Gradation. The fine aggregate gradation for all binder course and surface course asphalt mixtures produced for mainline overlay placement shall be FA 20 or FA 22. The fine aggregate gradation for all other HMA shall be FA 1, FA 2, FA 20, FA 21, or FA 22. When Reclaimed Asphalt Pavement (RAP) and/or Fractionated Reclaimed Asphalt Pavement (FRAP) and/or Reclaimed Asphalt Shingles (RAS) are incorporated into the asphalt mixture design, the use of FA 21 gradation will not be permitted.

Gradation FA 1, FA 2, or FA 3 shall be used when required for prime coat aggregate application for asphalt mixtures."

FINE AGGREGATE FOR PCC PAVEMENT MIXTURES (Illinois Tollway)

Effective: October 9, 2013
Revised: April 1, 2016

Fine aggregate materials for portland cement concrete pavement mixtures shall be in accordance with Section 1003 of the Standard Specifications except as modified herein.

Revise Article 1003.01(a)(3) of the Standard Specifications to read:

"(3) Stone Sand. Stone sand shall consist of either processed or unprocessed material.

a. Processed stone sand shall be produced by screening, washing, or processing by air separation, the fine materials resulting from crushing rock quarried from undisturbed, consolidated deposits, or crushing gravel that produces an FA 20, FA 21, or FA 6 gradation. The acceptance and use of crushed gravel stone sand shall be according to the current IDOT Bureau of Materials and Physical Research's Policy Memorandum, "Crushed Gravel Producer Self-Testing Program".

b. Unprocessed stone sand shall be the resultant fine materials from crushing carbonate rock quarried from undisturbed and consolidated deposits that produces an FA 5 gradation with exception to the percent passing the No. 200 sieve to be 12 ± 12."

Add the following to Article 1003.01(b) of the Standard Specifications:

Unprocessed stone sand shall meet the quality requirements of Article 1003.01(b) of the Standard Specifications for "A" quality aggregate, or each aggregate must meet the quality requirements as outlined in the following table with all tests conducted within 12 months of submittal date by IDOT or by an independent AMRL or CMEC certified lab.

Quality Test Specifications for Unprocessed Stone Sand

QUALITY TEST	LIMIT
Sodium Sulfate Soundness - AASHTO T103 (Illinois Modified)	Max 10% Loss
Deleterious	
Shale	3% Maximum
Clay Lumps	1% Maximum
Coal and Lignite	1% Maximum
Other Deleterious	3% Maximum
Total Deleterious	3% Maximum

Add the following to Article 1003.01(c) of the Standard Specifications:

"Gradation specifications for the applicable processed and unprocessed stone sand products to be used in concrete mixes are shown in the following Table.

Stone Sand Gradation Limits

Gradation Number	Fine Aggregate Gradations							
	Sieve Size and Percent Passing							
	3/8 in.	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100	No. 200[1]
FA 05[2]	100	92 ± 8					20 ± 20	12 ± 12
FA 06	100	92 ± 8					20 ± 20	6 ± 6
FA 20	100	97 ± 3	80 ± 20	50 ± 15		19 ± 11	10 ± 7	4 ± 4
FA 21	100	97 ± 3	80 ± 20	57 ± 18		30 ± 10	20 ±10	9 ± 9

1 When use in PCC the producer shall set the midpoint percent passing the No. 200 sieve and the target band will have a range of +/- 5% for gradation FA 05, and FA 21.

2 FA 5 stockpiles must be certified for use by the Illinois Tollway.

Specification bands may be modified under the Aggregate Gradation Control System (AGCS) to reflect customer needs or production/process requirements. Changes can be made on all sieves except the top and bottom sizes. Specification tolerances must be maintained on all modified sieves. Modified products will be denoted as FM rather than FA."

Revise Article 1003.01(e) of the Standard Specifications to read:

"(e) Storage of Fine Aggregate. The storage of all fine aggregate shall be according to the following.

(1) Sites for storage of all fine aggregates including unprocessed stone sand shall be grubbed and cleaned prior to storing the material.

Stockpiles shall be built according to the current IDOT Bureau of Materials and Physical Research's Policy Memorandum, "Aggregate Gradation Control System" and the following.

a. Fine aggregate of various gradations and from different sources shall be stockpiled separately.

b. Stockpiles shall be separated to prevent intermingling at the base. If partitions are used, they shall be of sufficient height to prevent intermingling.

c. Fine aggregates for portland cement concrete and Asphalt shall be handled in and out of the stockpiles in such a manner that will prevent contamination, segregation, and degradation.

At the time of use, the fine aggregate shall be free from frozen material, material used to caulk rail cars, and all foreign materials which may have become mixed during transportation and handling.

(2) Sites for storage of processed or unprocessed carbonate stone sand to be used in portland cement concrete pavement mixes shall be in accordance with Article 1003.01(e)(1) and the following.

a. Current Production Stockpiles. Production carbonate fines currently established under AGCS requirements are approved for Illinois Tollway use. FA 21 (FM 21), FA 20 (FM 20), and FA 5, and FA 6 will be accepted provided the aggregate quality meets or exceeds the requirements listed in the aforementioned Table for Stone Sand Gradation Limits and quality test specifications.

b. Newly Produced Materials. Newly produced carbonate fines that have not been previously approved by IDOT or the Illinois Tollway would be sampled and tested in accordance with the IDOT current AGCS policy. Once tested, the material shall be sampled, tested and stockpiled per the current AGCS policy. This may include carbonate screenings products that do not comply with an IDOT standard specification requirement, but still demonstrate consistency based on test results. Frequency of testing is as follows:

Startup Production – 3 @ 1,000 tons
Normal Production – 1 @ every 5,000 tons, 2 per day max., 1 per week min.
Stockpile / Load out – 1 per week min.

c. Recently Stockpiled Materials. Carbonate fines that were recently stockpiled using the same production techniques as newly produced fines (and separately stockpiled) can be used if previous production testing is provided. Materials will be tested at load out at a minimum rate of 1 gradation test per 1,000 tons. If previous production testing is not available, then the stockpile must be tested as if it were an existing stockpile as outlined in the AGCS program."

Revise Article 1003.02 of the Standard Specifications to read:

"1003.02 Fine Aggregate for Portland Cement Concrete and Mortar. The aggregate shall be according to Article 1003.01 and the following.

(a) Description. The fine aggregate shall consist of washed sand, processed stone sand, or a blend of washed sand and processed stone sand as approved by the Engineer. The use of unprocessed stone sand or a blend of washed sand and unprocessed stone sand as approved by the Engineer shall be allowed only for concrete pavement mixtures per the intended pavement application.

(b) Quality. The fine aggregate for portland cement concrete shall meet Class A Quality, except that the minus No. 200 sieve Illinois Modified AASHTO T 11 requirement in the Fine Aggregate Quality Table shall not apply to washed stone sand, unprocessed stone sand, any blend of washed stone sand and washed sand, and to any blend of unprocessed stone sand and washed sand approved by the Engineer.

(c) Gradation. The washed sand for portland cement concrete shall be Gradation FA 1 or FA 2. Processed stone sand for portland cement concrete, which includes any blend

with washed sand, shall be Gradation FA 1, FA 2, FA 6, FA 20 (FM-20), or FA 21 (FM 21). Unprocessed stone sand for portland cement concrete, which includes any blend with washed sand, shall be Gradation FA 5 with exception to the percent passing the 200 sieve to be 12% ± 12.

(d) Use of Fine Aggregates. The blending, alternate use, and/or substitution of fine aggregates from different sources for use in portland cement concrete will not be permitted without the approval of the Engineer. Any blending shall be by interlocked mechanical feeders at the aggregate source or concrete plant. The blending shall be uniform, and the equipment shall be approved by the Engineer. With the use of unprocessed stone sand with the production of concrete pavement mixes, the plant bins and feed lines shall be modified to prevent caking of the sand and disruption of production. The stockpiles of unprocessed stone sand at any concrete production plant shall be protected from rain by reasonable means to prevent clumping and caking of fines."

AGGREGATE SHOULDERS (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 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."

Pay Item Number	Designation	Unit of Measure
JI481040	AGGREGATE SHOULDERS, TYPE B	TON
JI481070	AGGREGATE SHOULDERS SPECIAL, TYPE C	TON
JI481130	AGGREGATE SHOULDERS WITH FILTER FABRIC, TYPE B 4"	SQ YD
JI481140	AGGREGATE WEDGE SHOULDER, TYPE B	TON

TEMPORARY PAVEMENTS (Illinois Tollway)

Effective: August 14, 2014
Revised: February 22, 2018

Description. This work shall consist of constructing a temporary pavement of the specified classification at the locations shown on the plans or as directed by the Engineer. All temporary pavements are to be constructed on a compacted aggregate base as shown on the plans with a minimum thickness of 9 inches.

TEMPORARY PAVEMENT, CLASS 1 shall be for temporary pavements that are designed to be opened to traffic for a period of 6 months or less and shall consist of either a 10 inch undoweled Portland cement concrete pavement in accordance with Sections 353 and 354 of the Standard Specifications except final finish shall be according to Article 420.09(e)(1); or of a 6 inch asphalt pavement in accordance with Sections 355 and 356 of the Standard Specifications and of the Illinois Tollway's special provision for Asphalt Binder and Surface Course Mixtures.

TEMPORARY PAVEMENT, CLASS 2 shall be for temporary pavements that are designed to be opened for a period of more than 6 months and shall consist of either an 11.5 inch undoweled Portland cement concrete in accordance with Sections 353 and 354 of the Standard Specifications except final finish shall be according to Article 420.09(e)(1); or of a 9 inch asphalt pavement in accordance with Sections 355 and 356 of the Standard Specifications and of the Illinois Tollway's special provision for Asphalt Binder and Surface Course Mixtures.

The removal of the temporary pavement shall conform to Section 440 of the Standard Specifications. The removal of any temporary base, if required, shall conform to Section 202 of the Standard Specifications.

Materials. Concrete used for temporary pavements shall be Class PV concrete in accordance with Section 1020 of the Standard Specifications.

Asphalt used for temporary pavements shall consist of a 2 inch WMA surface course, Mix D, N70 mixture placed over lift(s) of WMA binder course, IL-19.0, N50 mixture. The maximum lift for a binder course placement shall be 4.5 inches. The asphalt mixtures shall conform to Section 1030 of the Standard Specifications or the Illinois Tollway special provision for Asphalt Binder and Surface Course Mixtures.

Method of Measurement. This work will be measured in place and the area computed in square yards.

Basis of Payment. This work will be paid for at the contract unit price per square yard for TEMPORARY PAVEMENT, CLASS 1 or for TEMPORARY PAVEMENT, CLASS 2.

Removal of temporary base aggregate will be paid for separately at the contract unit price per cubic yard for EARTH EXCAVATION.

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

Pay Item Number	Designation	Unit of Measure
JI485010	TEMPORARY PAVEMENT, CLASS 1	SQ YD

STRIP SEAL GLAND REPLACEMENT

Description. This work shall consist of removal and disposal of all the existing glands at a joint, cleaning of the joint interface, technical assistance from the joint manufacturer during surface preparation and installation of glands as shown on the plans and as specified herein.

Material. The gland shall have a shallow “v” profile and shall be according to ASTM D 5973. Glands are to match the dimensions of the existing gland and be produced by the same manufacturer who produced the existing gland. Contractor is responsible for determining the manufacturer of the existing gland. The lubricant-adhesive used with the seals shall be according to ASTM D 4070.

CONSTRUCTION REQUIREMENTS

The Contractor shall furnish and install the specified joint gland at the locations shown on the plans in accordance with the manufacturer’s instructions and as directed by the Engineer.

Technical assistance provided by the manufacturer during surface preparation and installation shall be furnished at no additional cost to the Illinois Tollway. The Contractor shall furnish the Engineer with the manufacturer’s written product information, installation procedures, and instructional video at least two weeks prior to installation. The Contractor, the manufacturer’s representative, and the Engineer shall meet to review and clarify installation procedures, and requirements prior to starting the work. A technical representative must be present for the start of surface preparations and installation for at least one day. The Contractor shall contact the manufacturer at least two weeks prior to installation.

Any concrete repairs required to remove and replace unsound concrete as indicated on the plans or specified by the Engineer shall be in accordance with the Illinois Tollway special provision “Elastomeric Concrete Headings” as directed by the Engineer.

Prior to placement of the gland, the cavity shall be cleaned of debris. Surface rusting shall be removed and any bare steel touched up according to Article 506.10(c) of the Standard Specifications. The steel extrusion cavities shall be kept clean and dry until the strip seal is placed.

The placement of the gland will only be permitted when the ambient air and steel substrate temperatures are above the minimum temperature recommended by the manufacturer. Prior to inserting the gland in the steel retainer cavities, the “locking ears” portion of the seal shall be coated with adhesive/lubricant. A maximum of 5 feet of gland shall be coated at a time to prevent the adhesive/lubricant from drying prior to insertion into the cavities of the steel locking edge rails. After each section is coated the coated portion of the gland shall be inserted in the steel locking edge rail cavities.

The gland shall be installed without splices under the maintenance of traffic as shown in the plans or as approved by the Engineer.

Method of Measurement. This work will be measured for payment in place, in feet along the centerline of each gland per joint.

Basis of Payment. This work will be paid for at the contract unit price per foot for REPLACE STRIP SEAL GLANDS.

Pay Item Number	Designation	Unit of Measure
JI520022	REPLACE STRIP SEAL GLANDS	FOOT

SLOTTED DRAIN REMOVAL

Description. This work shall consist of the complete removal of the existing slotted drain where indicated in the plans. This work shall be in accordance with the Sections 440 and 551 of the Standard Specifications.

The existing concrete encasing the pipe of the slotted drain; the pipe, the slotted drain and all appurtenances shall be completely removed and disposed of in accordance with the Standard Specifications.

The area shall be backfilled as required for the final surface. This work will either be paid for as TRENCH BACKFILL or ACCELERATED PORTLAND CEMENT CONCRETE PATCHING, CLASS B.

Method of Measurement. SLOTTED DRAIN REMOVAL will be measured for payment in feet, along the centerline of the pipe of the slotted drain to be removed.

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

Pay Item Number	Designation	Unit of Measure
JI551010	SLOTTED DRAIN REMOVAL	FOOT

INLETS, TYPE A, TYPE 20A FRAME AND GRATE

Description. This work shall consist of constructing INLETS, TYPE A, TYPE 20A FRAME AND GRATE in accordance with Section 602 of the Standard Specifications. This work shall consist of constructing the inlets, frame and grates, backfilling, saw cuts, pavement removal and patching necessary.

Method of Measurement. The INLETS, TYPE A, TYPE 20A FRAME AND GRATE will be measured for payment as each.

Basis of Payment. INLETS, TYPE A, TYPE 20A FRAME AND GRATE will be paid for at the contract unit price per each of the type specified which shall include all labor, equipment and material necessary to complete this work.

Pay Item Number	Designation	Unit of Measure
JI602231	INLETS, TYPE A, TYPE 20A FRAME AND GRATE	EACH

CATCH BASINS TO BE ADJUSTED (SPECIAL)

Description. This work shall consist of adjusting (raising) the existing catch basin frame and grates as shown on the plans to meet proposed pavement finished grade (approximately 3 inches). This work will require the Contractor to obtain custom made frames that will be inserted into the existing frames to make up the necessary elevation difference.

CONSTRUCTION REQUIREMENTS:

The dimensions for the catch basin adjustment will be measured in the field by the Contractor. The Contractor will then submit this information to the Neenah Foundry Company or equal, so that new adjusting rings can be manufactured for Neenah Type R-3527-V and R-3528V frame and grates. The Contractor will then submit shop drawings to the Tollway for acceptance.

Method of Measurement. This work will be measured for payment complete in place in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each for CATCH BASIN TO BE ADJUSTED (SPECIAL).

Pay Item Number	Designation	Unit of Measure
JI602530	CATCH BASIN TO BE ADJUSTED (SPECIAL)	EACH

GUTTER

Description. This work shall be in accordance with the applicable portions of the Illinois Tollway Standard Drawing B1, B2, B3, and Section 606 of the Standard Specifications. Protective coat when required shall be constructed according to Article 420.18 of the Standard Specifications.

Gutter transactions as shown on the plans and in Illinois Tollway Standard Drawings B1, B2 and B3.

Method of Measurement. This work shall be measured for payment in feet. Gutter transitions shall be measured in feet along the edge of shoulder in feet, and included in the overall length of the gutter.

Basis of Payment. This work will be paid for at the contract unit price per foot for GUTTER, of the type specified.

Protective coat will be paid for at the contract unit price per square yard for PROTECTIVE COAT.

Pay Item Number	Designation	Unit of Measure
JI606010	GUTTER, TYPE G-2	FOOT
JI606015	GUTTER, TYPE G-2, MODIFIED	FOOT
JI606020	GUTTER, TYPE G-3	FOOT
JI606030	GUTTER, TYPE G-3, MODIFIED	FOOT

GALVANIZED STEEL PLATE BEAM GUARDRAIL (Illinois Tollway)

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 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.

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

TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL) TANGENT (Illinois Tollway)

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 T1 (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 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 C6.

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 (Special)	3	SKT-SP-MGS	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 C6.

Basis of Payment. This work will be paid for at the contract unit price per each, for TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL) TANGENT.

Terminal markers-direct applied will be paid for separately.

Pay Item Number	Designation	Unit of Measure
JI631110	TRAFFIC BARRIER TERMINAL, TYPE T1 (SPECIAL) TANGENT	EACH

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

TRAFFIC BARRIER TERMINAL, TYPE T2 (Illinois Tollway)

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 T2. The terminal shall conform to the individual manufacturer's specifications and shall be installed according to the manufacturer's instructions. The terminal shall include all necessary transitions between the terminal and the item to which it is attached.

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 shall be wood, either southern pine or Douglas fir (coast region), Grade No. 1 structural. Wood posts shall be treated. The posts shall be cut to the proper dimensions before treatment. No cutting of the posts will be permitted after treatment. Posts shall be erected according to Article 634.05 of the Standard Specifications.

Block-outs. When the terminal is installed behind a gutter, blockouts are required. 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.

Foundation Tubes. Foundation tubes shall be steel and installed at post locations per manufacturer's specifications. The top of the foundation tube shall not project more than 4" above the ground line when measured along a 5' cord, in compliance with AASHTO specifications.

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 Illinois Tollway. 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 C7.

Basis of Payment. This work will be paid for at the contract unit price per each, for TRAFFIC BARRIER TERMINAL, TYPE T2.

Pay Item Number	Designation	Unit of Measure
JI631120	TRAFFIC BARRIER TERMINAL, TYPE T2	EACH

TRAFFIC BARRIER TERMINAL, TYPE T6 (Illinois Tollway)

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 T6. 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 15 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 15 in. 3/4 in. bolts 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.

The tapered, parapet, wood blockout shall be used on all appurtenances with a sloped face.

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 technicians 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 C9.

Basis of Payment: This work will be paid for at the contract unit price per each, for TRAFFIC BARRIER TERMINAL, TYPE.

Pay Item Number	Designation	Unit of Measure
JI631130	TRAFFIC BARRIER TERMINAL, TYPE T6	EACH

TRAFFIC BARRIER TERMINAL, TYPE T6B (Illinois Tollway)

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

TRAFFIC BARRIER TERMINAL, TYPE T10 (Illinois Tollway)

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 T10. The terminal shall include all necessary transitions between the terminal and the item to which it is attached.

If any portion of the existing name plate of the bridge will be covered by the end shoe, the name plate shall be moved to an adjacent area along the rail or end post before the end shoe is installed.

When attaching the end shoe to concrete, constructed with forms and with a thickness of 12 in. or less, the holes may be formed or core drilled.. The anchor cone shall be set flush with the surface of the concrete. Externally threaded studs protruding from the surface of the concrete will not be permitted. The standard end shoe shall be placed between the splice plate and the rail element.

The distance between any anchor and the edge of existing concrete shall be 1’-6” minimum.

When a bridge expansion joint exists between the end shoe and the first post, all splice bolts at the end shoe shall be fitted with a lock nut or double nuts and tightened only to a point that will allow guardrail movement.

When attaching the end shoe to concrete, constructed with forms and with a thickness greater than 18 in. or not accessible to the back side, an approved 3/4 in. bolt shall be anchored into core drilled or formed holes using a chemical adhesive.

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 C11.

Basis of Payment. This work will be paid for at the contract unit price per each, for TRAFFIC BARRIER TERMINAL, TYPE T10.

Pay Item Number	Designation	Unit of Measure
JI631140	TRAFFIC BARRIER TERMINAL, TYPE T10	EACH

ROADWAY DELINEATORS (Illinois Tollway)

Effective: January 12, 2010
Revised: April 1, 2016

Description: This work shall consist of furnishing, installing, removing, and reinstalling roadway delineator assemblies as shown in the Plans.

Materials: Materials for roadway delineators shall be in accordance with Article 635.02 of the Standard Specifications, except as modified herein.

Revise the title of Article 1097.03(d) of the Standard Specifications to read:
"Housings. Only Type B housing shall be used."

Construction Requirements.

General. Roadway delineators shall be installed in the configurations, locations and spacing shown in the Plans.

Installing New Delineator Posts and Reflectors. Only the Illinois Tollway's specified type of reflector and geometric shape shall be permitted within the limits of a contract.

For qualification purposes only, ten (10) samples required for tests set forth in these Specifications shall be submitted by the Contractor. In addition, the Engineer will have the right to select 10 samples at random from each shipment for acceptance purposes.

The posts to which the delineator reflectors are fastened shall be vertical and oriented so that the face of the reflector shall be at 90 degrees to the adjacent pavement.

Delineator posts shall be driven to the prescribed depth by either hand or mechanical devices, using a suitable driving cap. Driven posts shall be firm and plumb above the ground. Any posts found battered, bent or damaged after driving or otherwise found not acceptable by the Engineer, shall be removed and replaced by the Contractor at no additional cost to the Illinois Tollway.

Delineator reflectors shall be fastened to the posts with vandal-proof fasteners approved by the Engineer.

The Contractor shall exercise care that the delineators are placed in a satisfactory and uniform alignment both horizontally and vertically. In addition to ordinary inspection, a night inspection shall be made by the Engineer and Contractor from an automobile. Delineators not having satisfactory and uniform night appearance shall be moved and adjusted by the Contractor until acceptable to the Engineer.

Removing and Reinstalling Existing Delineator Posts and Reflectors. Existing delineator posts and reflectors shall be removed and reinstalled according to Article 635.05 of the Standard Specifications.

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

Basis of Payment. The work of furnishing and installing new roadway delineator posts and reflectors will be paid for at the contract unit price per each, for ROADWAY DELINEATORS.

The work of removing and reinstalling existing delineator posts and reflectors will be paid for at the contract unit price per each for REMOVE AND REINSTALL ROADWAY DELINEATORS.

Pay Item Number	Designation	Unit of Measure
JI635010	ROADWAY DELINEATORS	EACH

CONCRETE BARRIER (Illinois Tollway)

Effective: October 23, 2006
Revised : April 1, 2016

Description. This work shall consist of constructing Concrete Barrier and Concrete Barrier Base according to Section 637 of the Standard Specifications except as modified herein.

Revise Article 637.02 of the Standard Specifications to read:

"637.02 Materials. Materials for the barrier and the Portland cement concrete base shall conform to the requirements of the following Articles/Sections of Division 1000 - Materials:

Item	Article/Section
(a) Portland Cement Concrete	1020
(b) Tie Bars (Note 1)	1006.10(a)(2)
(c) Dowel Bars	1006.11(b)
(d) Protective Coat	1023
(e) Non-Shrink Grout	1024.02
(f) Chemical Adhesive Resin System	1027.01
(g) Preformed Expansion Joint Filler	1051.01 – 1051.08
(h) Reinforcement Bars	1006.10(a)(2)

Note 1. Tie bars shall meet the requirements of ASTM A 706, Grade 60 AASHTO M312, Grade 60 (400).

The coarse aggregate to be used in the concrete barrier walls shall conform to the requirements for the coarse aggregate that is used for superstructure concrete.

Hot mix asphalt (HMA) base shall not be allowed."

Add the following to Article 637.06 of the Standard Specifications:

"When a reinforced single face barrier is specified, the required reinforcing shall be as detailed in the plans."

Revise Article 637.11(b) of the Standard Specifications to read:

"(b) Measured Quantities. Concrete barrier base will be measured for payment in feet in place, along the centerline of the barrier base.

Concrete barrier will be measured for payment in feet in place, along the centerline of the concrete barrier.

Concrete barrier transition will be measured for payment in feet in place, along the centerline of the transition.

Concrete gutter when used in conjunction with variable height barrier and base will be measured and paid for separately.

The cost of reinforcement bars shall be included in the cost of the CONCRETE BARRIER, SINGLE FACE, REINFORCED.

The cost of reinforcement bars shall be included in the cost of the CONCRETE BARRIER BASE FOR SINGLE FACE BARRIER, REINFORCED.

Protective coat will be measured for payment in place and the area computed in square yards."

Revise Article 637.12 of the Standard Specifications to read as follows:

"637.12 Basis of Payment. This work will be paid for at the contract unit price per foot for CONCRETE BARRIER BASE; CONCRETE BARRIER, DOUBLE FACE, VARIABLE HEIGHT; CONCRETE BARRIER BASE, 5'; CONCRETE BARRIER BASE, 7'; CONCRETE BARRIER BASE, VARIABLE HEIGHT, 7'; CONCRETE BARRIER BASE FOR SINGLE FACE; CONCRETE BARRIER, DOUBLE FACE, of the height specified; CONCRETE BARRIER, DOUBLE FACE, SPECIAL; CONCRETE BARRIER, SINGLE FACE, of the height specified; CONCRETE BARRIER, SINGLE FACE, SPECIAL of the height specified; CONCRETE BARRIER, SINGLE FACE, REINFORCED of the height specified; CONCRETE BARRIER BASE FOR SINGLE FACE BARRIER, REINFORCED of the height specified; and CONCRETE BARRIER TRANSITION, CONCRETE BARRIER, DOUBLE FACE, VARIABLE HEIGHT.

Protective coat will be paid at the contract unit price per square yard."

Pay Item Number	Designation	Unit of Measure
JI637030	CONCRETE BARRIER, SINGLE FACE, REINFORCED, 42 INCH	FOOT
JI637032	CONCRETE BARRIER BASE FOR SINGLE FACE BARRIER, REINFORCED, 42 INCH	FOOT

TEMPORARY MODULAR GLARE SCREEN SYSTEM (Illinois Tollway)

Effective: November 30, 2012
Revised: April 1, 2016

Description. This work shall consist of furnishing, installing, maintaining and removing a temporary modular glare screen system on top of temporary concrete barrier.

Materials. Materials shall be according to the following.

(a) Specifications. The base unit and blades shall be supplied from the same manufacturer.

The maximum length and width of the modular base units shall equal the dimensions of the top of the individual temporary concrete barrier sections.

The glare screen blades shall be green in color and made of impact resistant, non-metallic material. The blades shall have a height from 24 to 30 in. and a width from 6 to 9 in. The same sized blades shall be used throughout the project.

(b) Producers. The following modular glare screen systems or IDOT approved system shall be used:

(1) Modular Guidance System
Carsonite International
605 Bob Gifford Blvd.
Early Branch, SC 29916
Phone: (800) 648-7974

(2) Safe-Hit Glare Screen
Safe-Hit Corporation
35 East Wacker Drive, Suite 1100
Chicago, IL 60601
Phone: (800) 537-8958

(3) FlexStake Glare Screen
FlexStake, Inc.
2150 Andrea Lane
Ft. Myers, FL 33912
Phone: (800) 348-9839

Installation. The temporary modular glare screen system shall be installed according to the manufacturer's instructions such that it is centered along the top of the concrete barrier and does not extend over the joints between the concrete barrier sections. The glare screen blades shall be installed so the combination of blade width and spacing provide for a minimum 22 degree sight cut-off angle.

Maintenance. The Contractor shall maintain all component parts of the temporary modular glare screen system. Included are the replacement of damaged or missing glare screen blades, and any portions of the installation for the duration of time this item is in place. The Contractor, at no additional cost to the Illinois Tollway, shall replace any blades, base or other portions of

the assembly damaged by either the Contractor's operations or normal use, including damage by motorist. The Engineer shall determine whether individual glare screen blades or assemblies are to be repaired or replaced. Cleaning the blades shall be accomplished on an as needed basis and as directed by the Engineer, and shall be considered part of the maintenance of glare screen. As Temporary Modular Glare Screen System is considered part of the Contract Maintenance of Traffic requirements, the Engineer will make use of the penalties established in Article 701.01 (b) of the Illinois Tollway Supplemental Specifications when the Contractor fails to maintain the temporary modular glare screen system.

Method of Measurement. This work will be measured for payment in feet in place, along the centerline of the temporary modular glare screen system.

Basis of Payment. This work will be paid for at the contract unit price per foot for TEMPORARY MODULAR GLARE SCREEN SYSTEM.

Pay Item Number	Designation	Unit of Measure
JI638010	TEMPORARY MODULAR GLARE SCREEN SYSTEM	FOOT

ASPHALT SHOULDER RUMBLE STRIP

Description. This work shall consist of installing shoulder rumble strips in asphalt shoulders at locations shown in the plans and in accordance with applicable portions of Tollway Standard Drawing D6 and Section 642 of the Standard Specifications.

Method of Measurement. This work shall be measured for payment in feet along the edge of shoulder where rumble strips are installed.

Basis of Payment. This work will be paid for at the contract unit price per foot for ASPHALT SHOULDER RUMBLE STRIP, of the width specified.

Pay Item Number	Designation	Unit of Measure
JI642014	ASPHALT SHOULDER RUMBLE STRIP, 16 INCH	FOOT

HEADWALL TYPE III, 54”, 1:4

Description. This work shall consist of constructing a concrete headwall in the location of an existing headwall to be removed. The Contractor shall verify and record all grades of the existing headwall and ditch flowline in order to establish the same elevations for the new headwall. This work shall be in accordance with the applicable portions of the Illinois Tollway Standard Drawing B6 and Section 542 of the Standard Specifications.

Method of Measurement. The HEADWALL TYPE III, 54”, 1:4 will be measured for payment as each.

Basis of Payment. HEADWALL TYPE III, 54”, 1:4 will be paid for at the contract unit price per each which shall include all labor, equipment and material necessary to complete this work.

The removal of the existing headwall shall be paid for separately as CONCRETE HEADWALL REMOVAL SPECIAL.

HEADWALL GRATES shall be paid for separately.

Pay Item Number	Designation	Unit of Measure
JI680023	HEADWALL TYPE III, 54", 1:4	EACH

SLOPED HEADWALL

Description. This work shall consist of field verifying the existing storm sewer size and location, extending the existing storm sewer and constructing a cast-in-place or pre-cast sloped headwall as detailed in the Illinois Tollway Standard B10 and in accordance with Section 542 of the Standard Specifications.

The Contractor shall field verify the size, material and location of the existing storm sewer. Minor exploratory excavation will likely be required and is included in the cost of this pay item. If the storm sewer size is larger than 6”, this work shall be paid for in accordance with Article 109.04

Once located, the Contractor shall extend the storm sewer if required to transition into the new headwall. All work required to connect to the existing storm sewer including but not limited to excavation, bedding, saw cutting existing storm sewer, attaching the storm sewer extension in accordance with the Standard Specifications and trench backfill shall be included in the cost of the sloped headwall.

Method of Measurement. The SLOPED HEADWALL will be measured for payment as each.

Basis of Payment. SLOPED HEADWALL will be paid for at the contract unit price per each of the type, pipe diameter and slope specified which shall include all labor, equipment and material necessary to complete this work.

Pay Item Number	Designation	Unit of Measure
JI680120	SLOPED HEADWALL TYPE III, 6", 1:3	EACH

TEMPORARY PAVEMENT MARKING REMOVAL

Description. This work shall consist of removing all pavement marking tape type IV in accordance with the applicable portions of Section 783 and 703 of the Standard Specifications and Bureau of Design and Environment Special Provision 8029 Temporary Pavement Marking.

Basis of Payment. This work will be paid for at the contract unit price per square foot for TEMPORARY PAVEMENT MARKING REMOVAL.

Pay Item Number	Designation	Unit of Measure
JI703995	TEMPORARY PAVEMENT MARKING REMOVAL	SQ FT

TERMINAL MARKER DIRECT APPLIED (Illinois Tollway)

Effective: April 1, 2016

Description. This work shall consist of furnishing and installing direct applied terminal markers on guardrail terminals and impact attenuators in accordance with manufacturer's specifications for the terminals and attenuators.

Materials. Materials shall be according to Section 1091 of the Standard Specifications.

CONSTRUCTION REQUIREMENTS

Impact attenuators shall have a terminal marker direct applied to their nose according to the manufacturer's specifications.

Direct applied terminal markers shall be installed directly on the end of the guardrail terminal as shown on the plans and IDOT Highway Standard 725001. The surface of the terminal shall be cleaned of all contaminants prior to the installation of the terminal marker. The surface shall be cleaned using a 5-8 percent phosphoric acid solution and rinsed with clean water; or cleaned per the terminal marker sheeting manufacturer's specifications.

Method of Measurement. This work will be measured in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each for TERMINAL MARKER – DIRECT APPLIED.

Pay Item Number	Designation	Unit of Measure
JI725000	TERMINAL MARKER – DIRECT APPLIED	EACH

RAISED PAVEMENT LANE MARKER (Illinois Tollway)

Effective: July 1, 2009
Revised: April 1, 2016

Description. This work shall consist of furnishing and installing plowable prismatic reflector type pavement markers on pavement and/or concrete bridge decks as shown in the Plans, or as directed by the Engineer.

This work shall include necessary pavement and/or deck preparation for the raised pavement marker installation.

Materials. All materials for raised pavement lane markers shall meet the following specifications:

(a) The markers shall be low profile units consisting of an iron casting according to ASTM A 536-84, Grade 72-45-05 hardened to 52-54RC to which is attached a replaceable prismatic retro-reflector for reflecting light from one direction as specified. The casting shall be shaped to deflect a snowplow blade upward, thus preventing damage to the reflectors. The bottom of the casting shall incorporate two parallel keels and a bow shaped web designed to fit into a grooved road surface. The casting shall have leveling tabs to ensure proper embedment and shall be fastened to the road surface using an epoxy adhesive. The casting shall be designed for one directional plowing. The casting shall be marked with the manufacturer's name and the model number of the marker shall be visible after installation.

(b) The overall dimensions for pavement raised reflective pavement markers shall be approximately 10 inches long by 5.5 inches wide and a maximum of 1.76 inches high. The overall dimensions for bridge raised pavement lane markers shall be approximately 9.25 inches long by 5.86 inches wide and a maximum of 1.25 inches high. The surface of the keel and web shall be free of scale, dirt, rust, oil, grease, or any other contaminant which may reduce bond.

(c) The reflector shall be of the prismatic type consisting of a methyl methacrylate or suitably compounded acrylonitrile butadiene styrene (ABS) shell filled with a mixture of an inert thermosetting compound and filler material. The exterior surface of the shell shall be smooth and contain one (monodirectional) methyl methacrylate prismatic reflector face of the color specified. The shell shall be fabricated in a manner that will provide a mechanical interlock between the thermosetting compound and the shell. The thermosetting compound shall bond directly to the backside of the metalized lens surface. The manufacturer's trademark shall be molded in the face of the reflector lens or on the reflector body so as to be visible after installation.

(d) The reflector lens shall be high-intensive type corner cube prismatic and shall provide total internal reflection of the light entering the lens face. The reflector shall be 4 in. long x 2 in. wide x 0.44 in. high and fit securely into a recessed area on the upper surface of the marker casting web. The reflective surface shall be a minimum of 1.6 sq in. in area. The reflector shall have an abrasion resistant reflective surface.

(e) The specific intensity of the reflective surface at 0.2 degrees divergence angle shall be as follows when the incident light is parallel to the base of the marker.

Minimum Specific Intensity (candelas/foot candle)		
Color	Incidence Angle	
	0º	20º
Crystal	3.0	1.2

CONSTRUCTION REQUIREMENTS

It shall be the Contractor's responsibility to determine the location of any traffic control devices installed in the pavement and/or deck before beginning work, and shall conduct work to avoid damage to these devices. Any damage to these devices caused by the Contractor's operation shall be repaired at no additional cost to the Illinois Tollway.

The pavement and/or deck to which the marker is to be applied shall be accurately cut to the marker manufacturer's specifications. The depression shall be clean and dry prior to the installation of the marker.

The pavement shall be cut to match the bottom contour of the marker using a concrete saw fitted with 18 and 20-inch diameter blades. The bridge deck shall be cut to match the bottom contour of the marker using a concrete saw fitted with 18 and 19-inch diameter blades. Diamond blades shall be used on portland cement concrete pavement. The entire cut shall be made in a single plunge. Single blade cutting shall not be used. The cut shall be clean and completely dry prior to pouring the epoxy. After the cut is cleaned, the configuration shall be checked using a pavement marker. The marker shall fit easily within the cut with the leveling tabs resting on the pavement. If any force is required to place or remove the marker or if the leveling tabs do not rest on the pavement surface, the cut shall be enlarged as necessary. Installations on crowned pavements and/or decks, superelevations, or ramps shall be cut deeper than those on level pavements if necessary to get proper marker fit. A rapid setting (hard in one hour) epoxy meeting the requirements of AASHTO M 237 shall be poured into the cut to within 3/8 inch of the pavement surface. The installed height for the reflective pavement markers shall be approximately 0.3 in. above the road surface.

The marker shall then be placed into the epoxy-filled cut. After placement of the marker, epoxy should be flush with the pavement and/or deck surface. The leveling tabs shall rest on the pavement surface and the marker tips shall be slightly below the pavement surface when properly installed. There shall be no epoxy on the reflective lens. The epoxy, when properly mixed, shall be hard cured in 30-45 minutes. If after one hour, a screwdriver or other pointed instrument can be pushed into the epoxy, the marker and the uncured epoxy shall be removed, the marker shall be cleaned and the unit reinstalled.

The pavement and/or deck surface temperature and the ambient air temperature shall be at or above 50 ºF at the time of installation of the marker for the epoxy adhesive to properly cure.

The reflectors may be attached to the castings prior to or after the placement of the markers. The depression in the web shall be clean and dry. The reflector shall be laminated to an elastomeric pad and adhesively attached to the casting. A primer meeting the marker manufacturer's specifications shall be applied to the web surface. The protective paper or plastic film covering the adhesive pad shall be removed immediately prior to placing the reflector on the casting. Once the film covering is removed, extreme care shall be taken to avoid contamination of the exposed pad surface.

In lieu of an adhesive pad, an adhesive meeting the marker manufacturer's specification should be used. The adhesive shall be placed either on the reflector or on the web in sufficient quantity so as to ensure complete coverage of the contact area with no voids present and with a slight excess after the reflector is pressed in place. The reflector shall be placed on the casting with sufficient pressure to firmly seat it in place.

The raised pavement lane marker shall be in accordance with the Manufacturer's details and specifications. The raised reflective pavement markers shall not be laid directly over a longitudinal or transverse crack or joint. The raised reflective markers shall be placed in line with the permanent pavement markings with edge of the marker offset, toward traffic, a minimum distance of 2 in. from any joint (longitudinal or transverse) or crack in the pavement surface.

Reflector.

Where only the raised pavement lane marker reflector is specified in the Plans, the remaining portions of the existing raised pavement lane marker shall be cleaned by sandblasting or other methods approved by the Engineer. The contractor shall make certain the casting surface is dry and free of dirt and rust prior to placing the reflector on the casting.

Raised Pavement Lane Markers Inspection.

The permanent raised pavement lane marker will be inspected following installation, but no later than November 30. In addition, they will be inspected following a winter performance period that will extend 180 days from November 30.

Within 15 calendar days after the end of the winter performance period, a final performance inspection will be made. If this inspection discloses any work which is not visibly intact and serviceable, the Contractor shall, within 30 calendar days, completely repair or replace such work to the satisfaction of the Engineer.

Measured in its entirety, the work shall be 97 percent intact.

Upon completion of the final performance inspection or after satisfactory completion of any necessary corrections, the Engineer shall notify the Contractor in writing of the date of such final performance inspection and release him/her from further performance responsibility.

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

Basis of Payment. This work will be paid for at the contract unit price per each, for RAISED PAVEMENT LANE MARKER, RAISED PAVEMENT LANE MARKER, BRIDGE, RAISED PAVEMENT LANE MARKER REFLECTOR.

Pay Item Number	Designation	Unit of Measure
JI781000	RAISED PAVEMENT LANE MARKER	EACH
JI781010	RAISED PAVEMENT LANE MARKER REFLECTOR	EACH

GUARDRAIL BARRIER REFLECTORS, TYPE B (Illinois Tollway)

Effective: April 1, 2016

Description. This work shall consist of furnishing and installing guardrail barrier reflectors, Type B on guardrail as shown in the Plans and/or as directed by the Engineer.

Materials. Materials for guardrail barrier reflectors, Type B shall be in accordance with Section 1097 of the Standard Specifications, except as modified herein.

CONSTRUCTION REQUIREMENTS

Prismatic Barrier Reflector. Reflectors shall be according to minimum specific intensities per Article 1097.02 of the Standard Specifications.

The Contractor shall furnish, when requested to do so, a certification from the manufacturer stating that all reflectors conform to these requirements. The reflectors shall be furnished in either amber or crystal as specified and shall be ready for mounting. The plastic reflector units shall be free of cracks and checks, and fabrication shall be accomplished in a uniform and professional manner.

The direct applied guardrail barrier reflectors shall be mono-directional, molded of methyl methacrylate (acrylic) plastic into the following shape in accordance with Illinois Tollway Standard Drawing D4.

- Guardrail Barrier Reflectors, Type B lens shall be circular in shape.

The mounting bracket base material shall be fabricated from high impact thermoplastic, lexan, nylon, or other approved material which shall not shatter or crack under impact at temperatures of -30 ºF. The bracket shall be white in color.

The rear surface of the lens shall provide reflectivity by a prismatic configuration such that it will affect total retrodirective internal reflection of light incident to the lens surface without the necessity of any plating or separate reflector.

The manufacturer’s trademark shall be molded in the face of the lens or on the reflector body so it is visible after installation.

The back side of the reflector shall be protected by a plastic back fused to the lens under heat and pressure around the entire perimeter to form a unit permanently sealed against dust, water, and water vapor.

For qualification purposes only, ten (10) samples required for tests set forth in these Specifications shall be submitted by the Contractor. In addition, the Engineer will have the right to select 10 samples at random from each shipment for acceptance purposes.

Testing. The reflector unit shall meet the requirements for sealing and heat resistance per Article 1097.01(a) and Article 1097.01(b) of the Standard Specifications.

Installation. Guardrail barrier reflectors, Type B shall be installed at the spacing and elevations shown in the Plans or as directed by the Engineer. The face of the unit shall be vertical and oriented so the reflector face shall be at 90 degrees to the centerline of the guardrail web.

Only the Illinois Tollway's specified type of reflector and geometric shape will be permitted within the limits of a contract.

Guardrail barrier reflectors, Type B shall be installed using an adhesive.

The surface of the guardrail to which the unit is to be applied shall be free of foreign matter and any material which would adversely affect the bond of the adhesive. Cleaning of the surfaces shall be to the satisfaction of the Engineer.

An adhesive meeting the reflector unit manufacturer's specifications shall be placed either on the surface or the bottom of the unit in sufficient quantity to ensure complete coverage of the contact area with no voids present and with a slight excess after the unit is pressed firmly in place.

The Contractor shall exercise care that the reflectors are placed in a satisfactory and uniform alignment both horizontally and vertically. Acceptance of the reflectors installation will include, in addition to ordinary inspection, a night inspection shall be made by the Engineer and Contractor from an automobile. Reflectors not having satisfactory and uniform night appearance shall be moved and adjusted or replaced as required at no additional cost to the Illinois Tollway until they do conform to the requirements herein and are found to be acceptable to the Engineer.

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

Basis of Payment. This work will be paid for at the contract unit price per each, for GUARDRAIL BARRIER REFLECTORS, TYPE B.

Pay Item Number	Designation	Unit of Measure
JI782014	GUARDRAIL BARRIER REFLECTORS, TYPE B	EACH

BARRIER WALL REFLECTORS, TYPE C (Illinois Tollway)

Effective: April 1, 2016

Description. This work shall consist of furnishing and installing barrier wall reflectors, Type C on concrete barrier wall and temporary concrete barrier as shown in the Plans and/or as directed by the Engineer.

Materials. Materials for barrier wall reflectors, Type C shall be in accordance with Section 1097 of the Standard Specifications, except as modified herein.

The reflector reflective face shall be fabricated from either methyl methacrylate (acrylic) plastic or a high-performance retroreflective sheeting material.

The plastic prismatic barrier reflectors shall be according to minimum specific intensities per Article 1097.02 of the Standard Specifications.

The flexible reflective sheeting face fabricated of a high-performance retroreflective sheeting according to Article 1091.03 of the Standard Specifications.

CONSTRUCTION REQUIREMENTS.

Reflectors. The direct applied barrier wall reflectors shall be rectangular in shape, mono-directional, and have a minimum of 9.0 sq in. of effective reflective area in accordance with Plans.

The Contractor shall furnish written documentation from the sheeting manufacturer stating that the reflector unit conforms to these specification requirements. The reflectors shall be furnished in either amber or crystal as specified and shall be ready for mounting. The base assembly of the reflector units shall be free of cracks and checks, and fabrication shall be accomplished in a uniform and professional manner.

The manufacturer’s name, model and date of manufacture shall be clearly identified on the base of the reflectors so that it is visible after installation.

For qualification purposes only, ten (10) samples required for tests set forth in these Specifications shall be submitted by the Contractor. In addition, the Engineer will have the right to select 10 samples at random from each shipment for acceptance purposes.

Installation. Barrier wall reflectors, Type C shall be installed at the spacing and elevations shown in the Plans or as directed by the Engineer.

Only the Tollway’s specified type of reflector and geometric shape will be permitted within the limits of a contract.

The surface of the barrier to which the unit is to be applied shall be free of foreign matter and any material which would adversely affect the bond of the adhesive. Cleaning of the surfaces shall be to the satisfaction of the Engineer.

Barrier wall reflectors, Type C shall be installed using an adhesive meeting the reflector unit manufacturer's specifications. The adhesive shall be placed either on the surface of the

barrier or the bottom of the unit in sufficient quantity to ensure complete coverage of the contact area with no voids present and with a slight excess after the unit is pressed firmly in place.

The Contractor shall exercise care that the reflectors are placed in a satisfactory and uniform alignment both horizontally and vertically. Acceptance of the reflectors installation will include, in addition to ordinary inspection, a night inspection shall be made by the Engineer and Contractor from an automobile. Reflectors not having satisfactory and uniform night appearance shall be moved and adjusted or replaced as required at the Contractor's expense until they do conform to the requirements herein and are found to be acceptable to the Engineer.

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

Basis of Payment. This work will be paid for at the contract unit price per each, for BARRIER WALL REFLECTORS, TYPE C.

Pay Item Number	Designation	Unit of Measure
JI782022	BARRIER WALL REFLECTORS, TYPE C	EACH

MAST ARM CABLE ASSEMBLY (SPECIAL) (Illinois Tollway)
Effective: March 20, 2018

Description. This work shall consist of furnishing and installing a mast arm cable assembly as specified herein and shown on the plans. This work shall also include furnishing all supervision, labor, transportation, equipment and materials necessary to complete mast arm (s) inspection prior to installation of the cable assemblies at the locations specified in the plans in accordance with the procedures described elsewhere in this special provision.

Materials. Materials shall be according to the following:

Wire Rope: Cable (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 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-1410 and Mil-DTL-83420.

Cable clips shall be stainless steel compatible with the cable and as recommended by the cable manufacturer. Clips shall be same stainless steel grade as the wire rope they are connected to.

CONSTRUCTION REQUIREMENTS

General

Prior to the installation of the cable assembly, the Contractor shall perform inspection of the mast arm (s) as outlined in the Inspection section herein. If inspection reveals cracks or other defects, the mast arm (both mast arms in the case of twin mast arms) shall be replaced. The replacement of the mast arms shall be in accordance with the Special Provisions MAST ARM REPLACEMENT (SPECIAL). The removal and replacement of the mast arm (s) shall be done such that the pole always has the intended luminaire in place, since poles are designed to carry loads. The cable assembly shall be installed as indicated in the plan details. The aluminum pole cap and luminaire lid may be removed to allow for the routing of the cable. The cable shall be routed around the bolts for the luminaire connection bracket encompassing a minimum of two (2) bolts. Each end of the cable shall be connected with a minimum of two (2) stainless steel wire rope clips as indicated. Reattached pole cap with new three (3) ¼" set screws and close the luminaire lid. Each pole shall be tagged with an aluminum tag. The tag shall be always placed on the same side of the light pole facing roadway and towards lower milepost. The tag shall be attached to the pole with adhesive at a distance of 6 feet above the roadway elevation and shall be a minimum 4" wide by 2"high, yellow color and have the year of the installation of the cable shown. Character height shall be 1". The tag and adhesive shall be for exterior use and provide a minimum of 15 years of service. In addition, each mast arm shall be tagged with a unique identifier (Pole Inventory Number Convention as described below). Same type and requirements for the pole tags shall apply to the mast arm tag, except character font shall be ½". Slack shall be provided as shown in the plans. Excess slack shall be tucked into the end of the mast arm to avoid entanglement with luminaire fixture.

Inspection

The inspections shall be in accordance with the guidelines, policies and procedures outlined herein and shall be conducted considering the safety of the inspection crew and Illinois Tollway patrons.

Inspection activities shall be scheduled with the applicable Illinois Tollway Maintenance Sections several weeks in advance of the inspections. The Contractor shall confirm in writing the specific inspection locations and dates with the Maintenance Section Manager between five and fifteen calendar days prior to the inspection.

The following manuals are to be used as references in the planning and performance of these inspections:

- Illinois Department of Transportation (IDOT) Sign Structure Inspection Manual
- FHWA “Guidelines for the Installation, Inspection, Maintenance and Repair of Structural Supports for Highway Signs, Luminaires and Traffic Signals
- Illinois Tollway Traffic Control and Communications Guidelines
- Bridge Inspector’s Reference Manual (FHWA) and Applicable Supplements
- IDOT Structural Services Manual

The Contractor shall have a detailed safety plan submitted prior to work commencing. The Safety Plan shall include, but not limited to:

- Safety Plan Officer for Inspection firm
- Safety Organization
- Safety Incident Report Procedures and Forms
- Fall Safety Specifications
- Operation of Bucket or lift truck guidelines
- Hospital Locations
- Latest Manual of Uniform Traffic Control Devices (MUTCD)
- Specific work zone traffic setups for ‘gore’ areas
- Specific work zone lane closure or shoulder closure schedule and lengths
- Mandatory personal safety equipment
- First Aid Kit

Inspector Qualifications. The minimum qualifications of the Team Leader shall be as follows:

- Is a Professional Engineer or Structural Engineer licensed in the State of Illinois who has designed, supervised the construction of, or inspected steel or aluminum structures for a minimum of 2 years; or
- Has a minimum of 5 years of experience in structure assignments in a responsible capacity or NICET Level III or IV certification in Structure Inspection and have completed

a comprehensive training program based on the Guidelines for the Installation, Inspection, Maintenance and Repair of Structural Supports for Highway Signs, Luminaires and Traffic Signals.

- The Team Leader shall be trained in and responsible for work zone traffic control and shall have received OSHA aerial lift certification and equipment training for the equipment being used.
- The Inspector shall be able to identify defective welds and fatigue prone connection details.
- The ability to perform all tasks outlined in the Mandatory Inspection Procedures.

Mandatory Inspection Procedures.

It is the responsibility of the Inspector to perform:

- A hands-on visual inspection of the mast arm, identify defects, deterioration, malfunction, damage or potential hazards; and report these deficiencies. The inspection shall include:
    - The mast arm to pole connection, luminaire to mast arm connection, light cover latches, missing cover plates, loose, broken or missing sections of conduit, open electrical boxes.
    - The mast arm to bracket welded connection shall be examined for any cracking. All cracks found during the inspection shall have their beginning and end points marked on the structure along with the date of inspection using a paint stick.
    - The mast arm to pole connections shall be checked for missing fasteners, misalignment, missing or loose nuts and cracked castings.
- Non-Destructive Testing (NDT) techniques such as Dye Penetrant shall be used to verify cracks. It is important that the person conducting the test, as well as the personnel interpreting the test data, be properly trained in the applied method. Additional qualifications include both an understanding of the theory behind the test and practical experience. All inspection methods shall be conducted in accordance with applicable American Society for Nondestructive Testing (ASNT) procedures. A 10-power magnifying glass shall be used to confirm the existence of a suspected crack.
- Document deficient areas with sketches, dimensions, and photographs as necessary, but at a minimum as described below. Sketches shall be attached to the inspection record as a PDF file.
- A minimum of three photographs for each mast arm inspected shall be taken during the inspection and included in the report. At least one photograph of entire mast arm shall be included. A photograph shall be taken of both sides of all mast arm to bracket welded connections. Additional photos detailing specific defects and problems shall be taken and included in the report. A caption must be entered for each photograph. A sequential photo order number must be entered for each photograph that is to be printed in the final report. The following naming convention shall be utilized for each photograph:

  PH_Pole_Description_Date.jpg

Photograph Naming Convention		
PH	PH	Constant, stands for photograph
Pole	See below for Pole Inventory Number Convention	Inventory number of Light Pole photographed
Description	i.e. Cracked Weld	Brief description of photograph (no spaces between words, capital first letter of each word, and abbreviate if necessary)
Date	MMDDYYYY	Date photograph was taken

The Pole Inventory Number Convention shall be as follows:

Tollway, Milepost, Type, Direction, Ramp location

TOLLWAY: EW = Reagan Memorial Tollway (I-88)
NS = Veterans Memorial Tollway (I-355)
NW = Jane Addams Memorial Tollway (I-90)
TS = Tri-State Tollway (I-294 & I-294/I-80)
TN = Tri-State Tollway (I-94)
ES = Eden's Spur (I-94)
EO = Elgin-O'Hare Tollway (I-390)
WA = West O'Hare Access Bypass (I-490)

MILEPOST: Milepost to the tenth or hundredth if a ¼ mile posts (i.e. 14.75)

TYPE: The type only refers to the basic shape of the light pole
P = Single Mast Arm
T = Twin Mast Arms, add direction (E, W, N, or S) to identify which arm

DIRECTION: EB, SB, WB, NB Inventory direction of the roadway, or X for centerline median

RAMP: (R) = along ramp (omitted if not along ramp)

EXAMPLE: TS38.4TE, NB(R) for a light pole with twin mast arm located along the Tri-State Tollway (I-294) northbound, east arm at milepost 38.4 on a ramp

Reporting Procedure. A report for each mast arm inspected shall be prepared and submitted electronically in PDF format. The report may include all mast arms inspected for the particular corridor. The general order of the report is as follows:

- A narrative description summarizing the scope of the inspections, the structures inspected, and the significant deficiencies found
- Individual mast arm Inspection Report Forms for each structure inspected
- Photographs or sketches for each mast arm depicting the overall condition and significant deficiencies
- Summary table of all mast arms inspected depicting Pole Identification (Pole Inventory Number Convention), Manufacturer of mast arm, Type (twin, truss, mono tube), Type of Luminaire and Defects.

The summary table shall be submitted to the Engineer for approval prior to Mast Arm Replacement.

Basis of Payment. This work will be measured as EACH for the assembly on a single mast arm and EACH at a twin mast arm pole, paid for at the contract unit price per each for MAST ARM CABLE ASSEMBLY, TWIN MAST ARM (SPECIAL) or MAST ARM CABLE ASSEMBLY, SINGLE MAST ARM (SPECIAL), which shall be payment for the work as described herein and as indicated in the plans.

Removal and replacement of defective mast arm(s) will be paid for as specified in the Special Provision for “MAST ARM REPLACEMENT (SPECIAL)”.

Pay Item Number	Designation	Unit of Measure
JI999787	MAST ARM CABLE ASSEMBLY, TWIN MAST ARM (SPECIAL)	EACH
JI999788	MAST ARM CABLE ASSEMBLY, SINGLE MAST ARM (SPECIAL)	EACH

MAINTENANCE OF TRAFFIC

Description. This work shall consist of furnishing, installation, maintenance, relocation and removal of work zone traffic control and protection in accordance with Section 701 of the Illinois Tollway Supplemental Specifications, plans details and as further defined and prescribed herein.

Maintenance of traffic on Illinois Tollway property is anticipated to consist of lane closures and lane shifts as necessary to perform the work specified in the plans and contract requirements.

GENERAL REQUIREMENTS

Utilize Illinois Tollway Standard details listed in the plans and the staging plans to perform lane closures and lane shifts.

Devices

Per Illinois Tollway Supplemental Specifications Article 701.03 except modified as shown below and to include the following additions. Warning signs and guide signs shall be consistent with barricade placement at all times. The Contractor shall immediately remove or cover signs that are inconsistent with lane assignments.

Plastic Drums: The Contractor shall use plastic drums as the type of channeling device within the contract limits. Where plastic drums are specified, type II barricades may not be used in lieu of drums.

Signs

All traffic control devices used for the maintenance of traffic shall be reflectorized prior to installation and cleaned as specified by the Engineer.

The Contractor shall be responsible for and shall replace any signs that are supplied by others and damaged by the Contractor's workforce or Subcontractors during relocation or construction operations.

The maintenance of all signs, drums, pavement marking, barriers, reflective markets, delineators, relocation of traffic control devices for snow removal operations, construction flagging, shall be required throughout the duration of the project.

All temporary construction and information signs (including signs from the MUTCD and Tollway Standards) shall be included in the maintenance of traffic pay item JS701010, unless otherwise specified.

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, twenty-one (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 two (2) days prior to the implementation of the new maintenance of traffic changes.

Traffic staging, closures, the placement and removal of signs, or the placement and removal of other traffic control devices within the limits of this Contract shall require coordination with other Contracts in adjacent sections. The requirements of Article 105.08 of the Illinois Tollway Supplemental Specifications will apply. Should a conflict arise between Contracts with respect to sequence of construction of maintenance of traffic requirements, said conflicts shall be resolved by or at the direction of the Engineer.

Any and all closures shall be coordinated between the Contractors for adjacent contracts. It is the Contractor's responsibility to maintain coordination between adjacent contracts throughout the duration of the project. This includes all maintenance activities.

The contractor shall provide 48 hours advance notice to the Engineer of any construction work that may impact Illinois Tollway cameras.

ALLOWABLE LANE CLOSURES

The project Maintenance of Traffic plan has been established for construction of the proposed improvements to I-94 utilizing staged construction within the project limits. The general Sequence of Construction expected to be followed by the Contractor is as shown on the maintenance of traffic drawings including provisions for allowable lane and shoulder closures necessary to perform the work in this contract.

Temporary lane closures within the contract limits will be permitted only with the Tollway's approval. All temporary lane and shoulder closures must be approved by the Tollway and shall be submitted by the Contractor to the Construction Manager (CM) by 7:00 AM weekdays at least one business day before the closure. The lane closure coordination must be routed through the CM and no contact should be made directly with the Tollway.

Closures along the Tri-State Tollway (I-94) shall be in accordance with the Tollway's Standard E-2, Lane Closure Details.

DAY	**ALLOWABLE 1-LANE CLOSURE TIMES (EDENS SPUR) M.P. 25.3 TO M.P. 27.7**	
	EASTBOUND	**WESTBOUND**
Monday	8:00 p.m. - 5:00 a.m. Tues.	7:00 p.m. - 6:00 a.m. Tues.
Tuesday	8:00 p.m. - 5:00 a.m. Wed.	8:00 p.m. - 6:00 a.m. Wed.
Wednesday	8:00 p.m. - 5:00 a.m. Thurs.	8:00 p.m. - 6:00 a.m. Thurs.
Thursday	8:00 p.m. - 5:00 a.m. Fri.	9:00 p.m. - 6:00 a.m. Fri.
Friday	8:00 p.m. - 8:00 a.m. Sat.	8:00 p.m. - 8:00 a.m. Sat.
Saturday	10:00 p.m. - 9:00 a.m. Sun.	7:00 p.m. - 9:00 a.m. Sun.
Sunday	10:00 p.m. - 5:00 a.m. Mon.	8:00 p.m. - 6:00 a.m. Mon.

DAY	ALLOWABLE 1-LANE CLOSURE TIMES (DEERFIELD RD TO HALF DAY RD) M.P. 21.8 TO M.P. 24.2 (THREE LANES OPEN)	
	EASTBOUND	WESTBOUND
Monday	7:00 p.m. - 6:00 a.m. Tues.	7:00 p.m. - 6:00 a.m. Tues.
Tuesday	7:00 p.m. - 6:00 a.m. Wed.	7:00 p.m. - 6:00 a.m. Wed.
Wednesday	7:00 p.m. - 6:00 a.m. Thurs.	7:00 p.m. - 6:00 a.m. Thurs.
Thursday	7:00 p.m. - 6:00 a.m. Fri.	7:00 p.m. - 6:00 a.m. Fri.
Friday	7:00 p.m. - 11:00 a.m. Sat.	7:00 p.m. - 9:00 a.m. Sat.
Saturday	6:00 p.m. - 11:00 a.m. Sun.	3:00 p.m. - 11:00 a.m. Sun.
Sunday	8:00 p.m. - 6:00 a.m. Mon.	2:00 p.m. - 6:00 a.m. Mon.

DAY	ALLOWABLE 2-LANE CLOSURE TIMES (DEERFIELD RD TO HALF DAY RD) M.P. 21.8 TO M.P. 24.2 (TWO LANES OPEN)	
	EASTBOUND	WESTBOUND
Monday	9:00 p.m. - 5:00 a.m. Tues.	8:00 p.m. - 5:00 a.m. Tues.
Tuesday	9:00 p.m. - 5:00 a.m. Wed.	8:00 p.m. - 5:00 a.m. Wed.
Wednesday	9:00 p.m. - 5:00 a.m. Thurs.	8:00 p.m. - 5:00 a.m. Thurs.
Thursday	10:00 p.m. - 5:00 a.m. Fri.	9:00 p.m. - 5:00 a.m. Fri.
Friday	10:00 p.m. - 8:00 a.m. Sat.	9:00 p.m. - 7:00 a.m. Sat.
Saturday	9:00 p.m. - 9:00 a.m. Sun.	7:00 p.m. - 9:00 a.m. Sun.
Sunday	9:00 p.m. - 5:00 a.m. Mon.	9:00 p.m. - 5:00 a.m. Mon.

DAY	ALLOWABLE 3-LANE CLOSURE TIMES (DEERFIELD RD TO HALF DAY RD) M.P. 21.8 TO M.P. 24.25 (ONE LANE OPEN)	
	EASTBOUND	WESTBOUND
Monday	12:00 a.m. - 4:00 a.m.	12:00 a.m. - 4:00 a.m.
Tuesday	1:00 a.m. - 4:00 a.m.	12:00 a.m. - 4:00 a.m.
Wednesday	1:00 a.m. - 4:00 a.m.	1:00 a.m. - 4:00 a.m.
Thursday	1:00 a.m. - 4:00 a.m.	1:00 a.m. - 4:00 a.m.
Friday	1:00 a.m. - 4:00 a.m.	1:00 a.m. - 4:00 a.m.
Saturday	1:00 a.m. - 5:00 a.m.	1:00 a.m. - 5:00 a.m.
Sunday	1:00 a.m. - 6:00 a.m.	1:00 a.m. - 6:00 a.m.

DAY	ALLOWABLE 3-LANE CLOSURE TIMES (LAKE COOK RD TO DEERFIELD RD) M.P. 24.2 TO M.P. 25.3 (3 LANES OPEN)
	EASTBOUND
Monday	9:00 p.m. - 5:00 a.m. Tues.
Tuesday	9:00 p.m. - 5:00 a.m. Wed.
Wednesday	10:00 p.m. - 5:00 a.m. Thurs.
Thursday	10:00 p.m. - 5:00 a.m. Fri.
Friday	10:00 p.m. - 8:00 a.m. Sat.
Saturday	10:00 p.m. - 9:00 a.m. Sun.
Sunday	10:00 p.m. - 5:00 a.m. Mon.

DAY	ALLOWABLE 2-LANE CLOSURE TIMES (LAKE COOK RD TO DEERFIELD RD) M.P. 24.2 TO M.P. 25.3 (4 LANES OPEN)
	WESTBOUND
Monday	8:00 p.m. - 5:00 a.m. Tues.
Tuesday	8:00 p.m. - 5:00 a.m. Wed.
Wednesday	9:00 p.m. - 5:00 a.m. Thurs.
Thursday	9:00 p.m. - 5:00 a.m. Fri.
Friday	9:00 p.m. - 7:00 a.m. Sat.
Saturday	8:00 p.m. - 9:00 a.m. Sun.
Sunday	9:00 p.m. - 5:00 a.m. Mon.

DAY	ALLOWABLE 1-LANE CLOSURE TIMES (LAKE COOK RD TO DEERFIELD RD) M.P. 24.2 TO M.P. 25.3 (5 LANES OPEN)	
	EASTBOUND	WESTBOUND
Monday	9:00 a.m. - 1:00 p.m. 4:00 p.m. - 7:00 a.m. Tues.	7:00 p.m. - 6:00 a.m. Tues.
Tuesday	9:00 a.m. - 2:00 p.m. 4:00 p.m. - 7:00 a.m. Wed.	7:00 p.m. - 6:00 a.m. Wed.
Wednesday	9:00 a.m. - 1:00 p.m. 4:00 p.m. - 7:00 a.m. Thurs.	7:00 p.m. - 6:00 a.m. Thurs.
Thursday	9:00 a.m. - 1:00 p.m. 4:00 p.m. - 7:00 a.m. Fri.	7:00 p.m. - 6:00 a.m. Fri.
Friday	8:00 a.m. – 12:00 p.m. 4:00 p.m. - 12:00 a.m. Sat.	7:00 p.m. - 9:00 a.m. Sat.
Saturday	12 a.m. - 12:00 a.m. Sun.	4:00 p.m. - 11:00 a.m. Sun.
Sunday	12:00 a.m. - 3:00 p.m. 5:00 p.m. - 7:00 a.m. Mon.	3:00 p.m. - 6:00 a.m. Mon.

DAY	ALLOWABLE 2-LANE CLOSURE TIMES (NORTHBOUND I-294 AT STRUCTURE # 340) (2 LANES OPEN)
	NORTHBOUND
Monday	7:00 p.m. - 6:00 a.m. Tues.
Tuesday	7:00 p.m. - 6:00 a.m. Wed.
Wednesday	7:00 p.m. - 6:00 a.m. Thurs.
Thursday	7:00 p.m. - 6:00 a.m. Fri.
Friday	7:00 p.m. - 9:00 a.m. Sat.
Saturday	5:00 p.m. - 10:00 a.m. Sun.
Sunday	4:00 p.m. - 6:00 a.m. Mon.

DAY	ALLOWABLE 1-LANE CLOSURE TIMES (LAKE COOK ROAD EXIT RAMP FROM NORTHBOUND I-294)(STRUCTURE #339) (1 LANE OPEN)
	NORTHBOUND
Monday	11:00 p.m. - 5:00 a.m. Tues.
Tuesday	11:00 p.m. - 5:00 a.m. Wed.
Wednesday	11:00 p.m. - 4:00 a.m. Thurs.
Thursday	12:00 a.m. - 4:00 a.m. Fri.
Friday	12:00 a.m. - 5:00 a.m. Sat.
Saturday	12:00 a.m. - 7:00 a.m. Sun.
Sunday	11:00 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 closure will not be allowed, or must be removed, if so directed by the Engineer, due to inclement weather or heavy traffic.

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.

SUBSTAGES

Two substages are included in the plans indicating the maintenance of traffic from Edens Plaza to Deerfield Road when the adjacent contract (east of Edens Plaza) is reduced to one lane. Substage 1A indicates the maintenance of traffic when traffic is shifted to the inside lanes. Substage 2A indicates the maintenance of traffic when traffic is shifted to the outside lanes. If the adjacent project does not reduce the traffic to a single lane prior to September 1, the substages may be implemented with Tollway approval after September 1.

SERVICE RAMP FULL CLOSURES

Service ramp full closures for single lane ramps will not be permitted between the hours of 5:00 a.m. Monday through 10:00 p.m. Friday. Service ramp full closures may only be closed as noted below:

DAY	ALLOWABLE SERVICE RAMP FULL CLOSURES TIMES
Friday	10:00 p.m. Fri. - 5:00 a.m. Sat.
Saturday	10:00 p.m. Sat. - 5:00 a.m. Sun.
Sunday	10:00 p.m. Sun - 5:00 a.m. Mon.

All detour signage shall be in place prior to ramp closures.

The Contractor shall furnish and install all signs as shown on the plans for service ramp closures. The cost of installing, maintaining and removing the detour shall be included in the contract unit price for MAINTENANCE OF TRAFFIC.

The temporary weekend detour route for Ramp E (Loop Ramp) to I-94 (from EB Deerfield Road) traffic shall be as follows and as shown on the plans:

- The I-94 traffic on Deerfield Road will be directed to southbound Saunders Road,
- South on Saunders Road to Lake Cook Road,
- East on Lake Cook Road to South Skokie Road,
- South on Skokie Road to I-94 SB.

The total detour length for I-94 traffic is 6.3 miles.

The temporary weekend detour route for Ramp E (Loop Ramp) to I-294 (from EB Deerfield Road) traffic shall be as follows and as shown on the plans:

- The I-294 traffic on Deerfield Road will be directed to southbound Saunders Road,
- South on Saunders Road to Lake Cook Road,
- East on Lake Cook Road to Southbound entrance ramp to I-294 SB,
- Southbound entrance ramp to I-294 SB.

The total detour length for I-294 traffic is 1.8 miles.

The temporary weekend detour route for Ramp F (Underpass) traffic to Deerfield Road shall be as follows and as shown on the plans:

- The I-94 WB traffic will be directed to continue westbound (north) on I-94 to Half Day Road exit ramp,
- West on Half Day Road to N. Milwaukee Road,
- South on N. Milwaukee Road to Deerfield Road,
- East on Deerfield Road to detour end.

The total detour length is 9.1 miles.

The temporary weekend detour route for Ramp C (from I-94 EB to Lake Cook Road) traffic shall be as follows and as shown on the plans:

- I-94 EB traffic accessing Lake Cook Rd. will be directed to exit at Half Day Road,
- West on Half Day Road to N. Milwaukee Road,
- South N. Milwaukee Road to Lake Cook Road,
- East on Lake Cook Road to detour end.

The total detour length is 7.3 miles.

Only one ramp within the project limits may be closed at one time. Simultaneous closure of ramps is not permitted.

The contractor shall coordinate with other projects along the detour route or in the area.

Specifically, the contractor shall coordinate with the Illinois Department of Transportation (IDOT) project on Route 21 near Deerfield Road. The contractor shall contact the resident engineer for the Route 21 project and coordinate his detour schedule with this project. The contractor may need to coordinate with the IDOT project for the Dundee Road Bridge Closure that will be

detouring traffic to Lake Cook Road. The contractor may need to coordinate with the Cook County Lake Cook Road Bridge project.

The contractor shall notify the Cook County Department of Transportation and Highways upon installation of signs and subsequent removal for any detours affecting Lake Cook Road.

The contractor shall verify that Half Day Road is not restricted to oversized trucks prior to establishing any detour using Half Day Road. If Half Day Road is restricted to oversized trucks, the contractor shall contact Mr. Corey Jucius at IDOT District 1 to apply for a temporary permit to lift the restriction during the detour hours. The application for the temporary permit must be made at least 21 days in advance of the time the permit is needed.

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" .

HOLIDAY PERIODS

Per Article 701.12 of the Tollway Supplemental Specifications as detailed below:

	From 12:00 Noon on:	Through 9:00 am on:
Thanksgiving Weekend	Wednesday, November 21, 2018	Monday, November 26, 2018
Christmas Weekend	Monday, December 24, 2018	Wednesday, January 2, 2019
Easter Weekend	Thursday, April 18, 2019	Monday, April 22, 2019
Memorial Day Weekend	Friday, May 24, 2019	Tuesday, May 28, 2019
Independence Day	Wednesday, July 3, 2019	Monday, July 8, 2019
Labor Day Weekend	Friday, August 30, 2019	Tuesday, September 3, 2019
Thanksgiving Weekend	Wednesday, November 27, 2019	Monday, December 2, 2019
Christmas Weekend	Tuesday, December 24, 2019	Thursday, January 2, 2020

WEEKEND TRAFFIC

Between Lake Cook Road and Deerfield Road, 2 eastbound lanes over the entire weekend can only be closed prior to Memorial Day or after Labor Day. Between Lake Cook Road and Deerfield Road, 2 westbound lanes may be closed on any weekend except for Friday nights between Memorial Day and Labor Day.

Method of Measurement. All maintenance of traffic required to safely set-up, maintain, and remove from site all MOT operations for work under this contract shall be considered part of the Lump Sum measurement for MAINTENANCE OF TRAFFIC.

Basis of Payment. This work will be paid for at the contract unit price per LUMP SUM for MAINTENANCE OF TRAFFIC.

Pay Item Number	Designation	Unit of Measure
JS70101	MAINTENANCE OF TRAFFIC	L SUM

LUMINAIRE, LED, HORIZONTAL MOUNT

Description. This work shall be done in accordance with Illinois Tollway Supplemental Specifications Section 821.

The following paragraph shall be added at the end of art. 821.04:

(e) Existing HID luminaire shall be removed and become property of the contractor prior to installation of the proposed LED luminaire.

Basis of Payment. This work will be paid for at the contract unit price per each for LUMINAIRE, LED, HORIZONTAL MOUNT, complete in place, accepted.

Pay Item Number	Designation	Unit of Measure
JS821100	LUMINAIRE, LED, HORIZONTAL MOUNT	EACH

LUMINAIRE, LED, WALL MOUNTED EXTERIOR

Description. This work shall be done in accordance with Illinois Tollway Supplemental Specifications Section 821 applicable to UNDERPASS LUMINAIRE, LED.

Basis of Payment. This work will be paid for at the contract unit price per each for LUMINAIRE, LED, WALL MOUNTED EXTERIOR, complete in place, accepted.

Pay Item Number	Designation	Unit of Measure
JS821230	LUMINAIRE, LED, WALL MOUNTED EXTERIOR	EACH

CO-LOCATED SOLAR POWERED GENERATOR ASSEMBLY (Illinois Tollway)

Effective Date: February 6, 2014
Revised Date: January 18, 2018

DESCRIPTION

This work shall consist of furnishing, installing, calibrating, and testing a Co-Located Pole Mounted Solar Powered Generator Assembly as shown on the contract plans and specifications and as directed by the Engineer. The system consists of a solar powered generator which is pole mounted (pole provided separately) and co-located with a Microwave Vehicle Detection System (MVDS) Assembly. The main components of the system are as follows:

Co-located pole mounted solar powered generator assembly shall consist of:

- Solar Panels
- Solar Controller (Morningstar TriStar MPPT-60)
- Batteries
- Cabinet/Enclosure to house batteries and electronics
- Mounting Brackets and Framing
- Conduit and Cable to connect generator to a single MVDS or dual MVDS assembly

All work will require close coordination with the Engineer. This includes, but is not limited to, the following:

a. Pre-installation meeting with Engineer
b. Locating the pole mounted solar powered generator assembly

MATERIALS

The Contractor shall furnish components for each Co-Located Solar Powered Generator Assembly in accordance with the plan details and as specified herein.

Co-Located Solar Powered Generator:
The following requirements shall be met for the solar powered generator assembly:

- All components shall be rated for a hardened operating temperature environment.
- The minimum operating temperature range shall be -4 degrees Fahrenheit (-20° C) to +140 degrees Fahrenheit (+60 C)
- The solar powered generator shall consist of a minimum of:
    - Two (2) 300 watt solar panels with Iron ridge mounting system
    - Two (2) six (6) volt batteries
    - Solar controller (Morningstar TriStar MPPT-60)
    - 12V DC Surge Protection (Atlantic Scientific Zone Barrier 24575)
    - All necessary panels, brackets, battery cables, wiring, terminal blocks, conduit, and circuit breakers required for a complete and operational system.

Electrical Criteria:

1) Each 300 watt (nominal) solar panel shall meet or exceed the following requirements:
    a. Surface area of less than 21 sq. ft.

b. Less than 52 pounds weight
c. Minimum Rated Current (Impp) at NOTC: 6.5 Amps

2) Individual Battery Voltage: 6V Absorbent Glass Mat (AGM) style
    a. Each Battery to be minimum 400 Amp hour (Ahr) rated based on 20hr rate @ 77 degrees Fahrenheit (+25° C)
3) Vented Stainless Steel NEMA 3R enclosure minimum size of 30”w x 36”h x 12” d with locking clasp to place batteries along with other electronics
4) Pole mounting kit for enclosure (Hoffman CPMK30)
5) Provide conduit between the Solar Generator and the pole. All cable to be routed through the pole.
6) Tilt Range: 15-65 degrees
7) Terminal Blocks (Allen Bradley 1492-CD8)
8) Ground Bar (Hoffman PGS2K)
9) DIN Rail

The following equipment shall be placed in the enclosure as shown on the plans, MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY and WIRELESS COMMUNICATIONS, ITS ASSEMBLY for associated components, cables, hardware and electronics for a fully functioning wireless, solar MVDS system deployment:

- T-Bus Connector
- Sensor Surge Protection Device
- RS-232/RS-485 to Ethernet Converter
- Multi-Conductor Cable to MVDS
- Wireless Modem
- Antenna
- Antenna Cable

Electrical design shall meet applicable International Building Construction (IBC) requirements and National Electric Code (NEC) standards.

Solar Power System Cabinet/Enclosure

The vented Stainless Steel cabinet shall have a full-length hinged door as manufactured by Hoffman NEMA 3R with a lock system and aluminum back panel. The cabinet shall be furnished with mounting brackets necessary for attachment to the pole. Raceways and other openings, including foundation, shall be sealed to prevent the intrusion of insects, rodents, pests, and debris and shall be installed as shown on the drawings and details. The minimum size of the enclosure shall be 30”w x 36”h x 12”d. The contractor shall upsize the cabinet as necessary to accommodate the batteries, breakers and solar charge controller, as necessary at no additional cost. The cabinet shall include shelving as necessary to house the batteries and any other pieces of electronics in the enclosure. Battery terminals must have adequate clearance to avoid incidental contact with other metallic surfaces/components within the cabinet.

Batteries

Batteries shall be fully charged and tested by the manufacturer. Prior to their installation with the solar power generator, battery test results shall be submitted to the Engineer for approval. After the solar power generator installation is completed, but before the MVDS assembly is powered from the generator system, the batteries shall be fully charged for 48 hours.

Solar Panel Mounting
A rack-mounted system for fixed mount pole top attachment of solar panels with ability to tilt at least within +/- 10 degrees of Latitude shall be manufactured by IRONRIDGE – Series UNI-TP to accommodate two (2) solar panels of the dimensions of the solar panels provided by the contractor for the solar power generator.

Grounding System
The Co-Located Solar Powered Generator ground shall be connected to the MVDS assembly ground system along with the external Master Ground Bus connections. For more detail pertaining to the grounding system, see the Illinois Tollway ITS ELEMENT SITE GROUNDING special provision.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate with the Engineer. This includes, but is not limited to, the following:

Pre-Procurement Documentation Approvals

- The Contractor shall submit for approval to the Engineer, within 10 business days from Notice to Proceed (NTP), a detailed schedule showing dates for: product submittals and approvals; device configuration by the Illinois Tollway; construction/installation; calibration; testing; burn-in period; and warranty of each Solar Powered Generator Assembly. This detailed schedule shall be included in the project schedule, as required per Illinois Tollway Supplemental Specifications Article 108.02. Schedules for each Co-Located Solar Powered Generator Assembly to be deployed within the larger construction contract and shall be staggered based on resources to be employed.
    - If this installation is part of a larger ITS deployment or construction project, then the furnishing, installation, and testing of the Co-Located Solar Powered Generator Assembly site(s), shall be specifically noted in the overall project schedule.
- Within 10 business days from Notice to Proceed, the Contractor shall submit a completed Contractor Shop Drawing Submittal Checklist (attached to this special provision) for review and approval by the Engineer.
- Within 10 business days from Notice to Proceed, the Contractor shall submit associated submittals for catalog cut sheets, wiring diagrams, and calculations for review and approval by the Engineer.

The Contractor shall make all submissions to the Engineer through the Illinois Tollway's Web Based Program Management (WBPM).

The Contractor must obtain approval of the schedule, catalog cut sheets, wiring diagrams, and calculations from the Engineer prior to purchasing any equipment and subsequently performing the installation per the approved documents, contract plans, and specifications.

INSTALLATION

The Contractor shall install the Co-Located Solar Powered Generator cabinet, solar panels, and associated cables and wiring at the location necessary to provide a working system as approved by the Engineer.

The solar panels shall be mounted in an orientation open 186 degrees from magnetic North and tilted 57 degrees, then optimized to achieve maximum possible solar exposure. The Contractor must submit the orientation and tilt to the Engineer for approval. The Contractor shall document the orientation and tilt in the as-built record drawings.

A ground rod shall be installed with a bare No. 2 AWG ground cable installed from the master ground bus and cadwelded to each ground rod.

The components shall be installed in the solar generator cabinet in accordance with approved contractor detail drawings. Once all equipment is installed at the solar power generator, the battery system must be fully charged before the MVDS assembly is connected. The Contractor shall submit documentation to the Engineer of the initial solar package turn-on time and the time in which the MVDS enclosure is connected. Once the batteries are fully charged, the component subsystem testing will be performed as described herein and per the manufacturer's recommendations. The contractor will complete the installation of the power cables from the solar generator to the MVDS. The solar generator package shall be completed in time to allow testing of the co-located MVDS assembly.

TESTING

The Contractor shall be required to perform the following tests after the installation of the Solar Powered Generator Assembly. The Contractor shall use the test plans within this special provision to conduct the following tests in the presence of the Engineer.

- Ground System Testing
- First Unit Factory Visual Inspection
- Site Test
- 30-Day Burn-in Period
- Final System Acceptance and Training

First Unit Factory Visual Inspection
The Contractor (or the Contractor's equipment fabricator) shall completely assemble one Co-Located Solar Powered Generator unit which includes the cabinet, solar array, batteries, solar charge controller, components and complete all internal wiring (including labeling), then provide 5 business days' notice (via the WBPM system) that this unit is ready for inspection. The contractor shall have one set of contract plans and two sets of shop drawings on site to be redlined with any discrepancies noted. One set of redlines will be retained by the Illinois Tollway. The Contractor shall follow the Illinois Tollway ITS Labeling Guide for all labeling of components. The manual can be found on the Illinois Tollway's website.

In lieu of the Factory Visual Inspection, the Contractor can obtain from the manufacturer a product validation certification illustrating that the manufacturer has followed their quality processes and verifies that the unit meets the specifications for operations. This certificate must be submitted to the Engineer for review and approval for the Factory Visual Inspection acceptance.

Site Testing
The purpose of the Site Test is to have the Contractor demonstrate to the Engineer that all Co-located Solar Powered Generator Assembly components have been installed, connected,

labeled, and configured correctly as per contract plans and as per the manufacturer's requirements, utilizing quality workmanship. This installation shall result in a reliable, fully functional co-located solar powered generator for service to a MVDS assembly.

The Site Test shall be performed in conjunction with all associated equipment installed at a common site, including but not limited to the following elements. A Site Test shall not be performed at the element or component level. Site Tests shall be performed for all relevant elements at a common site, meeting any Site Test requirements specified for each element.

- MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY
- ITS POLE MOUNTED ENCLOSURE, ITS ASSEMBLY (CCTV or MVDS)
- FIBER OPTIC COMMUNICATIONS, ITS ASSEMBLY
- WIRELESS COMMUNICATIONS, ITS ASSEMBLY
- CO-LOCATED SOLAR POWERED GENERATOR ASSEMBLY
- ITS ELEMENT SITE GROUNDING

For the Site Test to be accepted, the Contractor shall demonstrate to the Engineer that:

- The installation has been performed as per contract plans and as per the manufacturer's recommendations.
- All enclosure components are properly wired and demonstrate continuity and correct grounding utilizing good workmanship.
- The enclosure is attached/orientated to the pole and properly grounded.
- All raceways are secured and sealed, as required.
- All enclosure components demonstrate correct input and/or output voltages when powered/unpowered.
- All connections are tight and cannot be dislodged by incidental contact from the Engineer.
- All Co-located Solar Powered Generator Assembly equipment is properly labeled as per the Illinois Tollway ITS Labeling Guide (located on the Illinois Tollway website).
- Verify solar power generator functionality.
    - Adequate power is generated on a sunny day until the batteries become fully charged. Check the current, voltages, and charges at various stages.
    - Input solar array and battery bank voltages meet requirements.
- Grounding System testing meet requirements.

30-Day Burn-in Period

The purpose of the 30-Day Burn-in Period is to demonstrate the capabilities of the Solar Powered Generator Assembly, as well as the functionalities of the Local Field Test, troubleshooting, and diagnostics over the Burn-in Period.

For the 30-Day Burn-in Period to be accepted, the Contractor shall demonstrate to the Engineer that:

- The Engineer, Traffic Operations Center (TOC) Manager, Operations Manager, Illinois Tollway ITS maintenance manager have not submitted any trouble tickets or written (via email or Illinois Tollway's WBPM system) failure notifications within the 30-Day period.
- Failure notification shall include, but not be limited to:
    - Power loss or fluctuations.
- Any CCTV camera errors with Pan, Tilt, Zoom, automatic/manual iris, automatic/manual

focus, and camera pre-set capabilities.
    - Any operations anomaly that the Contractor cannot explain or rectify.
- For every one (1) day the Contractor is required to mitigate/fix a problem, an additional one (1) day per testing will be added to the 30-Day test. An additional one (1) day will be added to the 30-Day test of any associated external loads undergoing a concurrent 30-Day test.
- Receive written approval (via email) from the Engineer, TOC Manager, and ITS maintenance lead verifying the 30-Day Burn-In period has been successfully completed.

Final System Acceptance and Training
Final acceptance of the work associated with this Solar Powered Generator Assembly will be made after the Contractor has demonstrated to the Engineer the:

- Successful completion of the project final walk-through by the Illinois Tollway's ITS General Engineering Consultant (GEC).
- All Record Drawings and Warranty documents including an electronic computer file (Microstation and PDF) including a sketch of each solar powered generator assembly, user/operator manuals, listing each device's location, identification number, and GPS coordinates have been submitted (via Illinois Tollway's WBPM system) and been approved in writing by the Engineer.
    - Contractor shall work with the Engineer to develop record drawings of all solar power generators and connections (inclusive of electrical). Final documentation shall reflect all field changes, including but not limited to final coordinates solar powered generator assembly locations to the level of accuracy of 10 feet. Contractor shall submit these plans, maps, and/or drawings to reflect as-built condition, incorporating all changes made during installation and testing period within the 15 days prior to final acceptance.
    - The Contractor shall provide three hard and three electronic (PDF) copies of each of the operation and maintenance manuals to the Engineer for approval.
    - The Contractor shall add a new or updated laminated cabinet wiring diagram to each enclosure.
- Notification of Final Acceptance received in writing (via Illinois Tollway's WBPM system) from the Engineer.

WARRANTY

All co-located solar powered generator assembly equipment and system components shall be warranted and guaranteed against defects and/or failure in design, materials, and workmanship within the warranty period. The Contractor shall submit the warranty terms as part of each material item's shop drawing submittal for approval.

The warranty shall provide that, in the event of a malfunction during the warranty period, the defective system component shall be replaced with a new component by the manufacturer or his/her representative.

Any system component that, in the opinion of the Engineer, fails three (3) times prior to the expiration of the warranty will be judged as an unsuitable system and shall require the entire system be replaced by the device manufacturer or representative with a new system of the same type at no additional cost to the Illinois Tollway. The unsuitable system shall be

permanently removed from the project. A failure shall also be defined as the field device becoming unable to comply with all applicable standards at the time of original construction.

All manufacturer's equipment guarantees or warranties shall be included in the maintenance manuals for the subject equipment.

METHOD OF MEASUREMENT

This work will be measured in units of each, completed in place and accepted.

BASIS OF PAYMENT

This work will be paid for at the contract unit price per each for CO-LOCATED SOLAR POWERED GENERATOR ASSEMBLY.

MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY will be paid for separately.

ITS ELEMENT SITE GROUNDING will be paid for separately.

The payment to the Contractor will adhere to the following schedule:

Ten percent (10%) of the contract unit price will be paid upon receipt of submission and approval of all product submittal documentation, shop drawings, and calculations.

Sixty-five percent (65%) of the contract unit price will be paid at completion of the Site Test of the solar powered generator assembly location. Written (via Illinois Tollway's WBPM system) approval from the Engineer of acceptance of the Site Test is required before payment is released.

The final twenty-five percent (25%) of the contract unit price will be paid after Final System Acceptance by the Engineer and Training by the Contractor. Written (via Illinois Tollway's WBPM system) approval from the Engineer of Final System Acceptance is required before payment is released.

Pay Item Number	Designation	Unit of Measure
JT130701	CO-LOCATED SOLAR POWERED GENERATOR ASSEMBLY	EACH

CO-LOCATED SOLAR POWERED GENERATOR ASSEMBLY

PAY ITEM # JT130701

Contract #

e-Builder Submittal Package #:

e-Builder Submittal Date:

Reviewed By (CM Staff Name):

Review Date:

SUBMITTAL STATUS

APPROVED ☐

APPROVED AS NOTED ☐

REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
SOLAR GENERATOR / MOUNTING HARDWARE								
SPEC. PROV.		SOLAR PANELS, 300W, RATED CURRENT @NOTC = 6.5A (MIN)						
SPEC. PROV.		PANEL BRACKETS	IRONRIDGE					
SPEC. PROV.		SOLAR CONTROLLER	MORNINGSTAR	TRISTAR MPPT-60				
SPEC. PROV.		6-VOLT AGM BATTERIES - 400 AHR @ 20 HR RATE/25° C						
DETAIL DWG.		CONDUIT						
SPEC. PROV.		CABLES AND WIRING						
CABINET ENCLOSURE AND ALL ASSOCIATED MATERIALS								
SPEC. PROV.		SS NEMA 3R ENCLOSURE (MIN. 30"W X 36"H X 12"D)						
SPEC. PROV.		ENCLOSURE BACKPANEL (24"W X 14"H MIN)						
SPEC. PROV.		SHELVING (AS REQUIRED)						
SPEC. PROV.		POLE MOUNTING KIT FOR ENCLOSURE	HOFFMAN	CPMK30				
SPEC. PROV.		TERMINAL BLOCKS	ALLEN BRADLEY	1492-CD8				
SPEC. PROV.		GROUNDING BAR	HOFFMAN	PGS2K				
DETAIL DWG.		15 AMP CIRCUIT BREAKER						
DETAIL DWG.		2 AMP CIRCUIT BREAKER						
SPEC. PROV.		12VDC SURGE SUPPRESSOR	ATLANTIC SCIENTIFIC	ZONE BARRIER 24575				
DETAIL DWG.		DIN RAIL						
GROUNDING SYSTEM: SEE "ITS ELEMENT SITE GROUNDING" FOR DETAILS								
REFER TO "ITS ELEMENT SITE GROUNDING" CHECKLIST								

RE-AIMING MICROWAVE VEHICLE DETECTION SYSTEM (MVDS) UNITS (Illinois Tollway)

Effective: November 20, 2014
Revised: March 1, 2018

Description. This work shall consist of re-aiming and re-calibrating existing Microwave Vehicle Detection Sensors manufactured by Electronic Integrated Systems, Wavetronix or Image Sensing Systems. This work shall also include site and system testing of the sensors as described herein by either manufacture unit, or a combination there of.

CONSTRUCTION REQUIREMENTS

The Contractor shall re-aim and re-calibrate the existing vehicle detection sensor units when directed to do so within the contract documents or as directed by the Engineer. Prior to initiating this work, the Contractor shall provide confirmation from the Traffic Operations Center (TOC) Manager, via the Illinois Tollway Web Based Program Management (WBPM) system, that the vehicle detection unit(s) are collecting and transmitting data back to the TOC. During the calibration step, the proper equipment shall be onsite to support any re-aiming of the detection sensor that is required.

Ten days prior to any scheduled shift in traffic lanes the Contractor shall submit for approval by the Engineer, a detailed plan with the names of qualified personnel for the re-aiming and re-calibrating of the applicable vehicle detection sensor units. After approval of the Contractor's plan by the Engineer, and in coordination with the planned shift in traffic lanes, the Contractor shall re-aim and re-calibrate the applicable sensors and have the required documentation, including the completed calibration worksheets available to the Engineer through the Illinois Tollway WBPM system within 1 business day of calibration of each unit.

Aiming and Calibration

The Contractor shall download and use the current version of the manufacturer’s calibration software. The Contractor is NOT to rely solely on the manufacturer’s calibration wizard in automatic mode as it alone usually does not achieve the accuracy specified.

The Contractor shall re-aim and re-calibrate the vehicle detection sensor units within the MVDS manufacture’s specification tolerances prior to final acceptance by the Engineer. The Contractor shall fully complete MVDS calibration worksheet(s) in the presence of the Engineer before submitting for approval by the Engineer. The Contractor shall be totally and completely responsible for the vehicle detection sensor maintenance and data quality until system testing acceptance.

The properly aimed and calibrated units shall collect traffic counts and average speed on a per lane basis with individual detection zones. The detection zones shall be viewable by the Contractor performing the work.

The firmware (hardware and software) used to calibrate the MVDS unit(s) shall be capable of allowing verification of correct setup and diagnostics. It shall include facilities for saving verification data and collected data as well as saving and retrieving sensor setup from a disk file. Copies of this data shall be provided to the Engineer upon completion of the calibration procedure.

TESTING

The Contractor shall be required to perform the following tests after the re-aiming and re-calibrating of the MVDS units. The Contractor shall use the test plans within this special provision to conduct the following tests in the presence of the Engineer.

- Site Test
- System Test

Site Test

The purpose of the Site Test is to have the Contractor demonstrate to the Engineer that the MVDS unit(s) have been properly re-aimed and re-configured as per the manufacturer's requirements, utilizing quality workmanship. The re-aiming and re-calibrating shall result in the reviewing of accurate (per manufacturer's specifications) volume and speed data at the site before being connected to the Illinois Tollway switch and communications system.

For the Site Test to be accepted, the Contractor shall demonstrate to the Engineer that:

- The MVDS Calibration form and MVDS configuration spreadsheet (Available on the WBPM system) has been fully completed, signed by the Engineer and provided to the Illinois Tollway Traffic Operations Center (TOC) at the finish of the Site Test.
    - A minimum of 20 vehicles count per lane of traffic, per site (manual and via the MVDS) has been conducted, has accurately recorded the counts on the Volume Verification Sheet (attached to this specification), and the Volume Verification Sheet has been signed by the Engineer.
        - The counts from the MVDS shall be within 10% of the manual counts taken.
    - A one for one vehicle comparison has been conducted when calibrating the speed and has recorded the results on the Speed Verification Sheets (attached to this special provision).
        - The Contractor shall test a minimum of 20 vehicles per lane of traffic, per site. The observed average speed of the detector shall be within 10% of the average speed measured with a calibrated Lidar gun by a trained Lidar gun operator. If this requirement cannot be attained, then the Contractor shall adjust the unit and repeat the entire volume and speed tests.

System Test

The Contractor shall verify with the Engineer, via the WBPM system, if the System Test is required. The System Test shall demonstrate that the field devices can provide correct data at the TOC utilizing the Traffic Information Management System (TIMS) software.

For the System Test to be accepted, the Contractor shall:

- Notify the Engineer in writing (via the WBPM system) within 5 business days that all applicable MVDS sites are ready for System Testing.

- Demonstrate successful communication connectivity from TIMS to each re-calibrated MVDS unit.
- Demonstrate accurate data transmission from each MVDS site to TIMS.
- Receive written approval (via email) from the Engineer verifying that the TOC supervisor is receiving accurate field data from the units upon re-aiming/re-calibration.

Method of Measurement. This work will be measured in units of each, completed in place and accepted.

Basis of Payment. This work will be paid for at the contract unit price per each for REAIMING MVDS UNITS.

Pay Item Number	Designation	Unit of Measure
JT130714	REAIMING MVDS UNITS	EACH

MVDS Sensor Calibration Sheet

Project Number and Name: _____
Route (Circle One): I-88 / I-90 / I-94 / I-294 / I-355 / IL-390
Mile Post: _____ Direction (Circle One): NB / SB / EB / WB / Median
Latitude: _____ Longitude:_____
Date / Time: _____
Contractor: _____
CM: _____
Manufacture: **Wavetronix** Manufacture: **ISS**
Model: ss125 ss126 Model: X3 G4 Sx-300

Protocol: Smart Sensor X3 G4

Zone Number	Lane Number	Lane Direction	Actual Count	Sensor Count	% Difference	Speed Observed	Actual Speed	% Difference

Site Checklist					
Site Number Verification		Lane Configuration		Message Period @ 60 Sec	
Vehicle Classification		Speed Set to KPH		Lane 5 minute count	
Speed Calibration		Returned to STAT Mode		Saved to Sensor	
Saved to File					

Comments

Contractor:_____

Contractor signature:_____

CM:_____

CM signature:_____

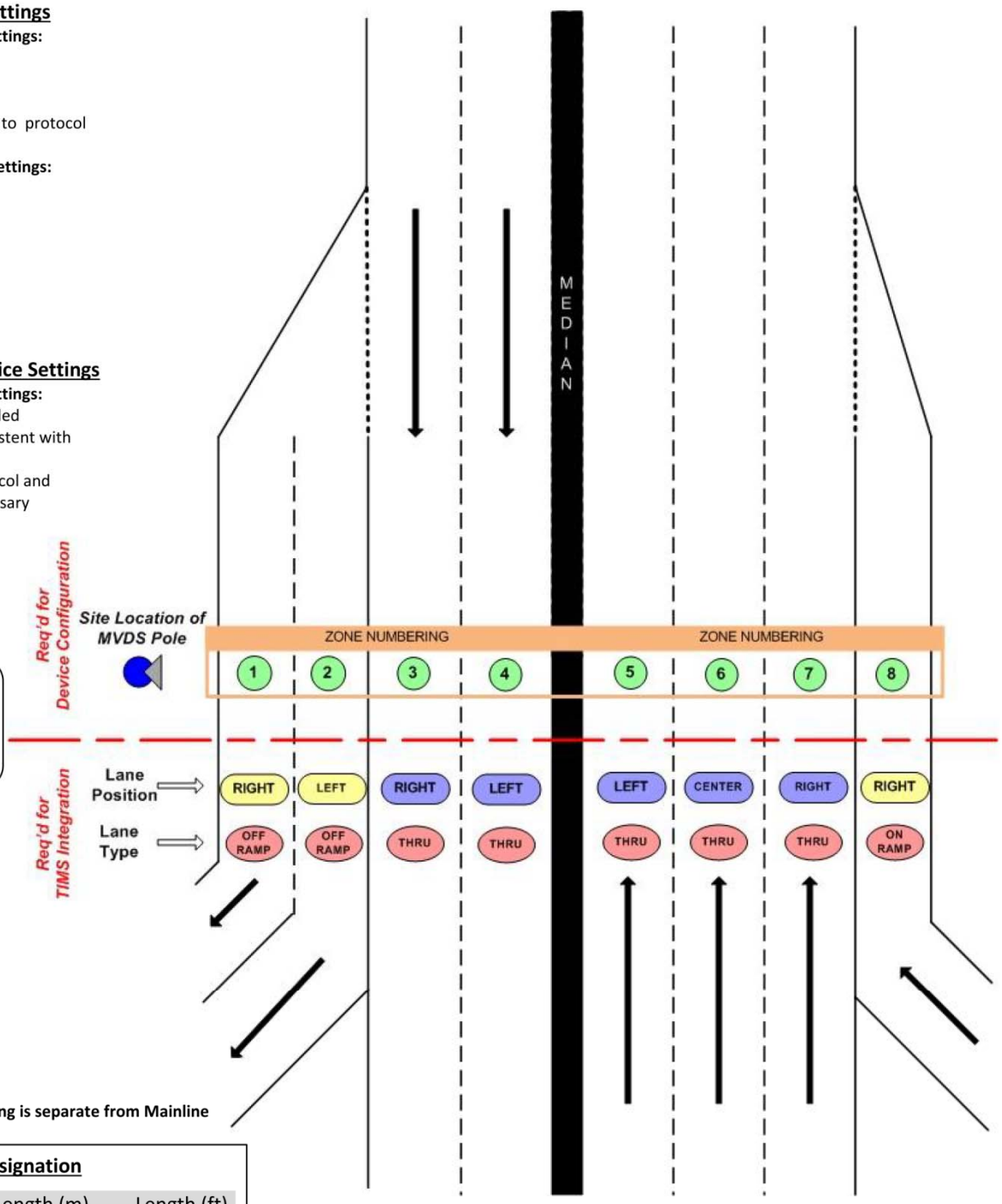
X3/G4 Device Settings

Preferred Device Settings:
Speed = KPH
Interval = 60 sec
Data mode = stat
Message comp = set to protocol

Preferred Modem Settings:
Data port = 12345
Protocol = RS232
Baud = 9600
Data bits = 8
Flow Control = none
Parity = none
Stop bits = 1

Wavetronix Device Settings

Preferred Device Settings:
-Interval mode enabled
-Serial port set consistent with modem
-Format set to protocol and broadcasted if necessary
-60 sec data interval



Note:

Ramp lane positioning is separate from Mainline

Classification Designation

Class/Bin	Length (m)	Length (ft)
1	up to 6.1m	up to 20'
2	6.1 – 7.9m	20 – 26'
3	7.9 – 15.5m	26 – 51'
4	> 15.5m	> 51'

MVDS Site Acceptance Test Form

Project Number and Name: _____

Route (Circle One): I-88 / I-90 / I-94 / I-294 / I-355 / IL-390

Mile Post: _____ Direction (Circle One): NB / SB / EB / WB / Median

Date / Time: _____ MVDS Type: _____

INTRODUCTION

Site Acceptance Testing verifies that the installed MVDS(s) are fully operational at each device site, prior to connection to the field Cisco switch.

PROCEDURE

From the Contractor's laptop, access the MVDS. Verify that the MVDS is communicating with vendor supplied software.

Use manufactured software to start automatic setup.

Use manufactured supplied software to adjust settings as required to meet

Fill out the MVDS calibration sheet.

Save setting to MVDS.

Save file to storage device.

Submit calibration sheet(s) and save file to CM via the WBPM system.

Additional Comments: _____

_____

_____

Test Conducted By: _____ **Date:** _____

CM: _____ **Date:** _____

Organization: _____

DYNAMIC MESSAGE SIGN – WALK-IN (Illinois Tollway)

Effective: January 20, 2014
Revised: January 18, 2018

Description. The work shall consist of furnishing, fabricating, manufacturing, transporting, delivery to site, installing, commissioning, testing, training, warranty, controller, controller cabinet and foundation, power and all incidentals necessary to provide a fully operational Dynamic Message Sign (DMS), of the type specified, per the contract plans and as directed by the Engineer, and as part of a fully functional ITS site.

- DMS – Type 1 shall be a walk-in type, full matrix, full color, high resolution, light emitting diode (LED) sign capable of displaying 3 lines of 21 characters of 18-inch high characters.
- DMS – Type 2W shall be a walk-in type, full matrix, full color, high resolution, light emitting diode (LED) sign or capable of displaying 3 lines of 18 characters of 18-inch high characters.

The work under this special provision shall be in association with the installation of the related DMS structure, electrical service, grounding, and communications.

Materials. The main components of the system are as described below. All other ancillary connection cables, brackets, and other items required for the installation of a fully functional DMS assembly are included under this provision.

- Dynamic Message Sign
- Associated DMS cabling
- Surge Protection Device (SPD)

The following are the specific materials required for the major system component of the DMS:

Sign Housing

A. The walk-in sign housing shall be designed to comply with NEMA Type 3R enclosure criteria. The DMS housing structural frame shall consist of aluminum extrusions made from 6061-T6 and/or 6063-T6 aluminum alloy. All sides of the DMS housing exterior, except the front, shall be covered with 0.125 inch thick aluminum sheets made from 5052-H32 aluminum alloy. This external aluminum skin shall be attached to the structural framework using a proven method of attachment. DMS structural assembly hardware (nuts, bolts, washers, and direct tension indicators) shall be stainless steel or galvanized A325 high-strength steel and shall be appropriately sized for the application.

B. Sign housing, including the framing, face and all mounting components, shall be designed to withstand a wind velocity of 90 MPH with a gust factor as specified in NCHRP Report 412, minimum wind pressure of 35 psf, in accordance with AASHTO's "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals" and certified by a Structural Engineer licensed in the State of Illinois. Design ice loading shall be a minimum of 3 psf per the above AASHTO requirements. The vendor shall submit the following shop drawing information for approval by the Engineer:

    1. Calculations showing wind load applied horizontally over the sign face and various combinations of vertical loads including dead load, ice load, and truck generated wind load (updraft).

2. Details of walkway, hangers and handrails for walkway that are externally mounted to DMS.
3. Static weights and center of gravity of the DMS.
4. Weld design computations showing all loads and stresses.
5. Structural Engineer certified fatigue resistance compliant with N.C.H.R.P., Report 412.

The manufacturer shall certify that all structural attachments satisfy the above criteria and are adequate to support the loads indicated. As required by the Illinois Tollway, this certification shall include the signature and seal of a Structural Engineer licensed in the State of Illinois. Certify the structural adequacy of all sign and device mounting brackets.

C. The DMS front face shall provide a built-in 3-degree downward tilt. The 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.

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.

D. The face shall be heated (only if the manufacturer requires) to prevent fogging, frost and condensation. A self-regulating, heat tape shall be provided along the bottom of each message line, between the glazing and the display modules. The heat tape shall be controlled by the DMS Controller.

E. DMS front face panels and front face border pieces shall be coated with semi-gloss black polyvinylidene fluoride (PVDF) applied in accordance to American Architectural Manufacturers Association (AAMA 2605) which has an expected outdoor service life of 10 to 15 years. All other DMS housing surfaces, including the access doors and DMS mounting brackets, shall be natural mill-finish aluminum.

F. Sign housing bottom panel shall contain a minimum of four small weep holes for draining moisture accumulations in the sign for condensation. Weep holes shall be designed to protect against entry of insects using non-corrosive materials. With the exception of weep hole and air in-take and exhaust openings the sign housing shall be watertight.

G. DMS and DMS Controller components shall operate in a minimum temperature range of –29ºF to +165ºF and a relative humidity range of 0 to 99%, non-condensing.

H. External DMS component hardware (nuts, bolts, screws, standoffs, rivets, fasteners, etc.) shall be fabricated from stainless steel in accordance with Article 733.02 of the Illinois Tollway Supplemental Specifications.

I. Multiple mounting brackets in the form of Z-bar extrusions shall be bolted to the DMS housing exterior rear wall to facilitate attachment of the DMS to the support structure. Mounting brackets shall be:

1. Extruded from aluminum alloy number 6061-T6.
2. Attached to the DMS structural frame members, not just the exterior sheet metal.
3. Installed at the DMS manufacturer's factory.
4. Attached to the DMS using stainless steel bolts.
5. Attached to the DMS using direct tension indicators to verify that mounting hardware is tightened with the proper amount of force.
6. Installed such that all bracket-to-DMS attachment points are sealed and water-tight.
7. Designed and fabricated such that the installing contractor can drill into them without penetrating the DMS housing and compromising the housing's ability to shed water.

J. For moving and installation purposes, multiple galvanized steel (or approved equivalent) lifting eyebolts shall be attached to the top of the DMS housing. Eyebolt hardware shall attach directly to the DMS housing structural frame and be installed at the DMS factory. All mounting points for eyebolts shall be sealed to prevent water from entering the DMS housing.

K. One (1) vertically hinged door shall be located on each end (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. Each door shall be furnished with a lock that is keyed to a Corbin #2 lock.

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.

For DMS – Type 2W, the outer door facing away from the access walkway shall be tack welded closed, 2 per unhinged side, from the interior of the DMS housing.

L. Minimum headroom of 72 inches shall be provided inside the walk-in DMS housing. A level aluminum walkway shall be installed in the bottom of the DMS housing. The walkway shall be a minimum of 24 inches wide, and it shall run the entire length of the housing, from access door to access door. The walkway's top surface shall be non-slip and shall be free of obstructions that could trip service personnel. The walkway shall support a load of 300 pounds per linear foot, and it shall be constructed of multiple aluminum removable panels.

M. 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 above the interior walkway, and a mid-rail that extends 21 inches above the interior walkway. The rail assembly shall require no tools to open and close.

N. The DMS housing 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 as required by OSHA. The anchorages must be located such that they will not allow a person to free-fall for 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.

O. All DMS equipment, assemblies and components shall be modular and capable of removal and replacement by a single technician within the door opening and interior space provided. The housing shall have non-corrosive, metal cage support frames to mount the LED display modules/driver boards. Plug-in, locking connectors shall be provided on each driver board for all connections. The cage support frame shall be designed to minimize and withstand vibration or movement of the display and/or electronics.

P. A folding, fiberglass, Class I, 24-inch high step stool shall be provided in the housing. The legs of the stool shall be equipped with rubber tread safety shoes. A wall rack shall be provided to securely store the folded stool.

Q. A collapsible or hinged flat working surface sized to fully support a portable computer or a typical technician's tool case when in a horizontal position shall be installed in the approximate center of the housing at an ergonomically correct height for a technician 70 inches tall. A duplex receptacle shall be located within five feet of this working surface.

R. The sign housing shall include a minimum of four compact fluorescent lamps (CFL) to provide uniform lighting within the sign housing interior for maintenance activities. Each lamp shall be rated for at least 10,000 hours of operation, have a minimum 30-watt rating, be self-ballasted, and be rated for cold weather. The light fixtures shall have a die-cast aluminum housing, a porcelain socket and a gasketed globe with a twist-on guard or wire cage to protect the lamp. The lighting circuit shall include timer switches located near each cabinet access door. Each timer switch shall be adjustable from 15-minutes to 4-hours of on time. Three 15 amp 120 VAC GFCI duplex outlets shall be installed at two feet from the door, minimum of two feet above the walkway surface.

S. A positive pressure ventilation system shall be installed to cool both the display modules and the sign-housing interior. The housing system shall include a minimum of two thermostatically controlled fans with sealed ball bearing motors and fan bearings. Fan assemblies shall be replaceable from the interior of the sign housing with hand tools within 15 minutes. The sign housing shall provide filtered and weatherproof protected exhaust ports and filtered and weatherproof protected intake ports. The exhaust ports shall be located near the top of the enclosure. Filters shall be capable of trapping airborne particle sizes 10 µm and larger. The two fans shall be capable of providing a minimum of two housing volume changes per minute. Additional thermostatically controlled fans shall be provided, as needed, to direct airflow uniformly to the back of each of the display modules,

either directly or by ducts. Any ductwork that blocks access to any sign component shall be removable without tools to gain access to the affected components. Time for removal and replacement of duct work and any other obstruction to a failed item shall be included in the total Mean Time to Repair (MTTR) of the failed item. Interior temperature sensors shall be installed to monitor the temperature within the housing and the air surrounding at least two representative display modules. The sensors shall be connected to the DMS controller for continuous monitoring. The DMS Controller shall report to the Illinois Tollway Traffic Information Management System (TIMS) Central Controller operated from the Illinois Tollway Central Administration Building and blank the sign if configurable temperatures are equaled or exceeded. The TIMS Central Controller or laptop computer shall have the ability to change this user selectable threshold and access temperature measurement from the DMS Controller. The ventilation system shall be equipped with a manual one hour override timer to allow ventilation when the DMS is being serviced.

T. The DMS housing shall be equipped with surge protection devices (SPD). The system power and communication lines shall be protected by two stages of surge protection devices including MOV's and spark gap arrestors. Tripping of each stage (or both if tripped simultaneously) of the surge protection shall cause the DMS Controller or other cabinet equipment to report the error condition to the Traffic Operations Center (TOC) immediately or on the next poll.

U. The DMS shall be equipped with grounding and neutral bus bars. The grounding bus bar shall be of solid copper construction with a bare tinned stranded #2/0 copper grounding conductor for connection to a ground rod at the base of the overhead sign structure support. The bus bar shall be approximately 24" in length, 4" in height, and ¼" in depth. The bus bar shall be provided with pre-drilled holes arranged to accept #6 AWG wire two-hole lugs and an additional pre-drilled hole arranged to accept a #2/0 AWG wire two-hole lug. All equipment grounds in the DMS shall be connected to this bus. See the Illinois Tollway special provision "ITS ELEMENT SITE GROUNDING".

V. The Contractor shall install a single mode fiber patch panel (Fiber Connections Gator Patch model G6#0#012LAB-XXX-0, substituting # with material per DMS manufacturer requirements and substituting "XXX" with the appropriate length of pigtail in meters) with six duplex connectors. The pigtail length shall be of a sufficient length as scheduled on the plans, 328 feet (100 meters) minimum, or as directed by the Engineer to accommodate slack requirements to properly splice and store the cable. The Contractor shall procure and install two 6.5-foot (2-meter) long FO jumper cables of the type and connection per the DMS manufacturer (to connect the DMS control board to the fiber patch panel). Depending upon which DMS vendor requirements, the Contractor shall terminate the pigtail cable from the DMS housing within the DMS controller cabinet at the rack mounted fiber patch panel.

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:

A. Each LED display module shall consist of one or two laminated fiberglass printed circuit boards. If two boards are used, they shall be mounted physically to each other using durable

non-corrosive 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.

B. Each LED display module shall be mounted to the rear of the display's front face panels using durable non-corrosive 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. It shall not be possible to mount an LED display module upside-down or in an otherwise incorrect position within the DMS display matrix.

C. 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. Hardened power supplies shall be wired in a redundant configuration that uses multiple supplies for the DMS display matrix.

D. All LED display module and line replaceable unit (LRU) failure modes shall be diagnosed by remote diagnostic software. Any failed module shall be replaced such that the maximum mean time to repair (MTTR) the DMS is 15 minutes or less from the time the sign is turned off for servicing and the time the sign is turned back on after the module has been successfully replaced. The DMS enclosure shall not be opened or closed with its display power turned on.

E. 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.

F. Individual addressing of each LED display module shall be configured via the communication wiring harness and connector or by inserting an addressing module into the LED driver board.

G. 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.

H. All LED display modules, as well as the LED pixel boards and driver circuit boards, shall be identical and interchangeable throughout the DMS.

Light Emitting Diodes (LED)

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:

A. 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 16 pixels high by 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-inch.

B. 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.

C. Each pixel shall contain the quantity of discrete LEDs needed to output white colored light at a minimum luminous intensity of 1,152 candelas per square foot when measured using a photometric meter through the DMS front face panel assembly.

D. Each pixel shall also be capable of displaying amber colored light with a minimum luminous intensity of 692 candelas per square foot when measured using a photometric meter through the DMS front face panel assembly.

Pixels

DMS pixels shall be constructed with discrete LEDs manufactured by Avago Technologies, CREE, Toshiba Corporation, Nichia Corporation, OSRAM, EOI, or approved equal. Discrete LEDs shall be fabricated from UV light resistant epoxy and conform to the following specifications:

A. 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 +/- 5 degrees.

B. Red LEDs shall utilize AlInGaP semiconductor technology and shall emit red light that has a peak wavelength of 618-630nm.

C. Green LEDs shall utilize InGaN semiconductor technology and shall emit green light that has a peak wavelength of 519-539nm.

D. Blue LEDs shall utilize InGaN semiconductor technology and shall emit blue light that has a peak wavelength of 460-480nm.

E. 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 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 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. The LED manufacturer shall assure color uniformity and consistency on the LED display face within the 30-degree cone of vision. Inconsistent color shifts or intensity will be cause for rejection.

F. 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.

G. 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.

H. The LED driver board shall contain a seven segment numeric LED display that indicates the functional status of the LED pixel display module. 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 LED display module shall report status, including pixel errors, voltage levels, etc. to the DMS Controller upon request.

Regulated DC Power Supplies

A. 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.

B. 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 or less.

C. 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.

D. The power supplies shall be sufficient to maintain the appropriate LED display intensity throughout the entire operating input voltage range.

E. The output of each power supply shall be connected to multiple circuits that provide power to the LED modules. Each output circuit shall be fused.

F. 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 DMS Controller upon request. The power supplies used to power the LED pixel modules shall be identical and interchangeable throughout the DMS. The failure of any single regulated DC power supply or common power supply module shall be reported to the TOC by the DMS Controller on the next poll.

G. Regulated DC power supplies shall conform to the following specifications:
    1. Nominal output voltage of 24 VDC +/- 10%
    2. Nominal maximum output power rating of 1000 watts
    3. Operating input voltage range shall be a minimum of 90 to 260 VAC
    4. Operating temperature range shall be a minimum of –30ºF to +165ºF
    5. Maximum output power rating shall be maintained over a minimum temperature range of –30ºF to +140ºF
    6. Power supply efficiency shall be a minimum of 80%
    7. Power factor rating shall be a minimum of 0.95
    8. Power supply input circuit shall be fused
    9. 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

10. Power supplies shall be UL listed
11. Printed circuit boards shall be protected by an acrylic conformal coating.

Displays

A. A full-matrix display shall be provided, each consisting of identical LED pixels as per the requirements stated herein.

B. For DMS – Type 1 The full-matrix display shall incorporate a pixel matrix that is 96 pixels tall by 400 pixels wide and be capable of displaying a three-line message consisting of up to twenty-one (21) full-width 23x15 alphanumeric characters with a minimum of four (4) blank columns between 23x15 characters per line, with each character nominally 18 inches high. The full-matrix display shall also be capable of displaying messages with characters nominally 12, 9 and 6 inches high.

   For DMS – Type 2W the full-matrix display shall incorporate a pixel matrix that is 96 pixels tall by 368 pixels wide and be capable of displaying a three-line message consisting of up to eighteen (18) full-width 23x15 alphanumeric characters with a minimum of four (4) blank columns between 23x15 characters per line, with each character nominally 18 inches high. The full-matrix display shall also be capable of displaying messages with characters nominally 12, 9 and 6 inches high.

C. The full-matrix display shall be capable of displaying other size characters and other numbers of lines depending on the height of characters utilized. The display shall be designed to provide proper spacing between lines of text when displaying characters and lines of text as indicated herein. The display shall also be capable of displaying graphics as programmed via TIMS software, via the remote computer or directly via the DMS Controller.

D. The signs shall have sufficient borders on all four sides for display clarity and background contrast, and shall be legible from a distance of 1000 feet with an 18 inch character height, 600 feet with a 12 inch character height, 450 feet with a 9-inch character height, and 300 feet with a 6-inch character height, within a minimum 30-degree cone of vision centered about the centerline perpendicular to the width of the sign.

Photoelectric Sensor Devices and Brightness Control

A. Three photoelectric sensor devices shall be provided on top of the sign with one facing the direction of travel, one facing the opposite direction of travel and one positioned to detect ambient lighting to use in performing automatic dimming and brightening the display to correspond to light conditions. The DMS Controller shall be capable of reading a minimum of 256 light levels from each photocell. Photocell failures shall be detected and remotely reported.

B. 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. Provisions, such as a moving average of measured brightness, shall be made to prevent brightening of the sign due to stray headlights shining upon the photo sensors at night.

C. Levels of brightness, as related to ambient light, shall be operator-selectable at the DMS

Controller and from TIMS Central Controller. The range of operator control over brightness shall be a minimum of 100 increments between fully dimmed and full brightness. Brightness control shall be able to be returned to automatic from the sign controller front panel and from the central computer overriding local manual control.

DMS Controller Hardware

A. The DMS Controller shall include one (1) Ethernet port, two (2) serial communication I/O ports and two (2) fiber ports to accommodate both local and remote communications. The local communications port shall be easily reached when the cabinet is opened from the front and shall be a DB 9 connector configured as a Data Communication Equipment connection. Access to the DMS Controller through the local communications port and user interface shall be protected by a password. A second security level password shall be required to edit messages.

B. The DMS Controller shall be mountable in an EIA standard 19-inch rack. The DMS Controller shall be mounted inside the local controller cabinet along with the fiber optic equipment. An auxiliary control panel shall also be provided inside the sign housing. The auxiliary control panel shall completely mimic the DMS Controller and have a rugged Display and a Keypad.

C. A unique logical address shall be assigned to the DMS Controller consisting of an 8 byte ID code. The DMS Controller address shall be readily changeable through jumpers, dip switches or plug-in modules.

D. The DMS Controller shall be capable of storing a minimum of thirty-two display messages in non-volatile programmable read only memory (PROM) and a minimum of twenty (20) display messages in battery backed random access memory (RAM). The DMS Controller shall be capable of storing a minimum of twenty (20) preset message display schedules in non-volatile read and write memory. The DMS Controller shall allow schedule entries to be either a date and time (i.e., month/day/year, hour/minutes) or by a weekday and time. The DMS Controller shall store all configuration variables in non-volatile read and write memory.

E. The front panel of the DMS Controller shall contain the following features:

1. On/Off switch controlling power to the DMS Controller.
2. Local/Remote switch (implemented in hardware or software) permitting control from the DMS Controller or from an external unit such as a remote computer or a TIMS workstation.
3. Keypad or switches permitting selection of one of the 25 non-volatile messages stored in the DMS Controller or permitting the DMS to be blanked.
4. Diagnostic mode switch or software function accessible from the keypad permitting selection of built-in diagnostic routines and individually testing LED pixels and display support step-by-step troubleshooting from the display and keypad.
5. A display capable of showing graphics and text as they would appear on the DMS.
6. A keypad providing keys for entry of zero through nine, four direction navigation, page-up and page down, home, delete, enter, and execute.
7. Interior temperature and humidity sensor monitored by the DMS Controller.

F. The DMS Controller shall contain a computer readable time-of-year clock with a lithium battery backup. The battery shall keep the clock operating for at least three years and have a ten (10) year life expectancy. The clock shall automatically adjust for daylight savings time and leap year and shall be accurate to within one minute per year. The controller shall also support Network Time Protocol Time Synchronization.

G. The DMS Controller shall have a hardware watchdog, which shall reset the DMS in case of software failure and/or DMS Controller lock-up. A counter shall be provided to count the quantity of reset events using the Watchdog Failure Count parameter as defined by NTCIP 1203v3.

H. The Contractor shall submit with the shop drawings for approval by Engineer or their representative, a subsystem analysis of the DMS Controller that includes the mean time between failure (MTBF) of all hardware components, the source of the MTBF values (i.e., testing, historical tracking, generally accepted values used in the industry) and the mean time to repair/restore (MTTR) values used in the calculation. If tracking data is unavailable the MTBF and MTTR shall be estimated based on prior product experience.

DMS Local Controller Cabinet

A. A pad mounted weatherproof NEMA 3R roadside cabinets shall be furnished and installed for the DMS Controller near each dynamic message sign location. The cabinet shall have separate sections for power and communications equipment. The power and communication sections shall be accessible from two different doors. The cabinet power section shall house all power related equipment and the communications section shall house all communications related equipment as listed herein this special provision. The cabinet shall utilize EIA-standard 19-inch racks and be designed with front and rear lockable waterproof access doors. Each door shall be furnished with a lock that is keyed to a Corbin #2 lock. The cabinet doors shall include permanent, fixed position non-corrosive handles. Furnish door handles which provide for positive latching of the door at three points as viewed when facing the door – top, bottom and left side. Provide a pin tumbler type lock which serves to secure the door handles, thereby locking the cabinet doors. The cabinet shall be sized to accommodate the DMS Controller, power conditioning, communications equipment, including fiber terminations and distribution, UPS, IP relay, Cisco switch, control equipment, batteries, rack mounts, shelving, and breaker panel. All communication and control section equipment shall be rack mounted, including all DIN rail mounted items. Final design of the cabinet including sizing and equipment layout shall be done by the Contractor. Shop drawings for the cabinet and equipment layout shall be submitted to the Engineer for review and acceptance before any fabrication is started.

B. The local control cabinet shall contain the following assemblies:

    1. Power-on indicator

    2. Local control LED switch

    3. IP communication (Ethernet) connection to field Cisco switch or for local testing with portable laptop computer with a Cat 6e cable (laptop by others).

4. One Duplex NEMA 5-15R-equipment receptacle with GFCI.

5. UL Listed appropriately sized Power Supply Module (+24 VDC) and socket.

6. The UPS shall be internal to the control cabinet and shall be as specified herein. The UPS shall be Alpha Technologies model number FXM 1100 (or approved equal). The UPS shall have the capacity to operate the DMS Controller and network switches for 10 minutes to allow the DMS Controller to notify the TIMS Central Controller when an improper power condition exists for longer than a user selectable power loss time. The UPS shall have a network interface module for communicating UPS status to the Cisco field switch described below. The UPS shall meet the following minimum specifications:

    a. Safety Compliance: UL listed to UA1778
    b. Efficiency:>95% on line
    c. Voltage Nominal: 120 VAC
    d. Voltage Range: 100-142 VAC
    e. Typical run time (minutes): Full load: 10 minutes.
    f. Transfer time: 4 ms typical
    g. Battery: Sealed, maintenance-free, valve regulated.
    h. Battery recharge time (to 95% of capacity): 8 hours with output fully loaded
    i. Over current protection (on line): circuit breaker
    j. Operating temperature: Range minimum -10°F - +140°F
    k. Humidity: 5% - 95% RH (non-condensing)

    The UPS and its batteries shall be installed in the Power Section of the DMS Controller cabinet.

    Submit calculation sheets, accompanied by manufacturer's data sheet listing the power requirement of critical components, as support materials for justifying the UPS sizing choices. Use worst-case power-load data for the calculations.

7. A Cisco Ethernet switch shall be provided inside the DMS local control cabinet. The Ethernet switch shall be a Cisco Model IE-3000-8TC-E switch with a PWR-IE3000-AC power supply. The contractor shall install the proposed Ethernet switch in accordance with these specifications, in accordance with manufacturer's recommendations and as directed by the Engineer. The contractor shall connect the field switch to the ITS Distribution FO cable by furnishing and installing two Cisco SFP modules (part # GLC-LX-SM-RGD) in the switch.

8. The Contractor shall install a 2U Corning model CCU-02U Closet Connector Housing (CCH) fiber patch panel with single mode adapters and DMS manufacturer required fiber optic adapters. The Corning model CCH-CP12-59 CCH panel SC adapter shall be utilized for the SMF interface while a CCH compatible panel adapter (meeting DMS manufacturer requirements) shall be utilized for the DMS sign interface. The Contractor shall procure and install two 6.5-foot (2-meter) long SM FO jumper cables with duplex LC-SC connectors (to

connect the SFPs in the Cisco switch to the CCH-CP12-59). Depending upon DMS manufacturer requirements, the Contractor shall procure and install two 6.5-foot long (2-meter) SMFO or MMFO jumper cables to connect the DMS controller to the CCH fiber patch panel adapter. The Contractor shall also procure and install the 12F armored SM fiber cable between the CCH-CP12-59 and the nearby ITS Distribution cable. The Contractor shall terminate both the SMF and DMS sign pigtail cable at the rear of the CCH-CP12-59 and the CCH panel adapter. The 12F armored SM cable shall be pulled into the nearest communications handhole and coiled as required in the plans, to be spliced into the ITS Distribution cable by others.

9. A Digital Loggers IP Relay (DIN 3) unit shall be installed in the DMS Controller cabinet and wired as specified in the wiring diagram.

10. Within 2 weeks of starting the ITS element installation work, the Contractor shall deliver the Cisco IE-3000-8TC-E switch, the IP Relay unit to the Illinois Tollway ITS Network Integrator at Illinois Tollway CA for configuration. The Illinois Tollway ITS Network Integrator will have one week to configure the equipment and notify the contractor of the completion of its configuration.

11. The contractor shall submit an RFI requesting configuration details for the UPS network interface, and shall configure this equipment themselves.

12. A foldout and or hinged aluminum work surface to fully support a portable computer or technician's tool case shall be installed at an ergonomically correct height for a technician 70 inches tall. The foldout surface shall be mounted inside the front access door and shall be flat and sturdy when folded out with a portable computer placed on the surface. The foldout surface shall be secured with appropriate hardware against the inside of the front access door when not in use.

13. Ground bus bar and neutral bus bar.

14. The DMS Controller Enclosure shall be equipped with an intelligent primary surge protection device (SPD). The primary SPD shall be MTL Zone Defender Pro Series, Model ZD16100. The primary SPD should have local visual indicators that allow a service technician to determine the operational status of the SPD and determine whether the SPD should be replaced immediately or monitored for later replacement. The DMS Controller cabinet shall also be equipped with secondary surge protection devices to protect the equipment within the enclosure. For details related to site grounding, see the Illinois Tollway special provision "ITS ELEMENT SITE GROUNDING".

15. The cabinet shall have a Magnecraft power relay model 199X-12. The power relay shall be connected to the digital loggers IP relay.

16. The cabinet shall include a Meanwell power supply model MDR-10-12. The power supply shall be DIN rail mounted within the DMS cabinet.

17. The surge protection equipment shall conform to the requirements indicated in

the Illinois Tollway special provision “ITS ELEMENT SITE GROUNDING”.

18. The cabinet shall have a sliding rack shelf (Great Lakes QGL-7206-FRSLA300) to house the batteries and UPS.

19. A 100 amp, single phase, 3 wire 120/240 VAC electrical service distribution panel with a 12 circuit capacity shall be located in the DMS cabinet. The panel shall include a 60 amp two-pole main breaker. Separate circuits with a properly sized breaker shall be provided for the DMS controller cabinet, as per the plan. All circuit breakers shall be thermomagnetic, quick-break, 60 VAC, UL listed, and properly labeled on the panel door.

20. As noted in the section above, the sign control and data cable from the DMS controller to the sign shall be armored multi-mode or single-mode fiber optic cable and include interface modules as required per the manufacturer’s recommendations.

21. The Contractor shall procure and install a cabinet heater that is sized accordingly for this application. The Contractor shall submit heat-load calculation sheets, accompanied by related manufacturer’s data sheets, as support materials for justifying the heating/cooling sizing choices. Use worst-case heat-load data of the energized devices for the calculations. The heater must be able to endure continuous operation for 60 contiguous days in the winter months. The heater shall be controlled via a standalone thermostat and have a high temperature alarm output.

22. The main power shall be connected through a main disconnect and dry type transformer located on the overhead sign structure support. See the Illinois Tollway special provision “DMS ELECTRICAL WORK” for additional information.

23. When all equipment is installed and connected, the Contractor shall test and demonstrate the performance of the installed Dynamic Message Sign and DMS Controller. This test shall ensure that communication is provided to and from the Illinois Tollway Traffic Operations Center (TOC). The Contractor shall provide all ancillary equipment, fiber patch panels, patch cables (fiber and copper), IP relay, cisco ethernet switch, and surge protectors required for connections between internal cabinet components and external devices and power connections. All cables shall be properly labeled with printed cable tags. Each internal device shall be permanently and securely mounted inside the cabinet back panel or DIN rail. All power and data cables shall be securely fastened to the cabinet back panel and shall be neatly dressed. Tie wraps shall not be used for data cables, whether fiber or copper. Instead cables shall be secured per BICSI best practices which recommend the use of Velcro straps for cable management. All equipment, components, wire, patch cords, cables, racks, and panels (shelves) installed as part of this work shall be labeled per ANSI/EIA/TIA-606-B and Illinois Tollway Labeling Guide. The Contractor shall follow the Illinois Tollway ITS Labeling Guide found on the Illinois Tollway’s website. Labeling and documentation shall be incidental to this work.

24. Insert a block diagram of all components illustrating all connectors and

connections used to interconnect the components, wiring diagrams and schematic drawings of all circuits in a re-sealable weather-resistant pocket that is permanently mounted on the inside of an accessible door in the controller cabinet.

25. The Contractor shall create a mock-up of the cabinet for review and approval by the Engineer before assembling other cabinets, or before delivering to the field. No cabinet shall be installed before the Engineer's approval.

Each DMS shall be connected from the field cabinet controller to the sign controller utilizing the manufacturer's recommended outdoor rated cable.

The primary surge protection device shall be MTL Zone Defender Pro Series, Model ZD16100.

The Contractor shall submit to the Engineer a request for variance when changing equipment provided on the Checklist provided within this special provision. The variance shall be the formal request of an approval of an equal or better substitute for a specified part by providing justification and supporting manufacturer's specifications and other relevant documentation.

FUNCTIONALITIES

System Description

A. Communications shall comply with the referenced National Transportation Communications for ITS Protocol (NTCIP) profiles and the software data dictionaries shall comply with NTCIP information profile level.

B. It is the contractor's responsibility to provide a fully functional communication path as specified herein and as shown on the plans. All of the material described below shall be procured and installed by the contractor. The DMS shall be controllable by the Illinois Tollway Traffic Information Management System (TIMS) operated from the Illinois Tollway Central Administration Building through its fiber optic network, as well as locally from a portable computer through the computer's Ethernet 10/100Base-T TIA/EIA-568-B interface. The interface between the DMS controller and TIMS shall be an Ethernet 10/100Base-T TIA/EIA-568-B RJ45 interface with an outdoor temperature rated Cat 6e patch cable connected to a 10/100 copper switch port in a Cisco IE-3000-8TC-E field switch mounted inside the DMS Controller cabinet. The portable computer, when present, (not provided by the Contractor) shall connect to the DMS Controller through a different 10/100Base-T copper switch port or directly into the DMS Controller's Ethernet port. The Cisco switch shall be connected to the Illinois Tollway SM fiber optic network with Two (2) Cisco Gigabit Ethernet SMF SFP modules with LC connector, LH (1Gbps Single Mode) transceivers Model GLC-LX-SM-RGD, and one FOC patch panel with six duplex connectors for SM FOC and two 6.5foot (2-meter) long SMF LC-SC jumper cables. The contractor shall install an armored, outdoor rated 12 strand SM fiber stub cable between the DMS Controller cabinet (Fiber Optic patch panel) and the nearby ITS SM FO Distribution Cable handhole where it will be spliced into the Illinois Tollway SM Distribution cable by the Illinois Tollway's Fiber Optic System Contractor. The contractor shall provide 3 business days' notice of its readiness for splicing by the Illinois Tollway's Fiber Optic System Contractor by email to the Engineer and the Illinois Tollway's Fiber

Optic System Contractor. Depending upon the DMS vendor specifications, the DMS shall connect to the DMS Controller through either SM or MM fiber optic cable. The contractor shall install and terminate an armored, outdoor rated 12 strand SM or MM fiber cable from the DMS to the DMS Controller within the cabinet.

C. The Illinois Tollway is responsible for integrating the DMS into the existing central control software. The Contractor shall provide the required assistance to enable the integration. This assistance shall include providing a DMS Controller to the Illinois Tollway's software integrator for software integration testing at least 90 days prior to the installation date of the first DMS for any manufacturer and/or model number not previously integrated by the Illinois Tollway. The DMS Controller will be returned to the contractor when software integration has been completed, and then can be installed in the field as a component of a final delivered DMS system.

Sign Display Messages

A. For DMS – Type 1 The DMS system shall be full matrix, full color, high resolution, light emitting diode (LED) sign capable of displaying 3 lines of 21 characters at 18-inches per character.

For DMS – Type 2W the DMS system shall be full matrix, full color, high resolution, light emitting diode (LED) sign capable of displaying 3 lines of 18 characters at 18-inches per character.

B. Each message shall include a minimum of three (3) display frames (pages). This function shall be achieved by implementing the "np" MULTI Tag as specified in NTCIP 1203v3.

C. The time each message frame (page) is displayed shall be independently configured. This function shall be achieved by implementing the "pt" MULTI Tag as specified in NTCIP 1203v3.

D. Each message frame (page) ON time shall have a minimum range from 2 seconds to 10 seconds in 0.5-second intervals and is adjustable in increments of 0.1 second. This function shall be achieved by implementing the "ptxoy" MULTI Tag as specified in NTCIP 1203v3.

E. The DMS Controller shall display characters using proportional spacing. Spacing options for the pixel columns shall be variable.

F. A currently displayed message shall not be affected as the DMS Controller performs other functions, except when displaying a new message or when blanking the DMS.

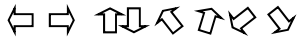
G. When flashing a message frame or displaying a message with two or more frames, the DMS Controller shall blank, change, or update the DMS display within 0.1 second. The flash rate shall be user programmable in increments of 0.1 second.

H. The DMS Controller shall contain the following minimum sets of fonts (height x width, line width, fixed width) using the Font tag and Default Font Definition object as specified in NTCIP 1203v3:

- 7 x 4, 1, variable
- 7 x 5, 1, fixed
- 7 x 6, 1, variable
- 7 x 6, 2, variable
- 7 x 8, 3, variable
- 8 x 4, 1, variable
- 8 x 5, 1, fixed
- 8 x 6, 2, variable
- 8 x 8, 3, variable
- 9 x 5, 1, variable
- 9 x 6, 2, variable
- 9 x 8, 3, variable
- 11 x 7, 2 fixed
- 11 x 7, 2, variable
- 11 x 9, 3, variable
- 12 x 18, 2, variable
- 14 x 8, 2, fixed
- 14 x 8, 2, variable
- 14 x 10, 3, variable
- 15 x 10, 2, variable
- 16 x 8, 2, variable
- 16 x 10, 3, variable
- 23 x 15, 3, variable

I. Each alphanumeric font shall include the following characters as a minimum:

a. “A” through “Z” All upper case
b. “0” through “9” All decimal digits
c. A blank or space
d. Special characters: , / !? ; ‘ : “ , . @ # &+()[]<> * - +



Display of Graphic Images

A. The DMS control software shall support the inclusion of graphics in messages according to NTCIP 1203v3 standards. The vendor shall also support graphics using the Manual on Uniform Traffic Control Devices (MUTCD) symbols, clip art, shapes, free form creations, manufacturer-specific objects, and MULTI tags. Packs of graphics and MUTCD symbols shall be included with the software.

Electrical Requirements

The electrical work for the DMS shall be in accordance with the applicable portions of Division 800 of the Standard Specifications as modified or supplemented by the Illinois Tollway Supplemental Specifications, the Illinois Tollway special provision “DMS Electrical Work”, and the NEC.

DMS Controller

A. The DMS Controller shall be able to perform all sign control functions and to enact locally selected functions via an external laptop computer or remotely selected from workstations connected through the TIMS communication server located at the Illinois Tollway's Central Administration building. Communications between the DMS Controller and these computers shall use the NTCIP standards. The DMS Controller shall process requests and messages from the TIMS (via the Ethernet port), and maintenance laptop (via the local Ethernet port). These requests shall be as defined in NTCIP 1203v3.

B. The DMS Control Cabinet shall be remotely monitored through 2 TCP/IP Ethernet outdoor rated Cat 6 connections to the Cisco switch. One Ethernet connection shall be from the SNMP module in the UPS to the switch. The other Ethernet connection shall be from a DIN rail mounted Digi serial to Ethernet module to the switch. Monitored points such as cabinet temperature alarm, door open alarm, and primary and secondary surge protection device status shall be connected to the Digi module with appropriate interface components.

C. The DMS Controller shall monitor the temperature values (minimum and maximum) within the Controller cabinet, sign housing and the sign exterior ambient temperature using the objects defined under the temperature status configuration group as defined in NTCIP 1203v3. A temperature greater than a user selectable critical temperature shall cause the sign message to go to blank and the DMS Controller shall report this error message to the TIMS. This temperature shall be selectable both locally and remotely from a TIMS workstation by an authorized user.

D. The DMS Controller shall monitor the photocell circuits in the sign and convert the measured light intensity into the desired pixel brightness using a look-up table. The DMS Controller shall be capable of an automatic, incremental, and smooth adjustment of the LED brightness. The pixel light shall be initially set to an output level that is twice as bright as the highest light level measured from the three photocells mounted to the sign. The brightness table shall be adjustable from a TIMS workstation. This function shall be achieved by implementing the Illumination/Brightness Conformance Group as specified in NTCIP 1203v3.

E. The DMS Controller shall continuously monitor the voltages of all LED display module power supplies. When the voltage drops below a configurable value, the under voltage shall be reported to the TIMS and any locally connected laptop computer. All LED power supply failures shall be detected and reported to the TIMS and any locally connected laptop computer.

F. The DMS Controller shall allow editing of the fonts and graphics using the objects defined in NTCIP 1203v3.

G. Once per day upon command from either the TIMS or a locally connected computer, the DMS Controller shall test the operational status of each LED pixel. Any defective pixels, identified by display module number, column number and pixel number shall be reported to the TIMS and any locally connected computer. Defective states shall include half-failed off, full-failed off, half-failed on and full failed-on. This test shall not affect the displayed message for more than 0.5 second.

H. Two separate types of pixel status feedback shall be provided to the TIMS Central Controller from the DMS Controller. These include a pixel test and a pixel read:

1. Pixel Test: The DMS Controller shall be able to perform the pixel text from the TIMS Central Controller on command and automatically on an operator selected schedule. During a pixel test, the full operational status of each string of LEDs in each pixel shall be tested and then transmitted to the TIMS 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 second.

2. Pixel Read: The DMS Controller shall be able to perform the pixel text during both message downloads and during every sign poll from the TIMS 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 TIMS Central Controller as it is currently displayed to the motorist, including any errors. This shall allow the TIMS 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 DMS Controller to allow the TIMS 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.

I. SNMP V2: Power supply, photocell and pixel failures and test results shall be retrievable through the Ethernet management interface using the SNMP V2 protocol to the Illinois Tollway TCP/IP network and identifiable down to the Line Replaceable Unit level.

J. The communication through the local fiber optic network switch, DMS, and DMS Controller shall be completed by the Contractor for communication to TIMS.

K. Support of the secure shell (SSH) security feature.

DMS Controller Software

A. The DMS Controller software shall comply with NTCIP Standards, as defined in greater detail below. The software shall comply with the version of the relevant NTCIP standards and all related amendments and errata sheets that are current on the advertised date of bid submittal.

B. *Application Level* - The software shall comply with the NTCIP 2301v2-Simple Transportation

Management Framework (STMF) Application Profile as a Managed Agent and shall meet the requirement for Conformance Level 1.

An NTCIP component may support additional Application Profiles at the manufacturer's option. Responses shall use the same Application Profile used by the request, thereby requiring coordination with the TIMS System Integrator. Each NTCIP Component shall support the receipt of Application data packets at any time allowed by the subject standards.

C. *Transport Level* - The software shall support NTCIP 2201, 2202, and the UDP/IP option defined by the standard. The DMS system shall support the receipt of datagrams conforming to any of the identified Transport profiles at any time. Response datagrams shall use the same Transport Profile used in the request, thereby requiring coordination with the TIMS System Integrator.

D. *Subnet Level* – The communications link between the DMS Controller and the TIMS communication server shall be Ethernet connection. The IP Communication physical layer interface used by each NTCIP component shall conform to NTCIP 2104.

E. *Information Level* – The software shall implement all objects of all the conformance groups as defined in NTCIP 1201v3-Global Object Definitions. The software shall implement all objects of all conformance groups as defined in NTCIP 1203v3 – Object Definitions for Dynamic Message Signs (DMS).

F. The software shall implement the tags (opening and closing where defined) of the MULTI language as defined in NTCIP 1203v3. The DMS shall support any valid MULTI string containing any subset of those MULTI tags.

<u>DMS Controller Diagnostics and Error Reporting</u>

A. The DMS Controller shall log all errors, all failures, and all warnings by implementing all of the objects under the Report Parameter Node as defined by NTCIP 1201v3, the Validate Message Error Parameter, Activate Message Error Parameter and all objects of Multi Error Conformance group as defined by NTCIP 1203v3.

B. The error and failure log shall incorporate a time and date stamp. All DMS errors, failures, and warnings shall immediately be logged by the DMS Controller and reported to the TIMS and the local communication port.

C. The DMS Controller shall incorporate a Communication Time Out Error by implementing the Communication Loss Time Definition Parameter as define by NTCIP 1203v3.

D. The DMS Controller shall use the Description of Other MULTI Error Parameter as defined by NTCIP 1203v3 when implementing manufacturer-specific error message descriptions.

E. The DMS Controller shall sense a Communication Error when it receives a message that cannot be processed using the Short Error Status Parameter as defined by NTCIP 1203v3.

F. The DMS Controller shall track Controller errors by implementing the Controller Error Status Parameter as defined by NTCIP 1203v3.

G. The DMS Controller shall continuously monitor, detect, and locate any pixel failure (single or multiple pixels) by implementing the Pixel Failure Table Parameter as specified in NTCIP 1203v3.

H. The Pixel Failure monitor and detection functionality shall be implemented by using the parameters as specified in NTCIP 1203v3.

I. At a minimum, the DMS Controller shall have the following display test patterns for visual inspection of DMS pixels. The Contractor may submit alternative test sequences for approval by the Engineer:

1. SET TEST: All pixels are on.
2. RESET TEST: All pixels are off.
3. SET RESET TEST: Set and resets all pixels continuously.
4. COLUMN TEST: Walking set column.
5. ROW TEST: Scrolling set row.

AC Power

A. Maximum AC power shall not exceed 5800 watts, when the following circuits are operational and fully loaded:

1. Full operation of the display modules with 100% of the pixels operating at maximum possible drive current.
2. DMS environmental control system in full operation.
3. DMS Controller cabinet and all components
4. Utility outlet circuit

B. The DMS shall operate from an electrical service providing 120/240 VAC, 60 Hz Single phase, three wire plus ground. Power and signal cables shall be installed in separate conduits.

Conduit and Ducts

A. See DMS plan sheets for individual site conduit size and routing requirements. The typical DMS site shall have the following conduit and duct routes:

1. Between the DMS structure foundation and the Light Duty Junction Box (LDJB):

a. Unit duct trenched conduit for DMS power supply. PVC coated Rigid Galvanized Steel (PGRS) sleeve shall be utilized to transition from underground to the sign truss.

b. Unit duct, HDPE or conduit trenched for DMS communication will be installed with a locate/trace wire next to it. A PGRS sleeve shall be utilized to transition from underground to the sign truss

2. Between the LDJB and the DMS Controller Cabinet:

a. 2 PGRS trenched conduits for DMS control and communications.
b. 2-PGRS trenched conduit for site power and DMS power

3. From the power source to the DMS Controller cabinet is a PGRS trenched conduit for site power or overhead lines as shown on plans.

4. From the fiber trunk LDJB to the LDJB near the DMS controller cabinet is a directional bored cable duct for single-mode fiber. All conduit and cable for installation of single mode fiber shall be procured and installed by the Contractor. All conduit, HDPE or duct installed for optic fiber will have a locate trace wire installed next to it.

B. All ground ring connectors shall be directly buried bare stranded copper cable except for where the conductor goes up to the Master Grounding Bus Bar (MGB). At that point the grounding conductor shall be routed in Schedule 80 PVC from MGB (4'-0") above finished grade down to a 90-degree bend that terminates at a depth of 40 inches below finished grade (conduit size as shown on the plans). See the Illinois Tollway special provisions "DMS ELECTRICAL WORK" and "ITS ELEMENT SITE GROUNDING" for more details.

C. The size and material of the conduit shall comply with all applicable NEC, Standard Specifications, and Illinois Tollway special provision "DMS ELECTRICAL WORK".

D. The Contractor shall provide a junction box at the base of each of the two roadside vertical supports of the sign structure or at the base of the steel pole mount support for cantilever/butterfly sign structures. Flexible liquid tight conduit shall connect the junction box to metallic conduit used to route power and communication wiring to the DMS by attachment to the sign support structure. The diameter/size and material specifications of the metallic conduit, connectors and fittings shall comply with all applicable NEC and Standard Specification requirements, as modified or supplemented by the Illinois Tollway Supplemental Specifications.

CONSTRUCTION REQUIREMENTS:
The Contractor shall closely coordinate with the Engineer. This includes, but is not limited to, the following:

Pre-Procurement Meeting and Documentation Approval

- Within 10 business days from Notice to Proceed The Contractor shall submit for approval to the Engineer, a detailed schedule showing dates for: product submittals and approvals; testing; device configuration by the Illinois Tollway; construction/installation; burn-in period; and warranty of each DMS. This detailed schedule shall be included in the project schedule, as required per Illinois Tollway Supplemental Specifications Article 108.02. Schedules for each DMS to be deployed within the larger construction contract and shall be staggered based on resources to be employed.
- Within 10 business days from Notice to Proceed, the Contractor shall submit a completed Contractor Submittal Checklist attached to this special provision and associated submittals for review and approval by the Engineer.

The Contractor shall make all submissions through the Illinois Tollway's Web Based Program Management (WBPM) to the Engineer, and shall include:

The Contractor must obtain approval of the schedule, catalog cut sheets, cabinet wiring diagrams, and calculations from the Engineer prior to purchasing any equipment and subsequently performing the installation per the approved documents, contract plans, and specifications.

Pre-Installation Requirements

- The Contractor shall coordinate with the Engineer to determine the DMS Controller cabinet components to be configured by the Illinois Tollway. Thirty (30) days prior to the scheduled field installation of each DMS, the Contractor shall notify the Engineer of the anticipated delivery date of any DMS Controller cabinet components to the Illinois Tollway Central Administration (CA) Building for configuration and labeling prior to installation by the Contractor.
    - The Contractor shall provide a form to the Illinois Tollway during acceptance of the equipment at CA showing the equipment, each equipment specific serial number, and the field location of the each piece of equipment. This form will be signed by both the Engineer and the Contractor.
    - The Illinois Tollway shall have a minimum of 10 working days to configure ten (10) or more device(s). More than ten (10) devices, the Illinois Tollway requires 20 working days to configure.
    - The Contractor shall take possession of the devices from the Illinois Tollway upon notification by the Engineer of configuration and labeling completion.

DMS Installation

- The Contractor shall install the DMS on the mounting structure, as noted on the plans or as per the manufactures recommendations, including the rotation away from the mounting structure for DMS legibility.
    - The material for attaching the DMS to the mounting structure shall include all mounting hardware, conduit, and cable from the DMS Controller cabinet up to the DMS.
    - The DMS shall be aligned such that the DMS message can be legible from a minimum of 1000 feet.
    - All associated conduit, wire, circuit breakers, brackets, etc. as shown on the contract plans, and all items and workmanship required to successfully pass the Site Test stated within this specification, shall be the sole responsibility of the Contractor.

- The Contractor shall have the DMS manufacturer commission the DMS per manufactures recommendation.

SUBMITTALS

The contractor shall submit a package of product data sheets, drawings and other documents that demonstrate that the proposed DMS meets or exceeds all performance and environmental requirements specified in this Special Provision and other contract documents. The submittal package shall be organized as follows:

The Contractor shall submit a completed copy of the Contractor Submittal Checklist and shall number all pages of the submittal package of product data sheets and other documents and

highlight or circle those product options or product performance features corresponding with the item descriptions on the submittal checklist. The contractor shall enter the relevant submittal package page numbers in the ”Submittal #” section of the submittal checklist. If the Contractor wishes to propose an equivalent item, the item information should be listed in the “Approved Equivalent Details” columns. The Engineer will verify that documentation of compliance with each requirement is in the submittal package by checking it off in the “INCLUDED” column. The Contractor must provide an explanation approved by the Engineer for any requirement in the checklist which has no corresponding product data sheet submittal page by adding a note to the “Notes” column.

The contractor shall request that the DMS manufacturer prepare and submit (via Illinois Tollway’s WBPM system), for approval by the Engineer, a Test Requirements Traceability Matrix (TRTM). The TRTM shall be provided by the DMS manufacturer, along with the DMS submittal package and shall list in matrix form requirements of the special provision for the DMS in the exact order found in the contract documents and in the approved product submittal. In addition, the TRTM shall include a column illustrating the testing phase (Factory Acceptance Test, Site Test, System Tests) each requirement shall be met. The contractor shall indicate with the words “Analysis”, “Demonstration”, or “Inspection” in each row of the matrix exactly how the Contractor proposes to validate that the requirement on that row has actually been met by the manufactured product. Each choice of validation method is subject to the approval of the Engineer before formal testing can begin. If a third party test is proposed, then the contractor shall enter the name of the test in the Design Approval test column on the appropriate row.

TESTING

The Contractor shall be required to perform the following tests after the installation of the DMS. The Contractor shall use the test plans within this special provision to conduct the following tests in the presence of the Engineer.

- Factory Acceptance Test
- Site Test
- System Test
- 30-Day Burn-in Period
- Final System Acceptance and Training

Factory Acceptance Test

The DMS vendor shall be responsible for conducting Factory Acceptance Tests on all units at the DMS vendor’s manufacturing facility. The DMS vendor shall provide five (5) copies of all Factory Acceptance Test procedure for the Engineer’s approval (via Illinois Tollway’s WBPM system) 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 (via Illinois Tollway’s WBPM system) 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.

The Engineer or his/her designee (along with Illinois Tollway personnel) reserves the right to witness the Factory Demonstration Tests at the vendor's manufacturing facility. All tests shall be conducted in accordance with the approved test procedures. All equipment shall pass the following individual tests:

A. Examination Tests: All equipment shall be examined carefully to verify that the materials, design, construction, markings and workmanship comply with the requirements of this Specification.

B. Continuity Tests: The wiring shall be checked to determine conformity with the requirements of the appropriate paragraphs in this Specification.

C. 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.

D. Consequences of Factory Acceptance Test Failure: If any unit fails to pass the Factory Acceptance Test, the unit(s) shall be corrected and the test successfully repeated. Should the Engineer or his/her designee (or Illinois Tollway representative) have to return to the manufactures facility to witness tests following corrective actions by the manufacturer, the manufacture shall be responsible for all travel, lodging and meal costs associated with the entire trip.

In lieu of the Factory Visual Inspection, the Contractor can obtain from the manufacturer a product validation certification illustrating that the manufacturer has followed their quality processes and verifies that the unit meets the specifications for operations. This certificate must be submitted to the Engineer for review and approval.

Qualification Tests

During the Factory Acceptance Test, the DMS manufacturer shall provide documentation indicating that each proposed DMS product has been tested in conformance with all applicable NEMA, Underwriters Laboratories (UL), and NTCIP Standards listed below under Third Party Testing. It shall be acceptable with prior Engineer approval for portions of 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.

Third Party Testing

The following testing shall be performed by a "Third Party", defined as an independent testing facility not associated with the DMS manufacturer or Contractor. During the Factory Acceptance Test, the DMS manufacturer shall supply the following Third Party test reports:

- NEMA Standards Publication TS4, 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.

Third party test reports shall be submitted for testing of the following (or the latest versions of) National Transportation Communication for ITS Protocol (NTCIP) standards:

- NTCIP 1201:2011, NTCIP Global Object Definitions (version 3)
- NTCIP 1203:2011, Object Definitions for Dynamic Message Signs (version 3)
- NTCIP 2101:2001, Point to Multi-Point Protocol Using RS-232 Subnetwork Profile.
- NTCIP 2103:2008, Point-to-Point Protocol Over RS-232 Subnetwork Profile (version 2).
- NTCIP 2104:2003, V01.11 Ethernet Subnetwork Profile
- NTCIP 2201:2003, V01.15 Transportation Transport Profile
- NTCIP 2202:2001, V01.05 Internet TCP/IP and UDP/IP) Transport Profile
- NTCIP 2301 V02.19: Simple Transportation Management Framework (STMF) Application Profile

The NTCIP testing shall be 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.

The Contractor shall submit third party test report(s) to the Engineer for review and approval.

Site Testing

The purpose of the Site Test is to have the Contractor/DMS Vendor 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. This installation shall result in the successfully completed commissioning (per manufacturer's specification) at the site before being connected to the Illinois Tollway switch and communications system.

If any unit fails to pass its site 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 test failure, a report shall be prepared and delivered to the Engineer, Illinois Tollway ITS Unit, and DMS manufacturer 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 in multiple DMS (defined as the lessor of 20% of the contract quantity or 10 units), the Illinois Tollway may direct that design and construction modifications be made to all units without additional cost to the Illinois Tollway or extension of the contract period.

For the Site Test to be accepted, the Contractor shall demonstrate that:

- The Illinois Tollway font library has been successfully loaded into the DMS controller and properly displayed on the DMS.
- The installation has been performed as per contract plans and as per the manufacturer's recommendations.
- All connections are tight and cannot be dislodged by incidental contact from the Engineer.

- All DMS equipment inside the control cabinet and sign shall be properly labeled as per the ITS Labeling Guide (located on the Illinois Tollway website).
- The DMS has been commissioned by the manufacturer's representative in the presence of the Engineer.
    - A completed commissioning form, provided by the DMS manufacturer and approved by the Engineer, has been fully completed, signed by the Engineer and provided to the Illinois Tollway TOC manager via Illinois Tollway's WBPM system.

System Test

The Engineer shall notify the Contractor, via Illinois Tollway's WBPM system, if the System Test is not required. The System Test will be conducted by the Illinois Tollway to validate that the field devices can be operated at the TOC utilizing the Traffic Information Management System (TIMS) software. The test shall remotely exercise all functions and display the return status codes from the DMS Controller.

If any component fails to pass its system test, the unit shall be corrected or another unit substituted in its place and the test successfully repeated. If a component has been modified or replaced as a result of a test failure, a report shall be prepared and delivered to the Engineer, Illinois Tollway ITS Unit, and DMS manufacturer prior to the re-testing of the unit, without additional cost to the Illinois Tollway or extension of the contract period.

For the System Test to begin the Contractor shall provide documentation via Illinois Tollway's WBPM system that DMS site has been successfully commissioned and site tested. The Contractor shall request that the Engineer notify the Illinois Tollway TOC operations manager when the DMS is ready to System Test.

For the System Test of the DMS to be accepted, the Contractor shall demonstrate to the Engineer that:
:

- Project pre-final walk-through has been successfully completed by the Illinois Tollway's ITS General Engineering Consultant (GEC) on all the contract ITS equipment.
- Contact the TOC operations manager to request that the DMS site within the project is integrated and tested for:
    - Communications connectivity from TIMS to the DMS.
    - Accurate data transmission from the DMS site to TIMS.
    - Accurate message display at the DMS.
- Receive written approval (via email) from the TOC operations manager verifying the communications connectivity and data transmission are within the Illinois Tollway requirements.

Notify the Contractor in writing (via Illinois Tollway's WBPM system) that the System Test has passed and the 30-Day Burn-In Period has immediately started. The Illinois Tollway will be responsible for conducting the 30-Day Burn-in Test.

The Illinois Tollway will complete the System Test within 2 weeks of notification from the Engineer requesting the DMS site be tested.

30-Day Burn-in Period
The purpose of the 30-Day Burn-in Period demonstrates that the DMS communicates 100% of the time to the TIMS software, that accurate messages are displayed, and accurate error reporting provided during the duration of the test.

For every one (1) day the Contractor is required to mitigate/fix a problem, an additional one (1) day per testing will be added to the 30-Day test.

The TOC operations manager will provide written approval upon successful completion of the 30-Day Burn-In period. The TOC Manager will provide the Engineer with a Burn-in Test Log at the end of successful completion.

Final System Acceptance and Training
The final inspection of the DMS will be performed by the Engineer in the presence of a representative of the Contractor. Final acceptance of the all work performed under this special provision will be made after:

- Successful completion of the project final walk-through by the Illinois Tollway's ITS GEC.
- Submission (via Illinois Tollway's WBPM system) and written approval by the Engineer of all Record Drawings and Warranty documents including an electronic computer file (Microstation and PDF) including a sketch of each ITS element assembly, user/operator manuals, listing each device's location, identification number, wireless channel information and GPS coordinates to the Engineer.
    - The Contractor shall provide three hard and three electronic (PDF) copies of each of the operation and maintenance manuals to the Engineer for approval.
- Notification of Final Acceptance will be sent in writing (via Illinois Tollway's WBPM system) by the Engineer.

TRAINING

General

A. The Contractor shall supply training for maintenance personnel in the operation and maintenance of all field equipment prior to any equipment's being made operational in the field. These personnel shall be designated from the Illinois Tollway. Training shall be conducted prior to System Acceptance.

B. Training shall be provided by DMS manufacturer representative(s) thoroughly familiar with the equipment operation. A complete course outline and summary of the experience and qualifications of the instructional personnel shall be submitted and approved by the Illinois Tollway prior to the start of training. Training sessions may be combined and/or shortened with the agreement of the Illinois Tollway and the Contractor.

C. Recommended test equipment, literature and drawings for the classes shall be furnished by the Contractor. At the conclusion of classes all items furnished which are not currently owned by the Illinois Tollway shall become the property of the Illinois Tollway.

Maintenance Personnel Training

A. Training for maintenance personnel shall consist of two separate and identical courses of 16 hours of classroom and system demonstration. Training shall be as follows:

B. Part 1 – 8 hours. The objective of Part 1 is to provide operational description, troubleshooting procedures, and recommendations for test equipment, test equipment use, repair procedures, design data and drawing for DMSs furnished as part of this project. This training shall be provided before the first DMS is delivered.

C. Part 2 – 8 hours. The objective of Part 2 is to provide "hands on" experience with trouble shooting software, manuals, drawings and test equipment for all LED type DMS equipment furnished as part of this project. This training shall be conducted on site at a contract DMS location.

D. All training class time (indoors or outdoors) shall be videotaped by the Contractor on DVD(s). The DVD(s) shall become the property of the Illinois Tollway.

SPARE PARTS

One set of spare parts shall be provided as noted in the list below. The following spare parts are intended to cover all DMS delivered and accepted:

A. Ten (10) LED display modules (for every sign).
B. Two (2) LED driver boards (for every sign).
C. Two (2) Power supplies (for every 5 signs or less).
D. One (1) Photo sensor (for every 5 signs or less).
E. One (1) Temperature sensor (for every 5 signs or less).
F. One (1) Signal (logic control) interface board (for every 5 signs or less).
G. One (1) DMS Controller (for every 5 signs or less).
H. One (1) Surge suppressor
I. One (1) Fan of each type
J. One (1) Fan control unit
K. Two (2) Sets of filters (for every sign).
L. Two (2) Sets of filters (for every DMS controller cabinet).

DOCUMENTAION

A. The Contractor shall furnish the following shop drawing submittals for approval before the delivery of any DMS:

1. LED manufacturer's data sheet, stating that make and model of LED to be used, the luminance of LED at a stated current, the maximum/minimum operating temperatures and other pertinent information.
2. Pixel Design – include a detail drawing of the physical layout of the pixel, including the pixel size, number of LED's board detail, operation voltage and current, method of weather protection, orientation of the individual LED's and the calculated luminance at the following points:
    - 15 degrees right and left of the vertical geometric center.

- 90 degrees perpendicular to the pixel.
- 15 degrees below the horizontal geometric center of the sign.

3. The module design, including mounting detail.
4. The cabinet design and installation details of equipment in the cabinet.
5. Cabinet shop drawings.
6. Air pre-cleaner and filter design.
7. Control cabinet/panel drawings.
8. A demonstration CD, DVD, or USB flash drive of the software to be used for local operation and troubleshooting. This shall be capable of running in the latest Windows environment.
9. Copy of the company's ISO 9001 certification or other Quality Management System (QMS) in place.
10. Pixel Module Shop Drawings
11. Wiring Diagrams
12. Water Test Certification
13. Full Electrical Schematics of all circuits with component values, operating voltages, operating current, etc.
14. Troubleshooting software
15. Maintenance and Troubleshooting Manuals to include, but not limited to:
    a. Maintenance Schedules
    b. Maintenance Instructions
    c. Troubleshooting guide
    d. Repair and disassembly procedures
    e. Decision Tree type of structure
    f. Step by step guidance

B. Contractor shall supply complete as built drawings of all associated equipment and site work.

WARRANTY

All DMS and associated components shall be warranted and guaranteed against defects and/or failure in design, materials, and workmanship within the warranty period. The Contractor shall submit the warranty terms as part of each material item's shop drawing submittal for approval.

The warranty shall provide that, in the event of a malfunction during the warranty period, the defective system component shall be replaced with a new component by the manufacturer or his/her representative.

Any system component that, in the opinion of the Engineer, fails three (3) times prior to the expiration of the warranty will be judged as an unsuitable system and shall require the entire system be replaced by the device manufacturer or representative with a new system of the same type at no additional cost to the Illinois Tollway. The unsuitable system shall be permanently removed from the project. A failure shall also be defined as the field device becoming unable to comply with all applicable standards at the time of original construction.

All manufacturer's equipment guarantees or warranties shall be included in the maintenance manuals for the subject equipment.

Method of Measurement. This work will be measured for payment, complete in place and accepted, in units as specified herein:

DYNAMIC MESSAGE SIGN, of the type specified, will be measured for payment in units of each.

DYNAMIC MESSAGE SIGN, of the type specified, (TRAINING) will not be measured for payment.

DYNAMIC MESSAGE SIGN, of the type specified, (SPARE PARTS) will be measured in units of each, for each spare part set.

Basis of Payment. This work will be paid at the contract unit price per each for DYNAMIC MESSAGE SIGN of the type specified, complete in place and accepted.

The payment to the Contractor will adhere to the following schedule:

Ten percent (10%) of the contract unit price will be paid upon receipt of submission and approval of all product submittal documentation, shop drawings, Test Requirements Traceability Matrix, and Factory Acceptance Test results.

Sixty-five percent (65%) of the contract unit price will be paid by the Engineer at full completion of the requirements listed under the Site Test of the DMS location. Written (via Illinois Tollway's WBPM system) approval from the Engineer of acceptance of the Site Test is required before payment is released.

Twenty-five percent (25%) of the contract unit price will be paid after the acceptance of the 30-Day Burn-In period, Final System Acceptance, and Training by the Contractor's Vendor in the presence of the Engineer. Written (via Illinois Tollway's WBPM system) approval from the Engineer of Final Acceptance is required before payment is released.

Payment for DYNAMIC MESSAGE SIGN, of the type specified, (TRAINING) will be made at the contract lump sum price, which includes all activities above at the completion of the training and acceptance of all materials specified herein.

Payments for DYNAMIC MESSAGE SIGN, of the type specified, (SPARE PARTS) will be made at the contract unit price per each spare part set, upon furnishing and acceptance of all materials specified herein.

Pay Item Number	Designation	Unit of Measure
JT132040	DYNAMIC MESSAGE SIGN – TYPE 1	EACH
JT132050	DYNAMIC MESSAGE SIGN – TYPE 1 (TRAINING)	L SUM
JT132060	DYNAMIC MESSAGE SIGN – TYPE 1 (SPARE PARTS)	EACH

DYNAMIC MESSAGE SIGN - TYPE 1 SUBMITTAL CHECKLIST

PAY ITEM # JT132040
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
DMS MATERIALS AND COMPONENTS								
SPEC. PROV.		SIGN HOUSING (COMPLY WITH NEMA TYPE 3R)						
SPEC. PROV.		DMS FRONT FACE						
SPEC. PROV.		LED DISPLAY MODULES						
SPEC. PROV.		LIGHT EMITTING DIODES (LED)						
SPEC. PROV.		PIXELS						
SPEC. PROV.		REGULATED DC POWER SUPPLIES						
SPEC. PROV.		DISPLAYS						
SPEC. PROV.		PHOTOELECTRIC SENSOR - BRIGHTNESS CONTROL						
SPEC. PROV.		DMS CONTROLLER HARDWARE						
SPEC. PROV.		DMS CONTROLLER SOFTWARE						
SPEC. PROV.		DMS NEMA 3R LOCAL CONTROLLER CABINET						
LOCAL CONTROLLER CABINET								
SPEC. PROV.		NEMA 3R						
SPEC. PROV.		SLIDING RACK SHELF (1)	GREAT LAKES	QGL-7206-FRSLA300				
SPEC. PROV.		SLIDING RACK SHELF (3)						
SPEC. PROV.		500 WATT AXIAL HEATER						
SPEC. PROV.	AJ	TERMINAL BLOCKS	ALLEN BRADLEY	1492-CD8				
SPEC. PROV.	D	TWO GROUNDING BAR SYSTEM (GROUND & NEUTRAL)	HOFFMAN	PGS2K				
SPEC. PROV.	F	(1) GFCI RECEPTACLE (1) STANDARD RECEPTACLE	HUBBELL HUBBELL	GFR5362 BR20WR				
SPEC. PROV.		DUCT SEAL PUTTY	RAINBOW TECHNOLOGIES					
SPEC. PROV.		DIN RAIL 35 mm (MINIMUM OF 36")						
IP ADDRESSABLE RELAY								
SPEC. PROV.		IP ADRESSABLE RELAY 8-CHANNEL	DIGITAL LOGGERS	DIN3				
CISCO FIELD SWITCH AND ASSOCIATED DEVICES								
SPEC. PROV.	J	ETHERNET SWITCH	CISCO	IE-3000-8TC-E				
SPEC. PROV.	K	ETHERNET SWITCH POWER SUPPLY	CISCO	PWR-IE-3000-AC=				
SPEC. PROV.	Y	(2) 1 GBPS SM SFP FIBER MODULE	CISCO	GLC-LX-SM-RGD=				
SPEC. PROV.		CONTACT CLOSURE TO ETHERNET MODULE						
FIBER OPTIC CABLE / PATCH PANEL(TO INCLUDE FURNISH, INSTALL, & TESTING)								
SPEC. PROV.	O	FIBER PATCH PANEL WITH SM CONNECTORS *(length per plans)*	GATOR PATCH	G620U012LAN-XXX-0 ("XXX" length per plans, 100M min)				
SPEC. PROV.	M	2METER SMFO DUPLEX LC-SC JUMPERS (2)	CORNING	047202R5120002M				
SPEC. PROV.		ADAPTER PANELS (DMS VENDOR SPECIFIC)	CORNING	CCH-CP12-59 CCH SC ADAPTER				
SPEC. PROV.	AQ	12F OUTDOOR RATED ARMORED SMFO CABLE						

DYNAMIC MESSAGE SIGN - TYPE 1 SUBMITTAL CHECKLIST

PAY ITEM # JT132040
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
CONCRETE SERVICE PAD								
SPEC. PROV.		CONCRETE SERVICE PAD / TRANSFORMER *(size per plans)*						
SPEC. PROV.		CONCRETE FOUNDATION / DISC. SWITCH *(size per plans)*						
SPEC. PROV.		CONCRETE SERVICE PAD 4' X 4' X 6"						
GROUNDING MATERIAL: SEE " ITS ELEMENT SITE GROUNDING" FOR DETAILS								
REFER TO "ITS ELEMENT SITE GROUNDING" CHECKLIST								
CONDUIT AND JUNCTION BOXES								
SPEC. PROV.		PULL BOXES & JUNCTION BOXES (PER SECTION 1088)	APPLETON,AUSTIN, CURLEE MANF.,CROUSE-HINDS, HOFFMAN, KEYSTONE, OZ-GEDNEY					
SPEC. PROV.		CONDUIT						
SPEC. PROV.		FLEXIBLE LIQUID TIGHT						
SPEC. PROV.		CONNECTORS, BUSHINGS	APPLETON, OZ/GEDNEY OR APPROVED EQ.					
POWER DISTRIBUTION EQUIPMENT								
SPEC. PROV.	AS	UNINTERRUPTIBLE POWER SUPPLY (Include sealed batteries)	ALPHA TECHNOLOGIES	FXM 1100				
SPEC. PROV.		INTELLIGENT TVSS (DMS MANUFACTURER)						
SPEC. PROV.		UTILITY PANEL (12 CIRCUIT CAPACITY)	SQUARE D	QO112M100RB				
SPEC. PROV.		CIRCUIT BREAKERS / PANEL 60 AMP, 2P						
SPEC. PROV.		CIRCUIT BREAKERS / PANEL 40 AMP, 2P						
SPEC. PROV.		CIRCUIT BREAKERS / PANEL 20AMP	SQUARE D	MGN61512				
SPEC. PROV.		CIRCUIT BREAKERS / PANEL 15 AMP	SQUARE D	MGN61510				
SPEC. PROV.		SURGE PROTECTION DEVICE IN SIGN (DMS MANUFACTURER)						
SPEC. PROV.	AW	INTELLIGENT SURGE PROTECTION DEVICE	MTL ZONE DEFENDER	MODEL ZD16100				
SPEC. PROV.	AX	LOAD SHEDDING RELAY WITH COVER	MAGNACRAFT	W199APX-34				
SPEC. PROV.	AT	OUTLET STRIP						
SPEC. PROV.	P	120 VAC SURGE SUPPRESOR	COOPER CROUSE HINDS	MA15/D/1/SI OR APPROVED EQUAL				
SPEC. PROV.	U	5A CIRCUIT BREAKER (2)	ALLEN BRADLEY	1492-SPM1B050				
SPEC. PROV.	AI	2A CIRCUIT BREAKER (5)	ALLEN BRADLEY	1492-SPM1B020				
SPEC. PROV.	AJ	TERMINAL BLOCKS	ALLEN BRADLEY	1492-CD8				
TESTING - TEST REQUIREMENTS TRACEABILITY MATRIX (TRTM)								
SPEC. PROV.		FACTORY ACCEPTANCE TESTS (FAT)						
SPEC. PROV.		FACTORY DEMONSTRATION TESTS (FDT)						
SPEC. PROV.		SITE TEST						
SPEC. PROV.		SYSTEMS TEST						
SPEC. PROV.		30 DAY BURN-N TEST						

DYNAMIC MESSAGE SIGN - TYPE 1 SUBMITTAL CHECKLIST

PAY ITEM # JT132040
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
DOCUMENTATION								
SPEC. PROV.		LED MANUFACTURER'S DATA SHEET, PIXEL DESIGN, MODULE DESIGN,						
SPEC. PROV.		CABINET DESIGN - EQUIPMENT LAYOUT						
SPEC. PROV.		CABINET SHOP/PANEL DRAWINGS, FILTER DESIGN						
SPEC. PROV.		FULL ELECTRICAL SCHEMATICS TO INCLUDE CIRCUITS, COMPONENTS, VOLTAGES, OPERATING CURRENT						
SPEC. PROV.		DEMONSTRATION DISK OF OPERATING SOFTWARE						
SPEC. PROV.		MANUFACTURER, ISO 9001 CERT / QMS						
SPEC. PROV.		WIRING DIAGRAMS						
SPEC. PROV.		WATER TEST CERTIFICATION						
SPEC. PROV.		MAINTENANCE & TROUBLESHOOTING MANUALS						
SPEC. PROV.		WEIGHT & CENTER OF GRAVITY LOCATION FOR DMS						
SPEC. PROV.		AS BUILTS OF ALL EQUIPMENT AND SITE WORK						

DYNAMIC MESSAGE SIGN - TYPE 1 (TRAINING) SUBMITTAL CHECKLIST

PAY ITEM # JT132050

Contract #

e-Builder Submittal Package #:

e-Builder Submittal Date:

Reviewed By (CM Staff Name):

Review Date:

SUBMITTAL STATUS

APPROVED ☐

APPROVED AS NOTED ☐

REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
TRAINING (TWO IDENTICAL CLASSES OF 16 HOURS EACH, 10 PERSON MAX PER CLASS)								
SPEC. PROV.		RECOMMENDED TEST EQUIPMENT						
SPEC. PROV.		LITERATURE						
SPEC. PROV.		DRAWINGS						
SPEC. PROV.		(PART-1) 8 HOURS: OPERATIONS, TROUBLESHOOTING, TEST EQUIPMENT & USE, REPAIR, DESIGN DRAWINGS **THIS TRAINING IS TO BE PROVIDED BEFORE THE FIRST DMS SIGN IS DELIVERED**						
SPEC. PROV.		(PART-2) 8 HOURS: "HANDS ON" TROUBLESHOOTING, SOFTWARE, MANUALS, DRAWINGS, TEST EQUIPMENT						
SPEC. PROV.		CONTRACTOR TO VIDEOTAPE THE TRAINING ON DVD'S AND SHALL BECOME THE PROPERTY OF THE TOLLWAY						

DYNAMIC MESSAGE SIGN - TYPE 1 (SPARE PARTS) SUBMITTAL CHECKLIST

PAY ITEM # JT132060

Contract #

e-Builder Submittal Package #:

e-Builder Submittal Date:

Reviewed By (CM Staff Name):

Review Date:

SUBMITTAL STATUS

APPROVED ☐

APPROVED AS NOTED ☐

REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
SPARE PARTS								
SPEC. PROV.		(2) LED DISPLAY MODULES PER SIGN						
SPEC. PROV.		(2) LED DRIVER BOARDS PER SIGN						
SPEC. PROV.		(2) POWER SUPPLIES PER EVERY 5 SIGNS						
SPEC. PROV.		(1) PHOTO SENSOR PER EVERY 5 SIGNS						
SPEC. PROV.		(1) TEMP. SENSOR PER EVERY 5 SIGNS						
SPEC. PROV.		(1) SIGNAL (LOGIC CONTROL)INTERFACE BOARD PER EVERY 5 SIGNS						
SPEC. PROV.		(1) DMS CONTROLLER PER EVERY 5 SIGNS						
SPEC. PROV.		(1) SURGE SUPPRESSOR						
SPEC. PROV.		(1) FAN OF EACH TYPE						
SPEC. PROV.		(1) FAN CONTROL UNIT						
SPEC. PROV.		(2) SETS OF FILTERS PER SIGN						
SPEC. PROV.		(2) SETS OF FILTERS PER EVERY DMS CABINET						

DYNAMIC MESSAGE SIGN - TYPE 2W SUBMITTAL CHECKLIST

PAY ITEM # JT132XXX
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
DMS MATERIALS AND COMPONENTS								
SPEC. PROV.		SIGN HOUSING (COMPLY WITH NEMA TYPE 3R)						
SPEC. PROV.		DMS FRONT FACE						
SPEC. PROV.		LED DISPLAY MODULES						
SPEC. PROV.		LIGHT EMITTING DIODES (LED)						
SPEC. PROV.		PIXELS						
SPEC. PROV.		REGULATED DC POWER SUPPLIES						
SPEC. PROV.		DISPLAYS						
SPEC. PROV.		PHOTOELECTRIC SENSOR - BRIGHTNESS CONTROL						
SPEC. PROV.		DMS CONTROLLER HARDWARE						
SPEC. PROV.		DMS CONTROLLER SOFTWARE						
SPEC. PROV.		DMS NEMA 3R LOCAL CONTROLLER CABINET						
LOCAL CONTROLLER CABINET								
SPEC. PROV.		NEMA 3R						
SPEC. PROV.		SLIDING RACK SHELF (1)	GREAT LAKES	QGL-7206-FRSLA300				
SPEC. PROV.		SLIDING RACK SHELF (3)						
SPEC. PROV.		500 WATT AXIAL HEATER						
SPEC. PROV.	AJ	TERMINAL BLOCKS	ALLEN BRADLEY	1492-CD8				
SPEC. PROV.	D	TWO GROUNDING BAR SYSTEM (GROUND & NEUTRAL)	HOFFMAN	PGS2K				
SPEC. PROV.	F	(1) GFCI RECEPTACLE (1) STANDARD RECEPTACLE	HUBBELL HUBBELL	GFR5362 BR20WR				
SPEC. PROV.		DUCT SEAL PUTTY	RAINBOW TECHNOLOGIES					
SPEC. PROV.		DIN RAIL 35 mm (MINIMUM OF 36")						
IP ADDRESSABLE RELAY								
SPEC. PROV.		IP ADRESSABLE RELAY 8-CHANNEL	DIGITAL LOGGERS	DIN3				
CISCO FIELD SWITCH AND ASSOCIATED DEVICES								
SPEC. PROV.	J	ETHERNET SWITCH	CISCO	IE-3000-8TC-E				
SPEC. PROV.	K	ETHERNET SWITCH POWER SUPPLY	CISCO	PWR-IE-3000-AC=				
SPEC. PROV.	Y	(2) 1 GBPS SM SFP FIBER MODULE	CISCO	GLC-LX-SM-RGD=				
SPEC. PROV.		CONTACT CLOSURE TO ETHERNET MODULE						
FIBER OPTIC CABLE / PATCH PANEL(TO INCLUDE FURNISH, INSTALL, & TESTING)								
SPEC. PROV.	O	FIBER PATCH PANEL WITH SM CONNECTORS *(length per plans)*	GATOR PATCH	G620U012LAN-XXX-0 ("XXX" length per plans, 100M min)				
SPEC. PROV.	M	2METER SMFO DUPLEX LC-SC JUMPERS (2)	CORNING	047202R5120002M				
SPEC. PROV.		ADAPTER PANELS (DMS VENDOR SPECIFIC)	CORNING	CCH-CP12-59 CCH SC ADAPTER				
SPEC. PROV.	AQ	12F OUTDOOR RATED ARMORED SMFO CABLE						

DYNAMIC MESSAGE SIGN - TYPE 2W SUBMITTAL CHECKLIST

PAY ITEM # JT132XXX
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
CONCRETE SERVICE PAD								
SPEC. PROV.		CONCRETE SERVICE PAD / TRANSFORMER *(size per plans)*						
SPEC. PROV.		CONCRETE FOUNDATION / DISC. SWITCH *(size per plans)*						
SPEC. PROV.		CONCRETE SERVICE PAD 4' X 4' X 6"						
GROUNDING MATERIAL: SEE " ITS ELEMENT SITE GROUNDING" FOR DETAILS								
REFER TO "ITS ELEMENT SITE GROUNDING" CHECKLIST								
CONDUIT AND JUNCTION BOXES								
SPEC. PROV.		PULL BOXES & JUNCTION BOXES (PER SECTION 1088)	APPLETON,AUSTIN, CURLEE MANF.,CROUSE-HINDS, HOFFMAN, KEYSTONE, OZ-GEDNEY					
SPEC. PROV.		CONDUIT						
SPEC. PROV.		FLEXIBLE LIQUID TIGHT						
SPEC. PROV.		CONNECTORS, BUSHINGS	APPLETON, OZ/GEDNEY OR APPROVED EQ.					
POWER DISTRIBUTION EQUIPMENT								
SPEC. PROV.	AS	UNINTERRUPTIBLE POWER SUPPLY (Include sealed batteries)	ALPHA TECHNOLOGIES	FXM 1100				
SPEC. PROV.		INTELLIGENT TVSS (DMS MANUFACTURER)						
SPEC. PROV.		UTILITY PANEL (12 CIRCUIT CAPACITY)	SQUARE D	QO112M100RB				
SPEC. PROV.		CIRCUIT BREAKERS / PANEL 60 AMP, 2P						
SPEC. PROV.		CIRCUIT BREAKERS / PANEL 40 AMP, 2P						
SPEC. PROV.		CIRCUIT BREAKERS / PANEL 20AMP	SQUARE D	MGN61512				
SPEC. PROV.		CIRCUIT BREAKERS / PANEL 15 AMP	SQUARE D	MGN61510				
SPEC. PROV.		SURGE PROTECTION DEVICE IN SIGN (DMS MANUFACTURER)						
SPEC. PROV.	AW	INTELLIGENT SURGE PROTECTION DEVICE	MTL ZONE DEFENDER	MODEL ZD16100				
SPEC. PROV.	AX	LOAD SHEDDING RELAY WITH COVER	MAGNACRAFT	W199APX-34				
SPEC. PROV.	AT	OUTLET STRIP						
SPEC. PROV.	P	120 VAC SURGE SUPPRESOR	COOPER CROUSE HINDS	MA15/D/1/SI OR APPROVED EQUAL				
SPEC. PROV.	U	5A CIRCUIT BREAKER (2)	ALLEN BRADLEY	1492-SPM1B050				
SPEC. PROV.	AI	2A CIRCUIT BREAKER (5)	ALLEN BRADLEY	1492-SPM1B020				
SPEC. PROV.	AJ	TERMINAL BLOCKS	ALLEN BRADLEY	1492-CD8				
TESTING - TEST REQUIREMENTS TRACEABILITY MATRIX (TRTM)								
SPEC. PROV.		FACTORY ACCEPTANCE TESTS (FAT)						
SPEC. PROV.		FACTORY DEMONSTRATION TESTS (FDT)						
SPEC. PROV.		SITE TEST						
SPEC. PROV.		SYSTEMS TEST						
SPEC. PROV.		30 DAY BURN-IN TEST						

DYNAMIC MESSAGE SIGN - TYPE 2W SUBMITTAL CHECKLIST

PAY ITEM # JT132XXX
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
DOCUMENTATION								
SPEC. PROV.		LED MANUFACTURER'S DATA SHEET, PIXEL DESIGN, MODULE DESIGN,						
SPEC. PROV.		CABINET DESIGN - EQUIPMENT LAYOUT						
SPEC. PROV.		CABINET SHOP/PANEL DRAWINGS, FILTER DESIGN						
SPEC. PROV.		FULL ELECTRICAL SCHEMATICS TO INCLUDE CIRCUITS, COMPONENTS, VOLTAGES, OPERATING CURRENT						
SPEC. PROV.		DEMONSTRATION DISK OF OPERATING SOFTWARE						
SPEC. PROV.		MANUFACTURER, ISO 9001 CERT / QMS						
SPEC. PROV.		WIRING DIAGRAMS						
SPEC. PROV.		WATER TEST CERTIFICATION						
SPEC. PROV.		MAINTENANCE & TROUBLESHOOTING MANUALS						
SPEC. PROV.		WEIGHT & CENTER OF GRAVITY LOCATION FOR DMS						
SPEC. PROV.		AS BUILTS OF ALL EQUIPMENT AND SITE WORK						

DYNAMIC MESSAGE SIGN - TYPE 2W (TRAINING) SUBMITTAL CHECKLIST

PAY ITEM # JT132XXX
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
TRAINING (TWO IDENTICAL CLASSES OF 16 HOURS EACH, 10 PERSON MAX PER CLASS)								
SPEC. PROV.		RECOMMENDED TEST EQUIPMENT						
SPEC. PROV.		LITERATURE						
SPEC. PROV.		DRAWINGS						
SPEC. PROV.		(PART-1) 8 HOURS: OPERATIONS, TROUBLESHOOTING, TEST EQUIPMENT & USE, REPAIR, DESIGN DRAWINGS **THIS TRAINING IS TO BE PROVIDED BEFORE THE FIRST DMS SIGN IS DELIVERED**						
SPEC. PROV.		(PART-2) 8 HOURS: "HANDS ON" TROUBLESHOOTING, SOFTWARE, MANUALS, DRAWINGS, TEST EQUIPMENT						
SPEC. PROV.		CONTRACTOR TO VIDEOTAPE THE TRAINING ON DVDS AND SHALL BECOME THE PROPERTY OF THE TOLLWAY						

DYNAMIC MESSAGE SIGN - TYPE 2W (SPARE PARTS) SUBMITTAL CHECKLIST

PAY ITEM # JT132XXX

Contract #

e-Builder Submittal Package #:

e-Builder Submittal Date:

Reviewed By (CM Staff Name):

Review Date:

SUBMITTAL STATUS

APPROVED ☐

APPROVED AS NOTED ☐

REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
SPARE PARTS								
SPEC. PROV.		(2) LED DISPLAY MODULES PER SIGN						
SPEC. PROV.		(2) LED DRIVER BOARDS PER SIGN						
SPEC. PROV.		(2) POWER SUPPLIES PER EVERY 5 SIGNS						
SPEC. PROV.		(1) PHOTO SENSOR PER EVERY 5 SIGNS						
SPEC. PROV.		(1) TEMP. SENSOR PER EVERY 5 SIGNS						
SPEC. PROV.		(1) SIGNAL (LOGIC CONTROL)INTERFACE BOARD PER EVERY 5 SIGNS						
SPEC. PROV.		(1) DMS CONTROLLER PER EVERY 5 SIGNS						
SPEC. PROV.		(1) SURGE SUPPRESSOR						
SPEC. PROV.		(1) FAN OF EACH TYPE						
SPEC. PROV.		(1) FAN CONTROL UNIT						
SPEC. PROV.		(2) SETS OF FILTERS PER SIGN						
SPEC. PROV.		(2) SETS OF FILTERS PER EVERY DMS CABINET						

REMOVE DYNAMIC MESSAGE SIGN - TYPE 1

Description. This work shall consist of removal of a DMS assembly from a gantry at mile post 22.6 as shown on the plans and delivery to the Illinois Tollway at the M-14 Maintenance Facility.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate with the Engineer. This includes but is not limited to the following:

Equipment Removal

The Contractor shall remove the DMS assembly, cabinet and associated cabling to the nearest junction box at locations as shown in the plans. The existing sign structures shall be reused if possible and if the sign has the same overall dimensions. Mounting arms, brackets, conduit LB's, and other hardware used to attach the DMS to the gantry shall be removed. Any openings that will not be reused shall be sealed with a material, approved by the Engineer, which prevents entry by water or animals.

Delivery to the Illinois Tollway

The Contractor shall deliver the DMS sign and cabinet to the Illinois Tollway at the M-14 Maintenance Facility. The DMS sign and cabinet shall be logged by inventory (M tag) number via the Illinois Tollway's A-14 inventory form and then delivered and unloaded at the M-14 building.

Any mounting hardware removed from the site shall be disposed of by the Contractor in accordance with Article 202.03 of the Standard Specifications.

Method of Measurement. This work will be measured for payment in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE DYNAMIC MESSAGE SIGN - TYPE 1.

Pay Item Number	Designation	Unit of Measure
JT132114	REMOVE DYNAMIC MESSAGE SIGN - TYPE 1	EACH

DYNAMIC MESSAGE SIGNS ELECTRICAL WORK (Illinois Tollway)

Effective: September 24, 2014
Revised: January 18, 2018

DESCRIPTION

This work shall consist of furnishing, installing, testing, commissioning, and field configuring the electrical work for Dynamic Message Signs (DMS), of the Type specified, as shown on the Plans, hereinafter specified, complete in every respect unless specifically exempted herein. The work shall also consist of furnishing and installing electrical cables, power conduits, fiber optic conduits with locate/trace wire and transformers, equipment grounding conductors and any other related grounding work for a properly grounded system. Procurement and installation of SMF and power for any Closed Circuit Television (CCTV) camera shown on the plans to connect to the DMS Controller Cabinet shall be included in this work.

The contractor shall provide operation and maintenance manuals, as available from the manufacturer, of any equipment specified hereinafter.

The Contractor shall have at least 5 years of successful installation experience with projects utilizing CCTV & DMS system equipment & fiber optic equipment similar to that required for this project. The Contractor must have qualified personnel permanently located within 2 hours of project site.

Unless specifically defined on the Plans as a unit cost Pay Item, all electrical work at the DMS sites, related CCTV camera sites, plaza buildings, or equipment shelters to incorporate the new DMS equipment and CCTV camera connections is included in this work.

Labeling of various equipment/enclosures/cables/conduit, as per the Illinois Tollway ITS Labeling Guidelines Manual and/or other referenced standards, is included in this work.

Should there be any discrepancies or a question of intent, the Contractor shall refer the matter to the Engineer for decision before ordering any equipment, materials or before starting any related work.

MATERIALS

Materials and equipment shall be new, UL or CSA labeled and shall bear the manufacturer's name, model number and other identification markings. Materials and equipment shall be the standard product of a manufacturer regularly engaged in the production of the required type of material or equipment for at least five years (unless specifically exempted by the Illinois Tollway) and shall be the manufacturer's latest design with published properties. Equipment and materials shall be of the same manufacturer throughout the project to provide uniform appearance, operation and maintenance. Equipment and materials shall be without blemish or defect and shall not be used for temporary light or power purposes, including lamps, without the Engineer's written authorization.

The main components of the DMS electrical work are as described below. All other ancillary connection cables, brackets, and other items required to have a complete installation are included under this pay item.

- Enclosures for Electrical Equipment
- Conduits, Fittings, and Bushings
- Pull and Junction Boxes
- Wires and Cables-600 Volt
- Power Distribution Equipment
- Power and Communication Lines Surge Protection Devices (SPDs)
- Special Cables

The following are the specific materials for the major system component described above:

- Enclosures for Electrical Equipment. Enclosures for electrical equipment shall conform to the area classification described below or unless otherwise noted on the plans. NEMA Type 4 enclosures shall be used in buildings, and NEMA Type 4X Stainless Steel enclosures shall be used in outdoor areas.

- Conduits, Fittings, and Bushings. Material for all conduits and fitting shall be in conformance with the following requirements:

  Galvanized Rigid Steel Conduit:
  - Galvanized Rigid Steel (GRS) conduit and fittings shall be installed in all areas of this Project except as indicated on the plans and/or noted herein.

  - GRS conduit shall be heavy wall type, hot-dipped galvanized with zinc-coated threads, and Underwriters' Laboratory labeled.

  - GRS conduit and couplings shall be threaded, rigid steel, hot-dipped galvanized after fabrication and shall be in accordance with UL 6.

  - All GRS conduit shall meet the requirements of the Section 1088 of the Illinois Tollway Supplemental Specifications.

  - The minimum size conduit shall be ¾ inch, unless otherwise noted.

  - Acceptable conduit manufacturers shall be Allied Tube and Conduit Corp, Wheatland Tube Company, Steel Duct Conduit Products, or approved equal.

  - Acceptable conduit fitting manufacturers shall be American Fittings, Appleton, Killark, OZ/Gedney, or approved equal.

  - Intermediate Metal Conduit (IMC) and Electrical Metallic Tubing (EMT) are not acceptable.

  PVC Coated GRS Conduit:
  - PVC coated rigid steel conduit (PGRS), including elbows and couplings shall be made with GRS conduit, conforming to the GRS specifications above, to which is

bonded a Polyvinyl chloride 40 mils (PVC) coating for the protection of the conduit.

- PVC coated GRS conduit shall also be used for other installations as shown on the Plans.

- PVC coated GRS conduit shall meet the requirements of the Section 1088 of the Illinois Tollway Supplemental Specifications.

- Acceptable PVC coated manufacturers shall be Thomas & Betts, Robroy Industries, or approved equal. All couplings, conduit bodies, etc. must be provided by same manufacturer as the conduit.

- The minimum size conduit shall be 1 inch unless otherwise indicated.

- Only PVC coated GRS in colors that are UL listed are acceptable.

- All conduit fittings shall be of the types specified, shall be in accordance with UL 514B for normal application.

- Any conduit that shows corrosion within the one-year guarantee/warranty period shall be replaced at no additional cost to the Illinois Tollway.

PVC Conduit:

- Non-metallic conduit must be PVC Schedule 40 or PVC Schedule 80 as shown on Drawings.

- PVC conduit, including elbows and couplings, must meet the requirements of NEMA Standard TC2 (latest edition), UL Standard 641, Federal Specifications WC-1094A and must be UL rated and listed for use with 90 degrees C rated conductors in compliance with Article 347 of the NEC. Materials must have a minimum strength of 7,000 psi, flexural strength of 11,000 psi, and compressive strength of 8,600 psi, all at an ambient temperature of 23 degrees C.

- The conduit must be manufactured from virgin PVC compound that must meet the applicable requirements of ASTM D1784.

- PVC conduit fittings must meet with the requirements of NEMA Standard TC3 (latest edition), UL Standard 514 supplement and Federal Specification WC-1094A.

- Standard fittings and cement must be obtained from the conduit manufacturer. Assembly of the PVC conduit system must be in strict accordance with the manufacturer’s instructions.

- Acceptable PVC conduit manufacturers shall be National Pipe, Carlon (Lamson and Sessions), Cantex, and IPEX.

Coilable Nonmetallic Conduit:

- Coilable Nonmetallic Conduit (polyethylene duct) shall comply with the requirements of the special provision “UNDERGROUND CONDUIT, COILABLE NONMETALLIC CONDUIT”, except as modified herein.

- Duct dimensions shall conform to the following table within the manufacturing tolerances set forth in ASTM F2160. Duct sizes shall be Schedule 40 or Schedule 80 PE conduit as shown on the plans.

Nom. Duct Diameter		Nom. Outside Diameter		Min. Wall Thickness	
40 - in	80 - in	40 - in	80 - in	40 - in	80 - in
1	1	1.315	1.315	.133	0.179
1.25	1.25	1.660	1.660	.140	0.191
1.5	1.5	1.900	1.900	.145	0.200
2.0	2.0	2.375	2.375	.154	0.218
3.0	3.0	3.50	3.50	.216	0.300
4.0	4.0	4.50	4.50	.237	0337
6.0	6.0	6.625	6.625	.280	0.432

Flexible Conduit and Fittings:

- Conduits installed in dry locations requiring moveable connection for adjustment or vibration isolated shall be provided with an 18-inch minimum length of flexible galvanized steel conduit.

- Flexible conduit installed in wet locations, exterior locations, and at motors shall be liquid-tight type.

- Flexible liquid-tight conduit shall be galvanized steel with a UL listed moisture and oil-proof plastic coated jacket.

- Connectors shall be malleable iron or steel squeeze-type, with annular gripping rib and insulated throat. Particular attention shall be given to maintaining ground bond through flexible connections.

- Plastic-coated, flexible metal conduit shall be in accordance with UL 360, type UA with PVC outer jacket and integral ground conductor as manufactured by Anamet, Electro Flex, International Metal Hose Company, or approved equal.

Bushings:

- Conduit bushings shall be malleable iron body with 150°C plastic insulating ring. Insulating material shall be self-extinguishing, shall be locked in place, and shall be non-removable.

- Acceptable manufacturers shall be Appleton Catalog Series BU751, OZ/Gedney Catalog Series IBC, or approved equal.

Pull and Junction Boxes:

- Pull boxes and junction boxes shall meet the requirements of the Section 1088 of the Illinois Tollway Supplement Specifications, except as modified on the Plans and as required by this Special Provision.

- Pull boxes and junction boxes shall be provided and sized in accordance with the requirements of the National Electrical Code, as shown on the Plans, and as required by this Special Provision.

- Pull boxes and junction boxes located outdoors shall be NEMA Type 4X, 16-gauge minimum, 304 stainless steel with stainless steel hinged cover and fasteners, unless noted otherwise on the Plans.

- Pull boxes and junction boxes located indoors shall be NEMA Type 4, gasketed, 14 gauge, continuously welded seam, galvanized box and cover. Each cover shall be secured with round, recessed, pan head, or flat head stainless steel screws.

- Pull boxes and junction boxes of the proper size and shape shall be provided. Where suitable, standard outlet boxes shall be used as pull boxes and junction boxes.

- Where required by building or plaza construction, special pull boxes or junction boxes shall be provided in sizes and shapes determined from field measurements as required making a neat and workmanlike installation.

- Acceptable manufacturers shall be Appleton Electric, Austin, Curlee Manufacturing Co., Crouse-Hinds, Hoffman, Keystone, OZ/Gedney, or approved equal.

Wires and Cables - 600 Volt:

- Wire and cable shall be delivered to the job site in original packing or on factory reels. All wire and cable shall bear tagging or marking on the finish at regular intervals and consisting of manufacturer's name as well as the insulation type, voltage rating, UL listing and date of manufacturer.

- Wire and cable shall be soft copper, properly refined, and shall have minimum conductivity of 98%. Aluminum conductors are <u>not</u> acceptable.

- Wire and cable shall have factory color-coded insulation and shall be installed and connected as follows:

    - Color coding for voltage systems of 250 volts and less shall be:
        - "A" Phase – Black
        - "B" Phase – Red

        - "C" Phase – Blue
        - Neutral – White
        - Ground – Green

    - Green shall be used for grounding only.

    - Color coding for voltage systems of greater than 250 volts shall be in accordance with the applicable electrical code sections. Phase legs shall be identified on the wire markers: see Section 1066 of the Illinois Tollway Supplemental Specifications.

- The insulation shall be applied tightly to the conductor and shall be free stripping.

- Power cables shall be insulated with XLP insulation over the conductor with a minimum average thickness as indicated in the table in Article 1066.03(a) of the Standard Specifications. Cable shall be rated USE-2.

- If any of the cable types are modified by the Plans, the Plans shall be followed.

- Ground cable shall be soft drawn copper, annealed, stranded copper with green insulation in required sizes and quantities for all equipment grounding.

- The 600-Volt insulated wires and cables shall be factory tested prior to shipment in accordance with ICEA standards for the insulation specified.

- Acceptable cable manufacturers for 600 volt rated cable shall be American Insulated Wire Corp., Cablec, Okonite, Prysmian, Southwire, or approved equal.

- Splices shall be made with UL approved, self-fusing jacketing tape, resistant to weather, oils, water and chemicals. The color shall be as required. Acceptable manufacturers shall be equal to 3M – Scotch 33 plus, or approved equal.

- Where necessary to use a lubricant for pulling wires, the compound shall be listed by Underwriters Laboratories. Cleaning agents or lubricants that have a deleterious effect on conductor covering shall not be used. Acceptable manufacturers shall be Polywater LZ High Performance Cable Lubricant or approved equal.

Power Distribution Equipment. Transformers and Disconnect Switches shall comply with the following requirements:

- Transformers:

    - Enclosures for Electrical Equipment

    - Transformers shall be outdoor single phase dry-type transformers of the two-winding type, self-cooled, with ratings and voltages as indicated on the Drawings.

- Transformers must be designed for continuous operation at rated KVA, for 24 hours a day, 365 days a year operation, with normal life expectancy as defined in ANSI C57.96.

- The core and coil assembly must be completely encapsulated in a proportioned mixture of resin and aggregate to provide a moisture-proof, shock resistant seal.

- The enclosure construction must be totally enclosed, non-ventilated, NEMA 4X, with lifting eyes.

- Each transformer shall be mounted to a structure using proper anchors and support materials. In no case shall the conduit be the support. The Contractor shall build any rack type support necessary for the mounting of this equipment as shown on the plans. Each rack must be solidly constructed and firmly anchored to the sign structure.

- Transformer enclosure shall be made of heavy gauge steel and shall be degreased, cleaned, primed and finished with ANSI 61 grey weather-resistant enamel. The transformer enclosure shall be sized to properly accept the conduit size shown on the plans and/or specified herein, from the base of the enclosure, or as approved by the Engineer. The shop drawing submittal shall include the physical dimensions and layout of the conduits and enclosures.

- Install transformers as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NESC, NEMA, ANSI, IEEE and in accordance with recognized industry practices to ensure that products fulfill requirements.

- All transformers shall be UL listed.

- Each transformer must be provided with a suitable terminal compartment to accommodate the required primary and secondary wiring connections and side or bottom conduit entrance.

- Acceptable manufactures are Cutler Hammer, General Electric, Square D, and ITE/Siemens.

- Prior to energizing, check for the following:

    - Electrical continuity
    - Short circuits
    - Improper grounds
    - Compliance with manufacturer's torque tightening specifications

- Disconnect Switches:

    - Disconnect switches shall be rated at 600 Volts for use on 480 VAC circuits. Disconnect switches shall be rated 240 VAC for use on 240, 208, and 120 Volt circuits.

- Each disconnect switch and circuit breaker must have an external handle that can be padlocked in the "ON and OFF" position. The padlocking provision must be capable of providing for at least three (3) padlocks. The handle operation must be non-teasable, quick make - quick break.

- Each disconnect switch shall be heavy duty, fusible or non-fusible as shown on the Drawings. When fusible disconnect switches are required they shall be complete with the required fuses.

- Each disconnect switch must be properly and effectively grounded. An individual ground conductor must be provided for each such disconnect.

- Disconnect switches shall be mounted such that center line of the operating handle is 5' - 0" above finished grade.

- Each transformer and disconnect switch shall be mounted to a structure using proper anchors and support materials. In no case shall the conduit be the support. Where required the Contractor shall build any rack type support necessary for the mounting of this equipment. Each rack must be solidly constructed and firmly anchored to the sign structure.

- Transformer and disconnect switch enclosures shall be made of heavy gauge steel and shall be degreased, cleaned, primed and finished with ANSI 61 grey weather-resistant enamel.

- Install transformers and disconnect switches as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NESC, NEMA, ANSI, IEEE and in accordance with recognized industry practices to ensure that products fulfill requirements.

- All transformers and disconnect switches shall be UL listed.

- Disconnect switches shall be Eaton Model DH362NWK or approved equal.

Power and Communication Lines Surge Protection Devices (SPDs). Each DMS enclosure shall be equipped with a Primary Surge Protection Device (SPD). The primary SPD shall be MTL Zone Defender Pro Series, Model ZD16100. The primary SPD shall have local visual indicators that allow a service technician to determine the operational status of the SPD and determine whether the SPD should be replaced immediately or monitored for later replacement. Each DMS with AC power lines longer than 30 feet shall also be equipped with a Secondary SPD.

- All Primary and Secondary Surge Protection Devices must meet the following criteria:

  - UL 1449 tested
  - Listed by UL
  - Meet or exceed ANSI/IEEE C62.45 and ANSI/IEEE C62.41
  - Provide L-L, L-G, L-N, & N-G protection modes

- Shall be of the Metal Oxide Varistor (MOV) or the Silicon Avalanche Diode (SAD) type.

- Primary Surge Protection Devices shall have the following additional requirements:
  - The Surge Protection Device shall be connected on the load side of the main circuit breaker and in parallel with the load.
  - The Surge Protection Devices must be listed for lightning protection.
  - Surge current capacity of 80 kA per phase or greater.
  - Light emitting diode (LED) indicating light for system status indication and failure indication.
  - Conduit nipple connected.
  - NEMA 1 enclosure if being installed inside another enclosed rated NEMA 3 or higher. Otherwise the enclosure shall be NEMA 3R.
  - Let-thru-voltage (LTV) performance measured outside the unit:
    - 3kA 8/20 u/s pulse =< 450volts
    - 10kA 8/20 u/s pulse =< 750volts

- Secondary SPDs shall have the following additional requirements:
  - SPD shall be connected to the AC power distribution side of the cabinet either hardwired into the load center, plugged into a non-GFCI outlet, or plugged into the load side of the UPS, where installed.
  - Surge current capacity of 50 kA or greater.
  - LED indicating light for power ON and failure indication.
  - Plug in power outlet strip design with at least seven (7) power distribution outlets.
  - Enclosure shall be NEMA 1.
  - LTV performance measured outside the unit.
    - 2kA 8/20 u/s pulse = <300volts
    - 3kA 8/20 u/s pulse = <350volts

- All Signal, Data and communication lines shall be protected with Surge Protection Devices with the following requirements:

- Surge current capacity of 10kA
- All solutions shall be in accordance with UL 452, UL 497, and UL 497C as applicable.
- All circuits must be protected at both ends with SPD ground reference established at the point of use.

- Special Cables

1. General:

   - The Contractor shall furnish and install the shielded control cable, shielded power cable, shielded data cable, and Ethernet cable as shown on the Plans and as required by this special provision.

2. Cable Identification:

   - All cables shall be identified at both ends per Illinois Tollway ITS Labeling Guide (found on the Illinois Tollway main website under Contractor Manuals)

3. Data and Communication Cable:

   - All outdoor data and communication cable shall be plenum rated cable.

   - Multimode or single mode fiber optic cables shall be utilized for communications to the DMS in accordance with DMS manufacturer

PRODUCT DELIVERY, STORAGE, AND HANDLING

Equipment and materials shall be delivered to the site and stored in the original containers, suitably sheltered from the elements and mechanical injury, but readily accessible for inspection until installed. Manufacturer's directions shall be followed in the delivery, handling, storage (in dry, heated spaces for moisture sensitive items), protection, installation and operation of all equipment and materials.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate his work and submittals with the Engineer. This includes, but not limited to, the following:

Pre-Procurement Documentation Approval

- Within 10 business days from the Notice to Proceed (NTP), the Contractor shall submit for approval to the Engineer a detailed schedule showing dates for: product submittals and approvals; construction/installation; testing; burn-in period; and applicable warranty information. This detailed schedule shall be included in the project schedule, as required per Illinois Tollway Supplemental Specifications Article 108.02.

- Within 10 business days from the NTP, the Contractor shall submit for approval to the Engineer a completed Contractor Submittal Checklist, attached to this special provision, and associated submittals.

The Contractor shall make all submissions to the Engineer through the Illinois Tollway's Web Based Program Management (WBPM) system to the Engineer, and shall obtain approval of the schedule, catalog cut sheets, cabinet wiring diagrams, and any required calculations from the Engineer prior to purchasing any equipment and subsequently, performing the installation per the approved documents, contract plans, and specifications.

Pre-Installation Requirements
The location of the electrical conduit, enclosures, service disconnects, etc., shall be staked in the field by the Contractor for approval by the Engineer.

Quality Assurance

- Materials and installation shall conform to the applicable Codes and Standards.

- After all equipment, devices and raceways are installed and wires and cables are in place and connected to devices and equipment, the Contractor shall test the system for continuity, proper phase rotation, short circuit, improper grounds, and other defects. If any defective conditions are present, the Contractor shall make all necessary corrections and retest for compliance.

- Each major component of equipment shall have the manufacturer's name, address, model number, and rating on the manufacturer's nameplate securely affixed in a conspicuous place.

- Code ratings, labels or other data, including any that are die-stamped into the surface of the equipment, shall be in a visible location.

Codes and Standards

- Materials and installation shall comply with codes, laws and ordinances of Federal, State, and Local governing bodies having jurisdiction.

- In every installation where regulations of electric utility and telephone companies apply, conformance with their regulations shall be mandatory and any costs incurred shall be included in the Contract.

- In case of differences between building codes, State and Federal laws, local ordinances, utility company regulations and the Contract Documents, the most stringent shall govern.

- All equipment and materials purchased for this Project shall conform to any acts, laws, rules, and regulations of the following organizations:

    1. National Electrical Code (NFPA70).
    2. National Electrical Safety Code (NESC-ANSI C2)
    3. American National Standards Institution (ANSI)
    4. National Fire Protection Association (NFPA)
    5. Institute of Electrical and Electronics Engineers (IEEE).
    6. Insulated Cable Engineers Association (ICEA)
    7. National Electrical Manufacturers Association (NEMA)
    8. Illuminating Engineers Society (IES)

9. Underwriters Laboratories, Inc. (UL).
10. Canadian Standards Association (CSA)
11. American Association of State Highway and Transportation Officials (AASHTO)
12. Occupational Safety and Health Administration (OSHA)

- For installations in locations under the jurisdiction of Illinois Department of Transportation (IDOT), equipment and materials shall also conform to their requirements.

- Should Work be performed which does not comply with the requirements of the applicable building codes, State and Federal laws, local ordinances, industry standards and utility company regulations, changes for compliance shall be done at no additional cost to the Illinois Tollway.

- The Contractor shall submit to governmental agencies and utility companies any shop drawings for equipment, which are required by these agencies, for their approval.

- The Contractor shall notify the Engineer of any proposed materials or apparatus believed to be inadequate, unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction.

Permits and Fees

- The Contractor shall obtain and pay for all permits and make all deposits necessary for the installation of the electrical system as herein specified.

INSTALLATION

General

- The Contractor shall perform all Work with trained staff of the particular trade involved in a neat and workmanlike manner as approved by the Engineer.

- The Contractor shall perform all Work in cooperation with other trades and schedule to allow speedy and efficient completion of the project.

- The Contractor shall furnish other trades with advance information on locations and sizes of frames, boxes, sleeves and openings needed for the Work and also furnish information and shop drawings necessary to permit trades affected to install their work properly and without delay.

- Where there is evidence that work of one trade will interfere with the work of other trades, all trades shall assist in working out space conditions to make satisfactory adjustments and shall be prepared to submit and revise coordinated shop drawings and installation drawings.

- With the approval of the Engineer and without additional cost to the Illinois Tollway, the Contractor shall make minor modifications in the work as required by structural interferences, by interferences with work of other trades or for proper execution of the Work.

- Work installed before coordinating with other trades so as to cause interferences with

the work of such other trades shall be changed as directed by the Engineer to correct such condition without additional cost to the Illinois Tollway.

- Minor changes in the locations of outlets, fixtures and equipment shall be made prior to rough-in at the direction of the Engineer and at no additional cost to the Illinois Tollway.

- The Contractor shall cooperate with other trades and coordinate the Work to eliminate conflicts with other work.

- The equipment shall be installed with ample space allowed for removal, repair or changes to equipment. Ready accessibility to removable parts of equipment and to wiring shall be provided without moving other equipment, which is to be installed or which is in place.

- The Contractor shall compare the Plans and Specifications, checking all measurements to determine the intent of the Contract Documents. Any discrepancies shall be brought to the Engineer's attention for interpretation.

- Locations of electrical outlets, panels, cabinets, equipment, etc. are approximate and exact locations shall be determined by the Contractor and approved by the Engineer at the Project site.

- The Contractor shall refer to Contract Documents for details and large scale Plans.

- The Contractor shall protect the materials and work of other trades from damage during installation of the Work provided under this Contract.

- Electrical equipment, conduit, and fittings shall not be mounted to or supported by elements subject to vibration except by methods, which shall prevent transmission thereof.

- Where flexible conduit lengths are utilized as a means of isolating equipment and minimizing conduit systems vibration, care shall be exercised to assure continuity of ground throughout. Flexible conduit lengths shall be kept to a minimum.

- The Contractor shall protect conduit and cable tray openings against the entrance of foreign matter by means of plugs or caps.

- The Contractor shall cover fixtures, materials, equipment and devices furnished or installed under this Contract or otherwise protect against damage, before, during, and after installation.

- Fixtures, materials, equipment, or devices damaged prior to final acceptance of the Work shall be restored to their original condition or replaced.

- The contractor shall protect conduits and any enclosures from entry by rodents and insects. Cabinets that are pad mounted shall be sealed and caulked around the bottom to make the installation of the cabinet to the concrete pad water tight.

- Location of conduits, fixtures and equipment shall be adjusted and supported to accommodate field conditions encountered, including any potential interferences with other construction or equipment to be installed.

- The Contractor shall determine the exact route and location of each duct bank and electrical raceway prior to fabrication.

- The Work shall be installed to permit removal (without damage to other parts) of parts requiring periodic replacement or maintenance.

- Exterior Wall Openings:

    a) Openings in exterior walls shall be kept properly plugged and caulked at all times, to prevent the possibility of flooding due to storms or other causes.

    b) After completion of work, openings shall be permanently sealed and caulked so as to provide leak-proof conditions.

Conduit Installation

- The Conduit system shall be installed complete with all accessories, fittings, and boxes, in an approved and workmanlike manner to provide proper raceways for electrical conductors. Conduit shall be installed concealed or exposed as shown.

- All underground conduit runs shall be Coilable Non-metallic Conduit (CNC). PVC conduit is allowed in open trench and in concrete.

- Exposed conduit runs shall be installed true, plumb, parallel with or at right angles to adjacent structural members, and must present an orderly, neat and workmanlike appearance.

- Field bends shall be carefully made to prevent conduit damage or reduction in internal areas. Field bends shall be made with proper tools for the size and type of conduit being used. The bending radius shall be not less than six times the nominal diameter of the conduit, with carefully matched bends on parallel runs to present a neat appearance. The number of crossovers shall be kept to a minimum.

- All conduit cut on the job shall be carefully reamed after threading, to remove burrs. All field cut threads shall be tapered. No running threads will be permitted. All field cut threads on steel conduit shall be given a coat of zinc dust in oil, or other approved compound.

- All threaded joints shall be watertight and ensure a low resistance ground path in the conduit system.

- All conduits shall be carefully cleaned before and after installation and all inside surfaces shall be free of imperfections likely to injure the cable. After installation of complete runs, all conduits shall be snaked with an approved tube cleaner equipped with an approved cylindrical mandrel of a diameter not less than 85 percent of the nominal diameter of the conduit. Any conduits through which the mandrel will not pass shall be removed and replaced. After snaking, the ends of the dead-ended conduits shall be

protected with standard malleable metal caps to prevent the entrance of water or other foreign matter.

- Lines of nylon or polypropylene, propelled by carbon dioxide or compressed air, shall be used to snake or pull wire and cable into conduits. Flat steel tapes or sparks tapes may be used where GRS conduit runs are shorter than 50 feet. Steel cables are NOT acceptable.

- Where conduits are connected to boxes or equipment enclosures, drilled holes or full size knockout openings shall provide electrical continuity for grounding and shall be assured by the use of bonding type locknuts. Where connections are at eccentric knockouts, jumper type grounding bushings and wire jumpers shall be installed.

- At pull boxes and junction boxes that have any box dimension in excess of 18 inches and having a total of more than four conduit terminations, jumper-type grounding bushings shall be installed on conduit ends and jumper wires shall be installed to bond all conduits and to bond conduits to boxes.

- Coring handholes as necessary to facilitate installation of conduits.

- Conduit bends which are crushed or deformed in any way shall not be installed.

- Conduit systems shall be installed, with fittings, double locknuts and bushings, and made up tight to insure ground continuity throughout the system.

- Conduit connections to NEMA Type 3R, NEMA Type 4, and NEMA Type 4X enclosures shall terminate in a threaded hub with an insulated throat to provide a positive seal, an electrical ground, and a water tight connection. Each hub shall be OZ/Gedney Type CH-T, or approved equal. Hubs for PVC coated GRS conduit shall be provided by Rob Roy, or approved equal.

- As far as practicable, conduit shall be pitched slightly to drain to the outlet boxes, or otherwise installed to avoid trapping of condensate. Where necessary to secure drainage, a breather-drain fitting shall be installed in the boxes or fittings at low points. Each breather drain fitting shall be manufactured by Crouse-Hinds Co., Appleton Electric Co., or approved equal.

- Conduit shall not run through columns or beams unless so specifically detailed on the installation drawings.

    1. Conduit Installed In Concrete Building Slab or Islands:

        - Where installed in concrete islands the conduit shall be placed in the locations shown on the Plans.

        - Joints for conduit installed in concrete slabs and islands shall be made watertight. Tape is NOT acceptable.

        - Conduit openings shall be temporarily plugged with metal caps to exclude water, concrete, plaster, and other foreign material.

- Conduits embedded in concrete shall be blocked and braced in place by use of adequate conduit separators to prevent displacement during the placing of concrete. The Contractor shall be held responsible for proper position of conduits and shall rearrange any conduit that may be displaced while concrete is placed.

- The number of 90-degree bends shall be limited to 4 or a total of 360 degrees including all off-sets, sweeps, kicks, etc. This shall be between Panel boards, switchboards, pull boxes, outlet boxes, fittings, or between outlets to fitting including bends located immediately adjacent to outlet or fittings. The maximum run without pull boxes shall be 150 feet.

- All wiring systems shall be “pullable” and use of “BX” is prohibited.

- Conduits entering freestanding panels, and free standing control cubicles shall be fitted with jumper type insulated grounding bushings, bonded together and to the structure of the enclosure by a continuous bonding wire.

- Conduits and concrete type boxes, masonry boxes, and other flush mounted boxes shall be installed concealed in masonry walls, plaster walls, dry wall and concrete walls.

- All concealed conduits shall be placed in walls, floors, or islands at the proper time, in accordance with the progress of the structural work.

- Heavy-wall conduits with chemically bonded, 40 mils PVC coating shall be installed as noted on the Plans. When PVC coated GRS is called for, the entire conduit run, including all elbows, couplings, and bushings shall be PVC coated.

- When Work is not in progress, open ends of conduit and fittings shall be securely closed so that no water, earth or other substance will enter.

2. Conduit Connections to Equipment:

    - The conduit system shall be terminated at the conduit connection points of electric devices and equipment. Terminations of conduits at such locations shall permit direct wire connections to the electrical devices or other equipment.

    - Conduit connections shall be made with rigid conduit if the equipment is fixed and not subject to adjustment, mechanical movement, or vibration. Rigid conduit connections shall have union fittings, to permit removal of equipment without cutting or breaking the conduit.

    - Conduit connections shall be made with approved flexible metallic conduit if the equipment is subject to adjustment, mechanical movement, or vibration. Flexible conduit connections shall be watertight.

Pull Box and Junction Box Installation

- Pull boxes and junction boxes shall be installed where shown, where necessary to insure that finished cable will not be damaged, and in accordance with code requirements.

- Pull boxes and junction boxes shall be supported independently from the conduit system.

- The Contractor shall add pull boxes where needed even though not shown on the Plans.

Wire and Cable Installation- 600 Volt

- All cable and wire shall be installed in conduit or cable tray. Exposed conduits shall be installed parallel or at right angles to building walls.

- All conduits shall be swabbed to remove any debris or accumulated moisture before cables or wires are pulled in.

- No splices will be permitted between terminals, except at approved junction or terminal box points, as required by Code for pull lengths. Cable and wire runs shall be looped through pull boxes without cutting and splicing where possible.

- Proper termination of conduits and wires at motors, control panels or other equipment items shall be provided.

- Where more than one cable will be installed in a duct or conduit, all shall be pulled at the same time.

- The ends of all cables shall be sealed with Scotch Number 88 tape or with 3M PST cable and sealing caps or approved equal before pulling into conduits or ducts, and shall be left so sealed until ready for termination.

Splices and Terminations – 600 Volt Cable

- No splicing will be permitted except in junction boxes.

- All splices and pigtail connections for indoor lighting and receptacle wire for cable sizes Number 10 AWG and smaller may be made up with pre-insulated spring connectors, 3M Company “Scotchlock,” Ideal Industries, Inc., wire nuts, or approved equal.

- For connectors to bus bars, use copper compression connectors. Connectors must be crimp type. All connectors must be copper. Copper compression connectors must be long barrel, tin plated, closed end compression type. The barrel for each cable lug must be sized for the exact cable size specified. Copper-Aluminum connectors are not acceptable.

- Splices and terminations in wire/cable larger than 8 AWG must be made with compression type connectors and lugs. The tools used must provide a UL certification

connection. Indenter or set screw type compression fittings are not acceptable. Lugs must be one (1) or two (2)-hole, color keyed. Lug bolting must include a flat washer, Belleville washer and a locknut.

a) Conductors No. 2 AWG and larger must terminate in two-hole solder less lugs.

b) Conductors No. 8 AWG and No. 4 AWG, inclusive, must terminate in one (1)-hole lug.

c) Multiple-hole lugs must have NEMA spacing.

d) Acceptable connector manufacturers are Burndy Type YA, Anderson Type VHCL, Thomas & Betts Co., Series 54800 and 54900 or Panduit Series LCB.

- Outdoor splices of conductors must be made using heat shrink products which, when properly installed, will produce a completely sealed covering over the connectors or lugs. The tube or jacket must be completely coated with mastic to insure a 100 percent seal to the conductor jacket. The splice, when completed, must be watertight. An acceptable manufacturer of this type product is Raychem.

Electrical Hardware Installation

1. Locations:

    1. Anchor bolts, sleeves, inserts, hangers and supports required for the Work shall be furnished and installed by the Contractor.

    2. Any expense resulting from improper location or installation shall be paid for by the Contractor at no additional cost to the Illinois Tollway.

2. Conduit Supports:

    3. Exposed conduits shall be supported in an approved manner. Conduits shall not be fastened to or come in contact with any mechanical system pipes, ducts, or equipment of other trades, except as approved. In all exposed conduit work, approval channel, racks, one-hole straps, or a combination thereof shall be used as supports.

    4. Where conduits are supported with one-hole straps, spacers shall be used to provide ¼-inch minimum clearance between the conduits and supporting surfaces.

    5. All hangers, racks, and straps shall be galvanized steel for GRS conduits.

    6. All hangers, racks, rods, straps, bolts and mounting hardware shall be PVC coated hot dipped galvanized steel for PVC coated GRS conduits.

    7. Perforated straphangers are not acceptable.

    8. Hanger rods for trapeze type hangers shall be made from high tensile strength

carbon steel not less than ½ inch diameter. The rods shall have free-runner, burr-free Unified National Course threads, with an electrogalvanized finish.

9. Conduit supports shall not exceed 5 feet, or as approved by the Engineer due to specific job site conditions. All conduits shall be supported within 3 feet of a conduit run termination.

10. Conduits shall be securely fastened to each support with U-bolts, straps, or clamps. Conduit supports shall be manufactured by B-Line, OZ/Gedney, Unistrut Corp. or approved equal. Supports shall be held to concrete walls and ceilings by power-driven fasteners or electrogalvanized steel inserts as manufactured by B-Line, Ramset, Power Struts, Unistrut Corp., or approved equal.

3. Hangers:

11. The Contractor shall provide adequate supports for all equipment, either suspended from the construction above, or by means of struts to the construction below.

12. The Contractor shall provide straps, clamps, threaded rods, turnbuckles and anchors and all miscellaneous specialties for the attachment of hangers and supports to the structure.

13. Conduit hangers for single conduit threaded rod supports shall be a maximum of 7 feet long. Threaded rod supports shall be sized in accordance with the hanger manufacturer's requirements.

4. Painting:

- All electrical equipment not specified for factory finish painting under other Special Provision Items shall be painted.

    - All exposed GRS conduit, conduit supports, pull boxes, junction boxes, and other electrical equipment attached to the ramp canopies shall be thoroughly cleaned and treated against rust and corrosion with a rust-inhibiting phosphatized coating and finished with two coats of ANSI-61 grey paint, or painted to match the color of existing conduits and supports. PVC coated GRS conduit shall not be painted.

5. Cleaning:

- All rubbish and debris resulting from the Work shall be collected, removed from the site and disposed of legally on a daily basis.

- All floors shall be kept in a broom clean condition.

- In addition to using preventative measures, such as, keeping conduits capped, keeping gaskets clean and intact, keeping covers/doors closed on boxes and enclosures, and covering equipment as needed; the Contractor shall clean inside

of the conduits as before pulling wires and cables. The Contractor shall clean the interiors of equipment enclosures, lighting fixtures, light standards and panels as needed before installing field mounted equipment and devices. The Contractor shall clean the interiors and exteriors of all enclosures, fixtures, and panels as needed or as directed by the Engineer.

- After completion of the electrical installations, the entire system shall be thoroughly cleaned to remove all foreign materials from the conduits, boxes and enclosures, equipment, lighting fixtures, and panels as needed or as directed by the Engineer.

- Cleaned shall mean the thorough removal of, but not limited to, dust, dirt, oil, grease, cement, plaster, welding splatters, and paint spatters.

- All cleaning agents and methods shall be in accordance with the electrical equipment manufacturers' recommendations and subject to approval of the Engineer.

Power and Communication Lines Surge Protection Devices (SPDs)

- The grounding conductor connecting the SPD to the ground bar/rod must be as short and direct a run as practicable.

- One primary SPD shall be connected in parallel to the load side of the service disconnect overcurrent protection device (OCPD) with a circuit breaker. One or more secondary SPD shall be installed on the load side of the OCPD but shall be connected in series with the load.

- All conductors entering or leaving an enclosure shall be protected with surge protection devices.

Special Cable

- The Contractor shall uncoil, feed, grip, pull, and terminate the cable using equipment as recommended by the manufacturer.

- Cable pull lengths shall not exceed the maximum pull tensions as recommended by the manufacturer or 200 pounds maximum, whichever is less.

- Sufficient slack/loops shall be left in pull boxes and hand holes to allow for thermal expansion and contraction.

- The Contractor shall purchase and use the proper specialization tools for stripping jackets, coring and assembling the cable connectors and splice connectors. After all Work has been completed, tested and accepted by the Engineer, one complete set of these tools shall become property of the Illinois Tollway.

- All cables shall be installed without splices from the field equipment to the termination points. Three feet of cable shall be left at the equipment housing end. If the cable cannot be coiled in the housing, the end shall be sealed with a shrink wrap end cap and left exposed.

- Shielded Cable Grounding:

    - Shielded control and data cables shall have the shields grounded at one end. The shield shall be insulated from the conductors with an insulation that is equal to that of the original cable insulation at each splice and termination.

    - Shielded power cables shall have shields grounded at the load ends. Shielded data cables shall have shields grounded at the Data Cabinet or source ends. Shields shall be insulated from the conductors.

Wiring Devices:

- The Contractor shall furnish and install wiring devices as shown on Plans and as required by this Special Provision.

- The Contractor shall install equipment in strict accordance with approved shop drawings and equipment manufacturer's recommendations.

- The Contractor shall adjust the location of equipment to accommodate Work in accordance with field conditions encountered.

- The Contractor shall install each convenience receptacle with grounding pole on bottom when mounted vertically or on right when mounted horizontally.

- The Contractor shall install plates on all switch and receptacle outlets and shall install blank plates on all boxes without wiring devices.

- The Contractor shall install devices and plates level.

- The Contractor shall test complete wiring device installations to assure proper operation.

Grounding

- All grounding materials and associated work shall be in accordance with the requirements of the special provision "ITS ELEMENT SITE GROUNDING".

Electrical Identification

- The Contractor shall furnish and install all electrical identification and labeling as shown on Plans and as required by this special provision.

Equipment Identification

- The Contractor shall provide white with black core laminated phenolic nameplates with 3/8 inch lettering etched through outer covering. Each nameplate shall be fastened with stainless steel screws to each piece of equipment.

- Embossed self-adhering plastic tape labels shall not be accepted.

Wire Identification

- Cable/Wire markers shall be installed on both ends of all conductors.

- All wire and feeder cables shall be labeled with wire markers in all junction boxes, pull boxes, control panels, panel boards, switchboards, etc.

- Wire and cable markers shall be self-adhesive, self-laminating mechanically printed with a clear protective laminating over wrap or mechanically printed heat shrink tubing.

- Cable and wire markers shall be per EIA/TIA Standard TIA-606-B Standard for labeling telecommunication equipment and be approved by the Engineer. The markers shall be attached to all cable where entering or leaving a conduit run. Cable designation and circuit use shall appear on the tag.

- Acceptable manufacturers shall be Brady, Panduit, 3-M, Thomas and Betts, or approved equal.

Plaza Building Communication System Installation

- Install fiber optic communication devices and jumpers in plazas or equipment shelters to provide a fully operational communication system.

- Install all required fiber optic cable jumpers from fiber patch panel inside the Plazas or equipment shelters to equipment to provide a fully operational communication system. All jumpers will be labeled with the opposite end equipment type and location information.

- It shall be the contractor's responsibility to provide all necessary interconnection materials at the Plaza building communication room or equipment shelters for a fully operational communication system.

ELECTRICAL TESTING

- The complete installation shall be tested in accordance with Section 801 of the Illinois Tollway Supplemental Specifications, except as modified by this or other related special provisions.

- This work covers the tests and checks that shall be made on all electrical equipment and wiring to ensure compliance with the applicable codes and standards and with the Plans and Special Provisions. Whenever possible, all checks and tests shall be made just prior to energizing the equipment or circuits and shall be coordinated with the field schedule and field conditions.

- Before testing and energizing a system, all necessary precautions shall be taken to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements must have been made and approved on all conductors and energized parts of electrical equipment.

- The following tests are required, in addition to testing requirements listed in the plans or specified elsewhere. All required tests shall be supervised and witnessed by the Engineer. Contractor shall provide 48 hour notice prior to initiating testing procedures.

    - Short circuits.
    - Improper grounds.
    - Power and control electrical circuits for circuit continuity and function.

- The Contractor shall furnish all meters, instruments, cable connections, equipment or apparatus necessary for making all tests.

- After wires and cables are in place and connected to devices and equipment, the system shall be tested for short circuits, improper grounds, and other faults. If fault condition is present, the trouble shall be rectified and the wiring system shall be retested.

- Conductors, if shorted, grounded or at fault shall be removed, shall be replaced and the wiring system shall be retested.

- Any wiring device, electrical apparatus, or lighting fixture grounded or shorted on any integral “live” part, shall be removed and the trouble rectified by replacing the defective parts or materials.

- Upon completion of the electrical work, the Contractor shall place the entire installation in operation, test for proper function, and show systems and equipment to be free of defects.

- The Illinois Tollway will conduct from time to time such tests as may be required to any part of the equipment to determine if it is installed in accordance with these special provisions. The Contractor shall extend to the Illinois Tollway all facilities to this end and shall furnish required labor. All tests shall be witnessed by the Engineer and three copies of the verified test results shall be given to the Engineer promptly upon completion of a test.

- The Contractor shall provide assistance to the various equipment manufacturers’ field Engineers as required in the testing and adjusting of the electrical power and control equipment. Cooperation of the Contractor shall be such that a minimum of time is required for equipment testing.

- A log shall be maintained for all tests. This log shall be certified before completion of the job, both as to test value and date of test.

- Any faults in the work performed by the Contractor or in materials or equipment furnished by the Contractor shall be corrected or replaced promptly by the Contractor at no additional cost to the Illinois Tollway.

- Any faults in materials or equipment furnished by the Contractor which are the results of careless, incompetent or improper handling or installation by the Contractor, shall be corrected or replaced promptly by the Contractor at no additional cost to the Illinois Tollway.

- All tests shall be made by the Contractor and certification of the tests shall be submitted to the Engineer through the WBMPS. If any failures occur during the tests, the Contractor shall replace the faulty item.

- All data and communication cable tests shall be recorded on the following forms:

Form Number	Description
FORM 1306-ET - 1	MULTIPLE CONDUCTOR CABLE MEGGER TEST, 300 VOLTS & LESS.
FORM 1306-ET - 2	SINGLE AND MULTIPLE CONDUCTOR POWER CABLE MEGGER TEST, 600 VOLTS & LESS.

FORM 1306-ET – 1

MULTIPLE CONDUCTOR CABLE MEGGER TEST, 300 VOLTS & LESS

Testing shall be performed before connecting the cables to the terminals at either end. Continuity of each conductor shall be checked at this time.

Each conductor shall be checked with a 500-volt Megger to ground, with all other conductors in the cable and shield, grounded. The minimum acceptable Megger resistance shall be 50 megaohms for each conductor to ground.

DATE			
PROJECT NAME			
FEEDER NUMBER		LOCATION	
FROM MANHOLE		TO MANHOLE	
CABLE SIZE		CABLE LENGTH	
NUMBER OF CONDUCTORS		INSULATION TYPE	
MANUFACTURER		LINE VOLTAGE	
TEMPERATURE		HUMIDITY	
MEGGER TYPE		SERIAL NUMBER	
TEST VOLTAGE		MULTIPLIER	
REMARKS			

CONDUCTOR NO.	MEGAOHMS		CONTINUITY		CONDUCTOR NO.	MEGAOHMS		CONTINUITY	
	C/C	C/S	PASS	FAIL		C/C	C/S	PASS	FAIL

TEST PERFORMED BY: _____ _____
SIGNATURE Date

TEST WITNESSED BY: _____ _____
SIGNATURE Date

FORM 1306-ET – 2

SINGLE & MULTIPLE CONDUCTOR POWER CABLE MEGGER TEST, 600 VOLTS & LESS

WIRING – FEEDER CIRCUITS

Testing shall be performed before connecting the cable to the terminals at either end. Continuity of each conductor shall be checked at this time.

Each conductor shall be checked with a 1000-volt Megger to ground, with all other conductors in the cable and shield, grounded. The minimum acceptable Megger resistance shall be 250 megohms per 1000 feet for each conductor to ground.

DATE			
PROJECT NAME			
FEEDER NUMBER		LOCATION	
FROM		TO	
CABLE SIZE		CABLE LENGTH	
NUMBER OF CONDUCTORS		INSULATION TYPE	
MANUFACTURER		LINE VOLTAGE	
TEMPERATURE		HUMIDITY	
MEGGER TYPE		SERIAL NUMBER	
TEST VOLTAGE		MULTIPLIER	
REMARKS			

If applicable, All Shields Must Be Properly Grounded Prior to Testing.

Cable No.	MEGAOHMS Phase A	MEGAOHMS Phase B	MEGAOHMS Phase C

TEST PERFORMED BY: _____ _____
SIGNATURE Date

TEST WITNESSED BY: _____ _____
SIGNATURE Date

Final System Acceptance
Final acceptance of the DMS Electrical Work installation will be made after satisfactory completion of the required Electrical Testing. The final inspection of the entire system will be performed by the Engineer in the presence of a representative of the Contractor. Final acceptance of the all work performed under this special provision will be made after:

- Successful completion of the project final walk-through by the Illinois Tollway's ITS GEC.
- Submission (via Illinois Tollway's WBPM system) and written approval by the Engineer of all Record Drawings, Warranty documents, and required user/operator manuals.

    i. The Contractor shall provide three hard and three electronic (PDF) copies of each of the operation and maintenance manuals of any installed equipment to the Engineer for approval.

    ii. At the conclusion of the work, the Contractor shall demonstrate and explain to the Engineer and Illinois Tollway Maintenance Representative(s) the function, operation and maintenance of all equipment installed.

Notification of Final Acceptance will be sent to the Contractor in writing (via Illinois Tollway's WBPM system) by the Engineer.

WARRANTY

All DMS electrical work and associated components shall be warranted and guaranteed against defects and/or failure in design, materials, and workmanship within the warranty period. The Contractor shall submit the warranty terms as part of each material item's shop drawing submittal for approval.

The warranty shall provide that, in the event of a malfunction during the warranty period, the defective system component shall be replaced with a new component by the manufacturer or his/her representative. The Contractor shall make good, repair, or replace at no additional cost to the Illinois Tollway, any defect which in the opinion of the Engineer is due to imperfections in material, design or workmanship, if defect shows itself to be defective within the warranty period stated elsewhere in this special provision.

Any system component that, in the opinion of the Engineer, fails three (3) times prior to the expiration of the warranty will be judged as an unsuitable system and shall require the entire system be replaced by the device manufacturer or representative with a new system of the same type at no additional cost to the Illinois Tollway. The unsuitable system shall be permanently removed from the project. A failure shall also be defined as the field device becoming unable to comply with all applicable standards at the time of original construction.

All manufacturer's equipment guarantees or warranties shall be included in the maintenance manuals for the subject equipment.

The Contractor shall be responsible for protecting all equipment and systems against harmful exposures to, or accumulations of dust and moisture, flooding, corrosion, or other forms of

damage and shall clean and restore damaged finishes as required to place installations in a "like new" condition before warranty repairs are accepted.

METHOD OF MEASUREMENT

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

BASIS OF PAYMENT

This work will be paid for at the contract unit price per each for DMS ELECTRICAL WORK, of the type specified.

Except as specified herein for associated CCTV camera connecting to the DMS Controller Cabinet, single mode fiber optic (SMF) cables, multimode fiber optic (MMF) cables, SMF and MMF patch panels, and FOC jumpers shall be paid for under DYNAMIC MESSAGE SIGN, of the type specified.

The payment to the Contractor will adhere to the following schedule:

Ten percent (10%) of the contract unit price will be paid upon receipt of submission and approval of all product submittal documentation, shop drawings, and electrical test results.

Ninety percent (90%) of the contract unit price will be paid after the Final System Acceptance. Written (via Illinois Tollway's WBPM system) approval from the Engineer of Final Acceptance is required before payment is released.

Pay Item Number	Designation	Unit of Measure
JT132621	DMS ELECTRICAL WORK – TYPE 1	EACH

DMS ELECTRICAL WORK - TYPE 1 SUBMITTAL CHECKLIST

PAY ITEM # JT132621
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
*CONDUIT AND FITTINGS(*** IMC & EMT ARE NOT ACCEPTABLE ***)*								
SPEC. PROV.		GALVANIZED RIGID STEEL CONDUIT (PER SECT1088)MIN 3/4"	ALLIED TUBE & CONDUIT CORP, WHEATLAND TUBE, STEEL DUCT					
SPEC. PROV.		CONDUIT FITTINGS	AMERICAN FITTINGS, APPLETON, KILLARK, OZ/GEDNEY					
SPEC. PROV.		PVC CONDUIT (SCHEDULE 40 & 80)	NATIONAL PIPE, CARLON (LAMSON & SESSIONS), CANTEX, IPEX					
SPEC. PROV.		PVC COATED GRS CONDUIT (PER SECTION 1088) MIN 1"	THOMAS & BETTS, ROBROY INDUSTRIES					
COILABLE NON-METALLIC / FLEXIBLE CONDUIT AND FITTINGS								
SPEC. PROV.		PLASTIC COATED, FLEXIBLE METAL CONDUIT	ANAMET, ELECTRO FLEX, INTL METAL HOSE CO.					
SPEC. PROV.		CONNECTORS - MALLEABLE IRON OR STEEL SQUEEZE TYPE WITH ANNULAR GRIPPING RIBS & INSULATED THROAT						
SPEC. PROV.		BUSHINGS SHALL BE MALLEABLE IRON BODY WITH 150-DEGREE CELCIUS INSULATING RING	APPLETON OZ/GEDNEY	APPLETON SERIES BU751 OZ/GEDNEY SERIES IBC				
PULL BOXES AND JUNCTION BOXES(PER STANDARD SPECIFICATIONS, SECTION 1088)								
SPEC. PROV.		OUTDOOR - NEMA 4X, 16GA..MIN, 316 STAINLESS STEEL, STAINLESS STEEL HINGED COVER & FASTENERS	APPLETON, AUSTIN, CURLEE, CROUSE-HINDS, HOFFMAN, KEYSTONE, OZ/GEDNEY					
SPEC. PROV.		INDOOR - NEMA 4 GASKETED, 14GA., CONT WELD SEAM GALVANIZED BOX. COVER SECURED W/ ROUND RECESSED PAN HEAD/FLAT HEAD STAINLESS STEEL SCREWS	APPLETON, AUSTIN, CURLEE, CROUSE-HINDS, HOFFMAN, KEYSTONE, OZ/GEDNEY					
SPEC. PROV.		THREADED HUB W / INSULATED THROAT(ENCLOSURES)	OZ/GEDNEY	TYPE CH-T				
SPEC. PROV.		THREADED HUB W /INSULATED THROAT(PVC COATED GRS)	ROB ROY					
SPEC. PROV.		BREATHER DRAIN FITTING (IF REQUIRED)	CROUSE-HINDS, APPLETON					
WIRE AND CABLE								
SPEC. PROV.		600-VOLT XLP-USE	AMERICAN INSULATED WIRE, CABLEC, OKONITE, PRYSMAN, SOUTHWIRE					
SPEC. PROV.		TAPE, SEALING CAPS	SCOTCH 3M	SCOTCH NO. 88 TAPE 3M PST SEALING CAP				
SPEC. PROV.		SPLICES/PIGTAILS <10 AWG	3M IDEAL INDUSTRIES	3M SCOTCHLOCK SPRING CONNECTOR IDEAL INDUSTRIES WIRE NUTS				
SPEC. PROV.		COPPER COMPRESSION CONN >8 AWG., CRIMP TYPE, LUGS	BURNDY ANDERSON THOMAS & BETTS PANDUIT	BURNDY TYPE YA ANDERSON TYPE VHCL THOMAS & BETTS 54800/54900				
SPEC. PROV.		HEAT SHRINK	RAYCHEM					
SPEC. PROV.		UL LISTED LUBRICANT	POLYWATER	LZ				
TAPE								
SPEC. PROV.		UL APPROVED, SELF-FUSING, RESISTANT TO WEATHER, OILS, WATER, AND CHEMICALS	3M	SCOTCH 33 PLUS				

DMS ELECTRICAL WORK - TYPE 1 SUBMITTAL CHECKLIST

PAY ITEM # JT132621
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
ELECTRICAL HARDWARE								
SPEC. PROV.		ANCHOR BOLTS, HANGERS, HANGER RODS, TURNBUCKLES, STRAPS, CLAMPS, THREADED RODS						
SPEC. PROV.		CONDUIT SUPPORTS, <5FT.	B-LINE, OZ/GEDNEY, UNISTRUT					
SPEC. PROV.		FASTENERS, STEEL INSERTS	B-LINE, RAMSET, POWER STRUTS, UNISTRUT					
POWER DISTRIBUTION EQUIPMENT								
SPEC. PROV.		TRANSFORMERS - SINGLE PHASE, DRY TYPE, 2-WINDING, SELF COOLED,CONT. OPERATION 24/365. NON-VENTILATED, NEMA 4X, LIFTING EYES. 61 GREY	CUTLER HAMMER, GE, SQUARE D, ITE/SIEMENS					
SPEC. PROV.		DISCONNECT SWITCH - RATED 600V ON 480VAC, 240V ON <240VAC, PADLOCKED HANDLE, FUSES, 61 GREY, UL *(sized to receive conduit size as shown on plans)*	EATON	DH362NWK				
SPECIAL CABLE								
SPEC. PROV.		600V MULTI-CONDUCTOR SHIELDED POWER CABLE	MANHATTAN	TYPE PTN-TC FOIL SHIELD				
SPEC. PROV.		600V MULTI-PAIRED SHIELDED CONTROL CABLE	MANHATTAN	TYPE MMC-TC FOIL SHIELD				
SPEC. PROV.		300V, SIX PAIR #22AWG	BELDEN MANHATTAN	BELDEN #8778 MANHATTAN #M43106				
SPEC. PROV.		300V, THREE PAIR #22AWG	BELDEN MANHATTAN	BELDEN #8777 MANHATTAN #M43103				
SPEC. PROV.		300V, THREE PAIR #18AWG	BELDEN MANHATTAN	BELDEN #9773 MANHATTAN #13173				
SPEC. PROV.		OUTDOOR/INDOOR RATED 4PR 24AWG, 1000BASE-T CAT6 PREMANUFACTURED / PRETERMINATED PATCH CABLES	BELDEN	7953A				
GROUNDING MATERIAL: SEE " ITS ELEMENT SITE GROUNDING" FOR DETAILS								
REFER TO "ITS ELEMENT SITE GROUNDING" CHECKLIST								
EQUIPMENT / WIRE IDENTIFICATION								
SPEC. PROV.		EQUIPMENT: WHITE W/BLACK CORE LAMINATED PHENOLIC NAMEPLATES W/ 3/8" LETTERING, SS SCREWS	BRADY, PANDUIT, 3M, THOMAS & BETTS					
SPEC. PROV.		CABLE/WIRE: SELF ADHESIVE,SELF LAMINATING, MECH. PRINTED, W/ CLEAR PROTECTIVE OVER WRAP OR HEAT SHRINK TUBING. (PER TIA-606-B)	BRADY, PANDUIT, 3M, THOMAS & BETTS					

DMS ELECTRICAL WORK - TYPE 2 SUBMITTAL CHECKLIST

PAY ITEM # JT132622
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
*CONDUIT AND FITTINGS(*** IMC & EMT ARE NOT ACCEPTABLE ***)*								
SPEC. PROV.		GALVANIZED RIGID STEEL CONDUIT (PER SECT1088)MIN 3/4"	ALLIED TUBE & CONDUIT CORP, WHEATLAND TUBE, STEEL DUCT					
SPEC. PROV.		CONDUIT FITTINGS	AMERICAN FITTINGS, APPLETON, KILLARK, OZ/GEDNEY					
SPEC. PROV.		PVC CONDUIT (SCHEDULE 40 & 80)	NATIONAL PIPE, CARLON (LAMSON & SESSIONS), CANTEX, IPEX					
SPEC. PROV.		PVC COATED GRS CONDUIT (PER SECTION 1088) MIN 1"	THOMAS & BETTS, ROBROY INDUSTRIES					
COILABLE NON-METALLIC / FLEXIBLE CONDUIT AND FITTINGS								
SPEC. PROV.		PLASTIC COATED, FLEXIBLE METAL CONDUIT	ANAMET, ELECTRO FLEX, INTL METAL HOSE CO.					
SPEC. PROV.		CONNECTORS - MALLEABLE IRON OR STEEL SQUEEZE TYPE WITH ANNULAR GRIPPING RIBS & INSULATED THROAT						
SPEC. PROV.		BUSHINGS SHALL BE MALLEABLE IRON BODY WITH 150-DEGREE CELCIUS INSULATING RING	APPLETON OZ/GEDNEY	APPLETON SERIES BU751 OZ/GEDNEY SERIES IBC				
PULL BOXES AND JUNCTION BOXES(PER STANDARD SPECIFICATIONS, SECTION 1088)								
SPEC. PROV.		OUTDOOR - NEMA 4X, 16GA. MIN, 316 STAINLESS STEEL, STAINLESS STEEL HINGED COVER & FASTENERS	APPLETON, AUSTIN, CURLEE, CROUSE-HINDS, HOFFMAN, KEYSTONE, OZ/GEDNEY					
SPEC. PROV.		INDOOR - NEMA 4 GASKETED, 14GA., CONT WELD SEAM GALVANIZED BOX. COVER SECURED W/ ROUND RECESSED PAN HEAD/FLAT HEAD STAINLESS STEEL SCREWS	APPLETON, AUSTIN, CURLEE, CROUSE-HINDS, HOFFMAN, KEYSTONE, OZ/GEDNEY					
SPEC. PROV.		THREADED HUB W / INSULATED THROAT(ENCLOSURES)	OZ/GEDNEY	TYPE CH-T				
SPEC. PROV.		THREADED HUB W /INSULATED THROAT(PVC COATED GRS)	ROB ROY					
SPEC. PROV.		BREATHER DRAIN FITTING (IF REQUIRED)	CROUSE-HINDS, APPLETON					
WIRE AND CABLE								
SPEC. PROV.		600-VOLT XLP-USE	AMERICAN INSULATED WIRE, CABLEC, OKONITE, PRYSMIAN, SOUTHWIRE					
SPEC. PROV.		TAPE, SEALING CAPS	SCOTCH 3M	SCOTCH NO. 88 TAPE 3M PST SEALING CAP				
SPEC. PROV.		SPLICES/PIGTAILS <10 AWG	3M IDEAL INDUSTRIES	3M SCOTCHLOCK SPRING CONNECTOR IDEAL NDUSTRIES WIRE NUTS				
SPEC. PROV.		COPPER COMPRESSION CONN >8 AWG., CRIMP TYPE, LUGS	BURNDY ANDERSON THOMAS & BETTS PANDUIT	BURNDY TYPE YA ANDERSON TYPE VHCL THOMAS & BETTS 54800/54900				
SPEC. PROV.		HEAT SHRINK	RAYCHEM					
SPEC. PROV.		UL LISTED LUBRICANT	POLYWATER	LZ				
TAPE								
SPEC. PROV.		UL APPROVED, SELF-FUSING, RESISTANT TO WEATHER, OILS, WATER, AND CHEMICALS	3M	SCOTCH 33 PLUS				

DMS ELECTRICAL WORK - TYPE 2 SUBMITTAL CHECKLIST

PAY ITEM # JT132622
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
ELECTRICAL HARDWARE								
SPEC. PROV.		ANCHOR BOLTS, HANGERS, HANGER RODS, TURNBUCKLES, STRAPS, CLAMPS, THREADED RODS						
SPEC. PROV.		CONDUIT SUPPORTS, <5FT.	B-LINE, OZ/GEDNEY, UNISTRUT					
SPEC. PROV.		FASTENERS, STEEL INSERTS	B-LINE, RAMSET, POWER STRUTS, UNISTRUT					
POWER DISTRIBUTION EQUIPMENT								
SPEC. PROV.		TRANSFORMERS - SINGLE PHASE, DRY TYPE, 2-WINDING, SELF COOLED,CONT. OPERATION 24/365. NON-VENTILATED, NEMA 4X, LIFTING EYES. 61 GREY	CUTLER HAMMER, GE, SQUARE D, ITE/SIEMENS					
SPEC. PROV.		DISCONNECT SWITCH - RATED 600V ON 480VAC, 240V ON <240VAC, PADLOCKED HANDLE, FUSES, 61 GREY, UL *(sized to receive conduit size as shown on plans)*	EATON	DH362NWK				
SPECIAL CABLE								
SPEC. PROV.		600V MULTI-CONDUCTOR SHIELDED POWER CABLE	MANHATTAN	TYPE PTN-TC FOIL SHIELD				
SPEC. PROV.		600V MULTI-PAIRED SHIELDED CONTROL CABLE	MANHATTAN	TYPE MMIC-TC FOIL SHIELD				
SPEC. PROV.		300V, SIX PAIR #22AWG	BELDEN MANHATTAN	BELDEN #8778 MANHATTAN #M43106				
SPEC. PROV.		300V, THREE PAIR #22AWG	BELDEN MANHATTAN	BELDEN #8777 MANHATTAN #M43103				
SPEC. PROV.		300V, THREE PAIR #18AWG	BELDEN MANHATTAN	BELDEN #9773 MANHATTAN #13173				
SPEC. PROV.		OUTDOOR/INDOOR RATED 4PR 24AWG, 1000BASE-T CAT6 PREMANUFACTURED / PRETERMINATED PATCH CABLES	BELDEN	7953A				
GROUNDING MATERIAL: SEE " ITS ELEMENT SITE GROUNDING" FOR DETAILS								
REFER TO "ITS ELEMENT SITE GROUNDING" CHECKLIST								
EQUIPMENT / WIRE IDENTIFICATION								
SPEC. PROV.		EQUIPMENT: WHITE W/BLACK CORE LAMINATED PHENOLIC NAMEPLATES W/ 3/8" LETTERING, SS SCREWS	BRADY, PANDUIT, 3M, THOMAS & BETTS					
SPEC. PROV.		CABLE/WIRE: SELF ADHESIVE,SELF LAMINATING, MECH. PRINTED, W/ CLEAR PROTECTIVE OVER WRAP OR HEAT SHRINK TUBING. (PER TIA-606-B)	BRADY, PANDUIT, 3M, THOMAS & BETTS					

DMS ELECTRICAL WORK - TYPE 2W SUBMITTAL CHECKLIST

PAY ITEM # JT132XXX
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
*CONDUIT AND FITTINGS(*** IMC & EMT ARE NOT ACCEPTABLE ***)*								
SPEC. PROV.		GALVANIZED RIGID STEEL CONDUIT (PER SECT1088)MIN 3/4"	ALLIED TUBE & CONDUIT CORP, WHEATLAND TUBE, STEEL DUCT					
SPEC. PROV.		CONDUIT FITTINGS	AMERICAN FITTINGS, APPLETON, KILLARK, OZ/GEDNEY					
SPEC. PROV.		PVC CONDUIT (SCHEDULE 40 & 80)	NATIONAL PIPE, CARLON (LAMSON & SESSIONS), CANTEX, IPEX					
SPEC. PROV.		PVC COATED GRS CONDUIT (PER SECTION 1088) MIN 1"	THOMAS & BETTS, ROBROY INDUSTRIES					
COILABLE NON-METALLIC / FLEXIBLE CONDUIT AND FITTINGS								
SPEC. PROV.		PLASTIC COATED, FLEXIBLE METAL CONDUIT	ANAMET, ELECTRO FLEX, INTL METAL HOSE CO.					
SPEC. PROV.		CONNECTORS - MALLEABLE IRON OR STEEL SQUEEZE TYPE WITH ANNULAR GRIPPING RIBS & INSULATED THROAT						
SPEC. PROV.		BUSHINGS SHALL BE MALLEABLE IRON BODY WITH 150-DEGREE CELCIUS INSULATING RING	APPLETON OZ/GEDNEY	APPLETON SERIES BU751 OZ/GEDNEY SERIES IBC				
PULL BOXES AND JUNCTION BOXES(PER STANDARD SPECIFICATIONS, SECTION 1088)								
SPEC. PROV.		OUTDOOR - NEMA 4X, 16GA..MIN. 316 STAINLESS STEEL, STAINLESS STEEL HINGED COVER & FASTENERS	APPLETON, AUSTIN, CURLEE, CROUSE-HINDS, HOFFMAN, KEYSTONE, OZ/GEDNEY					
SPEC. PROV.		INDOOR - NEMA 4 GASKETED, 14GA., CONT WELD SEAM GALVANIZED BOX. COVER SECURED W/ ROUND RECESSED PAN HEAD/FLAT HEAD STAINLESS STEEL SCREWS	APPLETON, AUSTIN, CURLEE, CROUSE-HINDS, HOFFMAN, KEYSTONE, OZ/GEDNEY					
SPEC. PROV.		THREADED HUB W / INSULATED THROAT(ENCLOSURES)	OZ/GEDNEY	TYPE CH-T				
SPEC. PROV.		THREADED HUB W /INSULATED THROAT(PVC COATED GRS)	ROB ROY					
SPEC. PROV.		BREATHER DRAIN FITTING (IF REQUIRED)	CROUSE-HINDS, APPLETON					
WIRE AND CABLE								
SPEC. PROV.		600-VOLT XLP-USE	AMERICAN INSULATED WIRE, CABLEC, OKONITE, PRYSMIAN, SOUTHWIRE					
SPEC. PROV.		TAPE, SEALING CAPS	SCOTCH 3M	SCOTCH NO. 88 TAPE 3M PST SEALING CAP				
SPEC. PROV.		SPLICES/PIGTAILS <10 AWG	3M IDEAL INDUSTRIES	3M SCOTCHLOCK SPRING CONNECTOR IDEAL INDUSTRIES WIRE NUTS				
SPEC. PROV.		COPPER COMPRESSION CONN >8 AWG., CRIMP TYPE, LUGS	BURNDY ANDERSON THOMAS & BETTS PANDUIT	BURNDY TYPE YA ANDERSON TYPE VHCL THOMAS & BETTS 54800/54900				
SPEC. PROV.		HEAT SHRINK	RAYCHEM					
SPEC. PROV.		UL LISTED LUBRICANT	POLYWATER	LZ				
TAPE								
SPEC. PROV.		UL APPROVED, SELF-FUSING, RESISTANT TO WEATHER, OILS, WATER, AND CHEMICALS	3M	SCOTCH 33 PLUS				

DMS ELECTRICAL WORK - TYPE 2W SUBMITTAL CHECKLIST

PAY ITEM # JT132XXX
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
ELECTRICAL HARDWARE								
SPEC. PROV.		ANCHOR BOLTS, HANGERS, HANGER RODS, TURNBUCKLES, STRAPS, CLAMPS, THREADED RODS						
SPEC. PROV.		CONDUIT SUPPORTS, <5FT.	B-LINE, OZ/GEDNEY, UNISTRUT					
SPEC. PROV.		FASTENERS, STEEL INSERTS	B-LINE, RAMSET, POWER STRUTS, UNISTRUT					
POWER DISTRIBUTION EQUIPMENT								
SPEC. PROV.		TRANSFORMERS - SINGLE PHASE, DRY TYPE, 2-WINDING, SELF COOLED,CONT. OPERATION 24/365. NON-VENTILATED, NEMA 4X, LIFTING EYES. 61 GREY	CUTLER HAMMER, GE, SQUARE D, ITE/SIEMENS					
SPEC. PROV.		DISCONNECT SWITCH - RATED 600V ON 480VAC, 240V ON <240VAC, PADLOCKED HANDLE, FUSES, 61 GREY, UL *(sized to receive conduit size as shown on plans)*	EATON	DH362NWK				
SPECIAL CABLE								
SPEC. PROV.		600V MULTI-CONDUCTOR SHIELDED POWER CABLE	MANHATTAN	TYPE PTN-TC FOIL SHIELD				
SPEC. PROV.		600V MULTI-PAIRED SHIELDED CONTROL CABLE	MANHATTAN	TYPE MMC-TC FOIL SHIELD				
SPEC. PROV.		300V, SIX PAIR #22AWG	BELDEN MANHATTAN	BELDEN #8778 MANHATTAN #M43106				
SPEC. PROV.		300V, THREE PAIR #22AWG	BELDEN MANHATTAN	BELDEN #8777 MANHATTAN #M43103				
SPEC. PROV.		300V, THREE PAIR #18AWG	BELDEN MANHATTAN	BELDEN #9773 MANHATTAN #13173				
SPEC. PROV.		OUTDOOR/INDOOR RATED 4PR 24AWG, 1000BASE-T CAT6 PREMANUFACTURED / PRETERMINATED PATCH CABLES	BELDEN	7953A				
GROUNDING MATERIAL: SEE " ITS ELEMENT SITE GROUNDING" FOR DETAILS								
REFER TO "ITS ELEMENT SITE GROUNDING" CHECKLIST								
EQUIPMENT / WIRE IDENTIFICATION								
SPEC. PROV.		EQUIPMENT: WHITE W/BLACK CORE LAMINATED PHENOLIC NAMEPLATES W/ 3/8" LETTERING, SS SCREWS	BRADY, PANDUIT, 3M, THOMAS & BETTS					
SPEC. PROV.		CABLE/WIRE: SELF ADHESIVE,SELF LAMINATING, MECH. PRINTED, W/ CLEAR PROTECTIVE OVER WRAP OR HEAT SHRINK TUBING. (PER TIA-606-B)	BRADY, PANDUIT, 3M, THOMAS & BETTS					

TOWER MOUNTED CLOSED CIRCUIT TELEVISION (CCTV) CAMERA ASSEMBLY (Illinois Tollway)

Effective: January 30, 2015
Revised: March 11, 2018

Description. This work shall consist of furnishing, installing and testing of tower mounted cameras and enclosure(s) where shown on the plans and as directed by the Engineer. Removal of existing tower mounted cameras, enclosure(s), or associated appurtenances where shown on the plans and as directed by the Engineer shall be included in this work.

Disposal of removed, excess, or unsuitable materials shall be in accordance with Article 202.03 of the Standard Specifications.

The work under this special provision shall be in association with the installation electrical service, grounding, and communications.

Materials. The main components of the system are as described below. All other ancillary connection cables, brackets, surge suppression, and other items required for the installation of a fully functional Tower Mounted CCTV cameras assembly are included under this special provision.

- Digital Dome HD IP Camera, Structure Mounting Adapter, and CCTV Camera Mounting Arm
    - Vibration Pad (Neoprene in accordance with Article 1083.02(a) of the Standard Specifications)
- Category (CAT) 6 Cable
- Tower enclosure(s) and all associated electronics
- Surge Suppression
- Grounding System
- Communications Building materials (including video power junction enclosure power supplies, transformer, DIN Relay, surge protectors, breakers and other incidental material to complete system connectivity)

The following are the specific materials for the system components described above:

- The CCTV camera shall be Cohu Model 4224-1000 24 VAC. The CCTV camera shall be pole mounted with a Pelco PP450 mounting arm, a Pelco PA402 (or an equivalent) mounting adapter, and ½" thick neoprene vibration pad.
    - The contractor shall utilize rubber boots, Pipeconx Model #PCX56-32, along with RectorSeal on the inside of the camera housing to prevent moisture penetration.
        - The contractor shall provide a photograph of how the desiccant pack is ultimately attached inside the camera.
    - Use outdoor environmental epoxy type conduit weather seal fitting to prevent water, dust, salt, and rodents/insects from entering the CCTV camera through the mounting apparatus. In addition, this conduit weather seal fitting shall include a vented drain to allow passage of air, water, etc. in order to prevent moisture build-up and fogging within the CCTV camera dome cover.

- Use Commscope Model 31768A shall be used for angle members, Model 30848-5 for rounded tower members and Ex-Press for monopole members every 4-feet.
- The Contractor shall run 24VAC using 3-C #12awg (Belden 3102A) to each camera from this enclosure (the tower base mounted enclosure shall be used to pass through the 24VAC cable to each camera).
- Cable connections internal to the video power junction box shall be routed in wiring duct (Panduit FIXILG6 with cover C1LG6) to limit loose cabling.

- Outdoor Rated 4 Pair 23 AWG 1000BASE-T CAT6 Cable, manufactured by Beldon, model number 7953A
- The two tower mounted equipment cabinets shall be provided as shown on the plan details, meeting the following requirements:
  - The second cabinet (12”x12”x6” NEMA 4X stainless steel cabinet with a hinged door) is a camera transition enclosure that transitions from a single 1” conduit to two 1” conduits up to each camera.
  - Both enclosures shall be securely mounted to the tower and all mounting hardware is incidental.
  - All necessary panels, brackets, and outdoor rated wiring required for a complete and operating system shall be incidental.
  - All power (Belden 1034A from the top enclosure to the CCTV camera) and Cat 6 (Belden 7953A), cable shall be outdoor rated.
  - Raceway entry points to the equipment enclosure and building shall be sealed with duct seal (Rainbow Technologies) and steel wool to prevent the intrusion of insects, rodents, pests, and debris.
- Surge suppression should be:
  - Model ZB24590 device manufactured by Atlantic Scientific (Cooper Crouse Hinds / MTL Technologies) for CAT6 cabling to the tower.
  - Model ZB24590 device manufactured by Atlantic Scientific (Cooper Crouse Hinds / MTL Technologies) for power cabling to the cameras, 120VAC/24VAC power transformer (Square D, model 9070T250D13) and cover (Square D, model 9070FSC2)
- Grounding techniques shall adhere to latest version of Motorola's R56 Manual (Standards and Guidelines for Communications Sites).
  - The ground connection from the tower mounted electronic cabinets shall be made directly to the tower via a cad weld. The ground cable length shall be made as short as possible. Any buried ground cable shall be stranded bare tinned copper with a minimum size of #2 awg unless otherwise noted on the plans.
  - The grounding system shall be utilized to terminate surge suppression devices run from the tower to the building where the video power junction enclosure is installed. Conduit entrance locations to the building as shown on the plans shall be finalized at the pre-installation meeting.
  - The power supply and surge suppression enclosure located inside the building shall be placed within a few feet of the ground buss bar.

- The power supply and surge suppression enclosure ground cables shall be run to an existing ground buss bar to each lighting arrestor.

- Communications Building materials shall include a 36” x 30” video power junction enclosure, which shall be provided / installed as the conduit enters the Radio Room. A 20A, 120VAC power line shall be run from a UPS circuit to power all AC powered equipment inside this enclosure. This enclosure shall be used to house:
    - The contractor provided/installed surge protection devices for all power and CAT6 cable runs to the tower
    - DIN Relay (model number DIN4 manufactured by Digital Loggers or approved equal).
    - Any work done inside shall be completed in an orderly and neat fashion as to protect the sensitive electronic and fiber optic equipment that can be affected by dust and dirt created when core holing into the building.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate with the Engineer. This includes, but is not limited to, the following:

Pre-Procurement Documentation Approvals

- Within 10 business days from Notice to Proceed (NTP), the Contractor shall submit for approval to the Engineer a detailed schedule showing dates for: product submittals and approvals; device configuration by the Illinois Tollway; construction/installation; calibration; testing; burn-in period; and warranty of each CCTV camera. This detailed schedule shall be included in the project schedule, as required per Illinois Tollway Supplemental Specifications Article 108.02. Schedules for each CCTV camera to be deployed within the larger construction contract and shall be staggered based on resources to be employed.
    - If this installation is part of a larger ITS deployment or construction project, then the furnishing, installation, calibration and testing of the CCTV camera site(s), shall be specifically noted in the overall project schedule.
- Within 10 business days from NTP, the Contractor shall submit for approval to the Engineer a completed Contractor Tower Mounted Camera Checklist and associated submittals.

The Contractor shall make all submissions to the Engineer through the Illinois Tollway Web Based Program Management (WBPM).

The Contractor must obtain approval of the schedule, catalog cut sheets, cabinet wiring diagrams, and calculations from the Engineer prior to purchasing any equipment and subsequently performing the installation per the approved documents, contract plans, and specifications.

Pre-Installation Requirements

- Thirty (30) days prior to the scheduled field installation of each CCTV camera, the Contractor shall provide a form to the Engineer listing the specific serial number and field

location of each camera. The Illinois Tollway will elect to have the contractor deliver to the CCTV(s) to the Illinois Tollway's Central Administration (CA) Building for configuration and labeling prior to installation by the Contractor when there are less than 5 units requiring programming. When greater than 5 units needing programming, the Illinois Tollway will program all ITS elements within that system (Enclosure, Switch, CCTV(s), and IP Relay) at the same time and at the contractor's location with a minimum of 10 systems ready and a minimum of 4 systems powered. The Contractor shall provide a form to the Engineer during acceptance of the equipment at CA showing the equipment, each equipment specific serial number, and the field location of the each piece of equipment. This form will be signed by both the Engineer and the Contractor.

  - The Illinois Tollway shall have a minimum of 10 working days to configure ten (10) or more device(s). More than ten (10) devices, the Illinois Tollway requires 20 working days to configure.
  - The Contractor shall take possession of the devices from the Illinois Tollway upon notification by the Engineer of configuration and labeling completion.

- Fifteen (15) days prior to the scheduled field installation of each CCTV camera the Contractor shall submit via WBPM:
  - An Installation Shop Drawing detailing the method of attachment of all Contractor installed equipment to the tower, including:
    - The goose neck mounting conduit shall be attached to the tower at two locations and shall be detailed in the contractor provided shop drawings.
    - Camera connectivity (including proposed moisture seal) to the goose neck mounting conduit shall be detailed in the contractor provided shop drawings.
    - The transition junction box near the top of the tower and the equipment enclosure at the base of the tower shall be detailed in the contractor provided shop drawings.
    - Cable strain relief shall be detailed and approved by the Illinois Tollway prior to installation.
    - Mounting hardware shall be on hand and approved by the Illinois Tollway IT Department Tower Specialist at the pre-installation meeting.
- Ten days prior to the scheduled field installation of each CCTV camera, the Contractor shall:
  - Request, via WBPM, to the Engineer and Illinois Tollway ITS unit representative that two switch ports be assigned to these camera connections (by camera name assigned by the Illinois Tollway).
    - As part of the request, the Contractor shall specify the planned date and time of connection and connectivity testing to be witnessed by the Engineer.
    - Illinois Tollway IT will then, at the appointed time and date, activate the requested switch ports and remotely monitor the connection and connectivity testing of the cameras.
  - Meet with the Engineer, Illinois Tollway Traffic Operations Center (TOC) Manager, Illinois Tollway ITS/Operations Unit Manager, and Illinois Tollway ITS GEC to review and receive comments and/or approval on the Installation Shop Drawing. THE CONTRACTOR SHALL NOT BE ALLOWED TO START INSTALLATION WITHOUT RECEIVING INSTALLATION DRAWING

APPROVAL DURING THIS MEETING. The Engineer shall post comments and/or approval of the installation drawing via WBPMS.

- Three days prior to the scheduled field installation of each CCTV camera, the Contractor shall schedule an onsite pre-installation meeting to go through the tower installation details. The meeting shall include the Engineer, Illinois Tollway ITS/Operations Unit Manager, Illinois Tollway ITS GEC, the Contractor (including the Contractors Tower Climbers and Ground Crew), and the Illinois Tollway's Tower Crew. The meeting minutes from this pre-installation meeting shall be distributed and approved by the Contractor, the Engineer, Illinois Tollway ITS unit attendee and the Illinois Tollway's Tower Crew. A copy of the approved meeting minutes shall be posted on WBPM prior to the start of the CCTV installation.
    - The location of the tower mounted camera(s), as shown on the plans, shall be reviewed. This shall include, but not be limited to, which tower leg shall be used to run the conduit up to the camera and which tower leg shall be used to mount the camera. The Contractor shall provide details of conduit installation and trench details between the tower and the communication building for review and approval by the Illinois Tollway ITS Representative and Illinois Tollway IT Department.
    - Mounting hardware shall be on hand and approved by the Illinois Tollway IT Department Tower Specialist.

CCTV Camera Installation

- The contractor shall hand excavate the area that is utilized to run the PVC coated RGS conduits from the tower to the Radio Room.
    - One (1) week prior to excavation the Contractor shall coordinate with the Illinois Tollway to obtain an A-36 form which gives the Contractor the necessary approval to commence excavation work.
- The conduit depth shall conform to the 44” below ground (pre-excavation elevation) as per Illinois Tollway Supplemental Specification Article 810.04. . Prior to backfilling the area, the Construction Engineer and Illinois Tollway ITS Representative shall be notified to inspect this area. The existing tower mounted cameras shall remain operational during the installation of the proposed cameras.
    - Loss of views from the existing CCTV tower cameras by the Illinois Tollway TOC staff shall be 1 hour maximum.
    - The existing CCTV cameras shall be removed the same day as installation of the new cameras once the Illinois Tollway TOC Manager has provided written approval (via email) to the Engineer that the new cameras have full pan-tilt-zoom-focus and iris capabilities. The Engineer shall submit this email to WBPM as proof of basic operations.
    - The existing camera and communication junction box shall be salvaged to the Illinois Tollway. All other appurtenances shall be disposed of off-site by the Contractor in accordance with Article 202.03 of the Standard Specification.
- The Contractor shall install the CCTV camera on the mounting bracket and adaptor, as noted on the plans or as per the manufactures recommendations, including the mounting height and orientation/aiming.

- The material for attaching the CCTV camera to the tower shall include all mounting hardware, adapters, neoprene pads, conduit, and cable from the pole mounted ITS enclosure up to the CCTV camera.
- The CCTV camera shall be aligned such that there are no obstructed views of the Illinois Tollway mainline roadway, ramps, or plazas.
- All associated conduit, wire, circuit breakers, brackets, etc. as shown on the contract plans, and all items and workmanship required to successfully pass the Site Test stated within this special provision, shall be included in this work at no additional cost to the Illinois Tollway..

- The Contractor shall connect the CCTV cameras to the identified existing Cisco switch located in the Computer Room with two Cat 6 cables

TESTING

The Contractor shall be required to perform the following tests after the installation of the CCTV camera. The Contractor shall use the test plans within this special provision to conduct the following tests in the presence of the Engineer.

- First Unit Factory Visual Inspection (If Required)
- Site Test
- System Test
- 30-Day Burn-in Period
- Final System Acceptance and Training

First Unit Factory Visual Inspection
(ONLY REQUIRED IF TOWER MOUNTED CAMERA IS DIFFERENT FROM THIS SPECIAL PROVISION)

The Contractor (or the Contractor's equipment fabricator) shall completely assemble one camera unit which includes the CCTV camera assembly, all equipment, modules, components and complete all internal wiring (including labeling), then provide 5 business days' notice that this unit is ready for inspection. The Contractor shall have one set of contract plans and two sets of shop drawings on site to be redlined with any discrepancies noted. One set of redlines will be retained by the Illinois Tollway. The Contractor shall follow the Illinois Tollway ITS Labeling Guide for all labeling of components. The manual can be found on the Illinois Tollway's main website.

In lieu of the Factory Visual Inspection, the Contractor shall obtain from the manufacturer a product validation certification illustrating that the manufacturer has followed their quality processes and verifies that the unit meets the specifications for operations. This certificate must be submitted to the Engineer for review and approval for the Factory Visual Inspection acceptance.

Site Testing
The purpose of the Site Test is to have the Contractor demonstrate to the Engineer that all tower mounted camera components have been installed, connected, labeled, and configured correctly as per contract plans and as per the manufactures requirements, utilizing quality workmanship. This installation shall result in the reviewing of accurate (per manufactures specification) volume and speed data at the site before being connected to the Illinois Tollway switch and communications system.

For the Site Test to be accepted, the Contractor shall demonstrate to the Engineer that:

- The installation has been performed as per contract plans and as per the manufacturer's recommendations.
    - All devices are connected to the power sources.
    - All power supply voltages and outputs checked and are within design parameters.
    - The ground system has been tested and verified for the Tower, for the connection from the tower mounted equipment enclosure to the leg of the tower, as well as for a ground connection made inside the building from the surge protection junction box to the ground bussbar as shown in the plan details.
        - Grounding techniques shall adhere to Motorola's R56 Manual (Standards and Guidelines for Communications Sites).
    - Tower mounting of conduit, junction boxes and camera have been inspected and accepted in writing by the Engineer
    - C-condulet cable strain relief methods have been inspected and accepted in writing by the Engineer
- All connections are tight and cannot be dislodged by incidental contact from the Engineer.
- All equipment inside the tower building video power junction enclosure and tower mounted cabinet(s) are properly labeled as per the Illinois Tollway ITS Labeling Guide (located on the Illinois Tollway website).
- Each camera powers up to verify that it is wired correctly.
- All camera(s) have been tested in the presence of the Engineer to verify that a clear (no visible distortion) camera video stream can be viewed and that the camera can be panned, tilted and zoomed. The Contractor records the cameras performance on the Tower Mounted Camera Site Test form attached to this special provision. The form is signed by the Engineer.
- Raceway entry points to the equipment enclosure and building shall be sealed with duct seal (Rainbow Technologies or approved equal) and steel wool to prevent the intrusion of insects, rodents, pests, and debris.

System Test

The Engineer shall notify the Contractor, via WBPM, if the System Test is not required. The System Test demonstrates that the field devices can be operated at the TOC utilizing the Traffic Information Management System (TIMS) software.

For the System Test to begin, the Contractor shall notify the Engineer in writing (via WBPM), within 5-Days prior to the start of System Testing, stating that all project tower mounted camera sites are ready for integration into the Illinois Tollways Traffic Information Management System (TIMS) software and demonstrate to the Engineer that:

- Successfully complete a pre-final walk-through with the Illinois Tollway's ITS General Engineering Consultant (GEC).
- Contact the TOC Manager, after the 5-Day request from above, to request that all CCTV camera sites within the project are tested for:
    - Clear video without any distortion and interference/noise.
    - Pan, Tilt, Zoom, automatic/manual iris, automatic/manual focus, and camera pre-set capabilities.

    - Accurate camera video transmission from each tower site to TIMS.
    - IP relay functions properly cycle power to devices
- Receive written approval (via WBPM) from the Engineer and the TOC Manager verifying the communications connectivity and data transmission are within the Illinois Tollway requirements, and that the System Test has passed and the 30-Day Burn-In Period has immediately started.

The Illinois Tollway ITS unit representative will complete the System Test within 2 weeks of notification from the Engineer requesting that all CCTV camera sites be tested.

30-Day "Burn-in" Period Requirements

The Engineer shall notify the Contractor, via WBPM, if the 30-Day Burn-in Period is not required. The purpose of the 30-Day Burn-in Period is to demonstrate capabilities of the Tower Mounted Camera devices from the Illinois Tollway Central Administration Building via the installed/existing communications channels as well as the functionalities of the Local Field Test, troubleshooting and diagnostics for a 30-day period.

For the 30-Day Burn-in Period to be accepted, the Contractor shall demonstrate to the Engineer that:

- The Engineer, TOC Manager, Operations Manager, Illinois Tollway ITS maintenance manager have not submitted any trouble tickets or written (via email or WBPM) failure notifications within the 30-Day period.
    - Failure notification shall include, but not be limited to:
        - Any tower mounted camera power or communication error(s).
    - Any CCTV camera errors with Pan, Tilt, Zoom, automatic/manual iris, automatic/manual focus, and camera pre-set capabilities.
        - Any operations anomaly that the Contractor cannot explain or rectify.
    - For every one (1) day the Contractor is required to mitigate/fix a problem, an additional one (1) day per testing will be added to the 30-Day test.
- Receive written approval (via email) from the Engineer, TOC Manager, and ITS maintenance lead verifying the 30-Day Burn-In period has been successfully completed.

Final System Acceptance and Training

The final inspection of the tower mounted camera will be performed by the Engineer in the presence of a representative of the Contractor. Final acceptance of the all work performed under this special provision will be made after:

- Successful completion of the project final walk-through by the Illinois Tollway's ITS GEC.
- Submission (via WBPM) and written approval by the Engineer of all Record Drawings and Warranty documents including an electronic computer file (Microstation and PDF) including a sketch of each ITS element assembly, user/operator manuals, listing each device's location, identification number, wireless channel information and GPS coordinates to the Engineer.
    - The Contractor shall provide three hard and three electronic (PDF) copies of each of the operation and maintenance manuals to the Engineer for approval.
    - The Contractor shall add a new or updated laminated cabinet wiring diagram to each enclosure.
- Notification of Final Acceptance will be sent in writing (via WBPM) by the Engineer.

WARRANTY

All tower mounted camera and associated components shall be warranted and guaranteed against defects and/or failure in design, materials, and workmanship within the warranty period. The Contractor shall submit the warranty terms as part of each material item's shop drawing submittal for approval.

The warranty shall provide that, in the event of a malfunction during the warranty period, the defective system component shall be replaced with a new component by the manufacturer or his/her representative.

Any system component that, in the opinion of the Engineer, fails three (3) times prior to the expiration of the warranty will be judged as an unsuitable system and shall require the entire system be replaced by the device manufacturer or representative with a new system of the same type at no additional cost to the Illinois Tollway. The unsuitable system shall be permanently removed from the project. A failure shall also be defined as the field device becoming unable to comply with all applicable standards at the time of original construction.

All manufacturer's equipment guarantees or warranties shall be included in the maintenance manuals for the subject equipment.

Method of Measurement. This work will be measured in units of each, complete in place and accepted for a given tower location.

Basis of Payment. This work will be paid for at the contract unit price per each TOWER MOUNTED CAMERA ASSEMBLY, for a given tower location.

The payment to the Contractor will adhere to the following schedule:

Ten percent (10%) of the contract unit price will be paid upon receipt of submission and approval of all product submittal documentation, shop drawings, and calculations.

Sixty-five percent (65%) of the contract unit price will be paid at completion of the Site Test of the CCTV camera location. Written (via WBPM) approval from the Engineer of acceptance of the Site Test is required before payment is released.

Twenty-five percent (25%) of the contract unit price will be paid after the acceptance of the Final System Acceptance and Training. Written (via WBPM) approval from the Engineer that Final Acceptance is required before payment is released.

The installation and testing of the tower, electrical service, and communications shall be paid for under separate items.

Pay Item Number	Designation	Unit of Measure
JT132624	TOWER MOUNTED CAMERA ASSEMBLY	EACH

ITS POLE MOUNTED ENCLOSURE (CCTV OR MVDS) CHECKLIST

PAY ITEM # JT132810
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
CONCRETE SERVICE PAD								
SPEC. PROV.		CONCRETE SERVICE PAD 4' x 4'						
CABINET ENCLOSURE AND ASSOCIATED MATERIAL								
SPEC. PROV.	E	NEMA 4X ENCLOSURE ENCLOSURE BACKPANEL	HOFFMAN HOFFMAN	A36H3012SS6LP A36P30				
SPEC. PROV.		POLE MOUNTING KIT FOR ENCLOSURE	HOFFMAN	CPMK30				
SPEC. PROV.	AJ	TERMINAL BLOCKS	ALLEN BRADLEY	1492-CD8				
SPEC. PROV.	D	TWO GROUNDING BAR SYSTEM (GROUND & NEUTRAL)	HOFFMAN	PGS2K				
DETAIL DWG.	F	(1) GFCI RECEPTACLE (1) STANDARD RECEPTACLE	HUBBELL HUBBELL	GFR5362 BR20WR				
DETAIL DWG.	R	(3) 10A FUSE	GOULD (MERSEN)	ATM-10				
DETAIL DWG.		OUTDOOR RATED #10 / #16 AWG POWER CABLE (CABINET)						
DETAIL DWG.		DUCT SEAL PUTTY	RAINBOW TECHNOLOGIES					
DETAIL DWG.		DIN RAIL (MINIMUM OF 36")						
ETHERNET FIELD SWITCH								
SPEC. PROV.	J	ETHERNET FIELD SWITCH	CISCO	IE-3000-8TC-E				
SPEC. PROV.	K	ETHERNET FIELD SWITCH POWER SUPPLY	CISCO	PWR-IE-3000-AC=				
SPEC. PROV.	Y	(2) 1 GBPS SM SFP FIBER TRANSCEIVER MODULE	CISCO	GLC-LX-SM-RGD=				
DETAIL DWG.	AN	OUTDOOR / INDOOR RATED 4PR 23AWG 1000BASE-T CAT6 PRE-MANUFACTURED / PRE-TERMINATED PATCH CABLES						
CIRCUIT BREAKERS								
DETAIL DWG.	U	5A CIRCUIT BREAKER (2)	ALLEN BRADLEY	1492-SPM1B050				
DETAIL DWG.	AI	2A CIRCUIT BREAKER (5)	ALLEN BRADLEY	1492-SPM1B020				
DETAIL DWG.	G	15A CIRCUIT BREAKER	SCHNEIDER ELECTRIC	MGN81510				
DETAIL DWG.	I	480V, 2P, 30A CIRCUIT BREAKER COVERED TERMINAL SHIELD	CUTLER HAMMER CUTLER HAMMER	HFD2030L 625B229G07				
IP ADDRESSABLE RELAY								
SPEC. PROV.	X	IP ADDRESSABLE RELAY 8-CHANNEL	DIGITAL LOGGERS	DIN4				

TOWER MOUNTED CAMERA ASSEMBLY

PAY ITEM # JT132624

Contract #

e-Builder Submittal Package #:

e-Builder Submittal Date:

Reviewed By (CM Staff Name):

Review Date:

SUBMITTAL STATUS

APPROVED ☐

APPROVED AS NOTED ☐

REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	APPROVED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
CCTV CAMERAS								
SPEC. PROV.		CCTV CAMERAS	COHU	4224-1000				
SPEC. PROV.		DESICCANT PACKS	ULINE	S-3902				
SPEC. PROV.		DUCT SEAL	RECTORSEAL					
TOWER MOUNTED ENCLOSURES MATERIALS								
SPEC. PROV.		DUCT SEAL PUTTY	RAINBOW TECHNOLOGIES					
SPEC. PROV.		STEEL WOOL						
DETAIL DWG.	Z	48VDC TO 24VAC INVERTER	ABSOPULSE ELECTRONCS LTD.	CSI 200-48/24sF3TX-T0905				
DETAIL DWG.	Y	IP ADRESSABLE RELAY 8-CHANNEL	DIGITAL LOGGERS	DIN4				
SURGE PROTECTION DEVICE (SPD)								
DETAIL DWG.	AA	CAT6 POE+ SURGE SUPPRESSORS	MTL INSTRUMENTS	ZB24597 OR APPROVED EQUAL				
DETAIL DWG.	AB	24VAC SURGE SUPPRESSOR	MTL INSTRUMENTS	ZB24580 OR APPROVED EQUAL				
COPPER CABLE								
DETAIL DWG.	AR	OUTDOOR RATED 3/C #12 AWG POWER CABLE	BELDEN	3102A OR APPROVED EQUAL				
DETAIL DWG.	Z	OUTDOOR RATED 4PR 23AWG 1000BASE-T CAT6 CABLE	BELDEN	7953A				

CCTV Camera Site Acceptance Test

1. INTRODUCTION

Site Acceptance Testing verifies that the installed CCTV camera(s) are fully operational at each device site, **prior** to connection to the plaza building Cisco switch. This document provides the Site Acceptance Test procedure for Tower CCTV Cameras.

2. PROCEDURE

The Contractor shall confirm that all external power is connected to the Video Power Junction Box. Contractor shall test and record input and/or output voltages, grounding and continuity for all components inside the Video Power Junction Box in the presence of the Engineer. Then, from the Contractors IP camera tester, access the CCTV camera(s) IP address**.** Verify that the image is received. Also, verify that the camera can be controlled and all control functions are operational.

3. DEFINITIONS

Test	Action / Results
Image	Video Received at the site
Pan Right	Pans the camera to the right
Pan Left	Pans the camera to the left
Tilt Up	Tilts the camera up
Tilt Down	Tilts the camera down.
Zoom In	Zooms the camera in
Zoom Wide	Zooms the camera out
Variable Speed	Holding down a control button causes the camera to move faster
AutoFocus	Pressing FOCUS NEAR and FAR buttons manually overrides auto-focus
Iris Override	Pressing IRIS OPEN and CLOSE buttons manually overrides auto-iris

CCTV Camera Site Acceptance Test

Function	Pass	Comment
Image	☐	
Pan Right	☐	
Pan Left	☐	
Tilt Up	☐	
Tilt Down	☐	
Zoom In	☐	
Zoom Wide	☐	
Variable Speed	☐	
Auto Focus	☐	
Iris Override	☐	
Preposition Pan	☐	
Preposition Tilt	☐	
Preposition Zoom	☐	

CCTV Camera Site Acceptance Test

Device	Input / Output Voltage	Grounded	Continuity	Comment
500 VA, 120-24 VAC Transformer	/	☐	☐	
Grounding Bar	/	☐	☐	
120 VAC Receptacles	/	☐	☐	
8-Channel Ethernet Relay	/	☐	☐	
24 VAC, 10A Fused Breaker	/	☐	☐	
Terminal Block	/	☐	☐	
PoE Injector	/	☐	☐	
24 VAC Surge Suppressor	/	☐	☐	
CAT 6 Cable		☐	☐	
CAT 6 Surge Suppressor	/	☐	☐	
NEMA 1 Enclosure	Existing and Properly Attached		☐	
Transformer Cover	Existing and Properly Attached		☐	

Additional Comments:_____

_____

_____

Test Conducted By:_____ Date:_____

Engineer*:_____ Date:_____

* The Site Test shall not be official until the Engineer signs and dates this sheet. The Tollway will not accept any form that is not signed by both the Test Conductor and the Engineer.

FURNISH COMMUNICATIONS SYSTEM UPGRADE

Description. This work shall consist of furnishing and delivering or installing the following equipment to the Illinois Tollway as coordinated by the Engineer.

Materials. For locations requiring an Ethernet Switch, the main components of the system are as described below. All other ancillary connection cables, brackets, and other items required for the installation of a fully functional Ethernet Switch are to be included in this work.

- Cisco Switch with Power Supply
- Surge Suppressors
- Ethernet Relay
- Small Form-Factor Plug (SFP) Module
- 24 VDC Power Supply

For locations requiring an Ethernet Relay, the main components of the system are as described below. All other ancillary connection cables, brackets, and other items required for the installation of a fully functional Ethernet Switch are to be included in this work.

- Surge Suppressors
- Ethernet Relay
- 24 VDC Power Supply

For locations requiring an SFP, the main components of the system are as described below. All other ancillary connection cables, brackets, and other items required for the installation of a fully functional SFP are to be included in this work.

- Small Form-Factor Plug (SFP) Module
- Fiber Optic Patch Cables

The specific materials for each of the major system components described above shall be determined by the Engineer.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate with the Engineer. The Contractor must obtain approval of the schedule, catalog cut sheets, cabinet wiring diagrams, and calculations from the Engineer prior to purchasing any equipment and subsequently performing the installation per the approved documents, contract plans, and specifications.

The Contractor shall conduct all tests required by the Engineer in the presence of the Engineer.

Method of Measurement. This work will not be measured

Basis of Payment. This work will be paid for at the contract lump sum price per each for FURNISH COMMUNICATIONS SYSTEM UPGRADE.

Pay Item Number	Designation	Unit of Measure
JT132698	FURNISH COMMUNICATIONS SYSTEM UPGRADE	EACH

REMOVE ITS ENCLOSURE

Description. This work shall consist of removal of an ITS enclosure from an ITS pole or sign structure at locations shown on the Plans.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate with the Engineer. This includes, but is not limited to, the following:

Equipment Removal

The Contractor shall remove the ITS enclosure, associated cabling, conduit, and mounting hardware as shown on the Plans. Upon removal of the ITS enclosure, the Contractor shall seal any openings that were created for mounting brackets or conduit/cable access that are not to be reused. The openings shall be sealed with a material, approved by the Engineer, which prevents entry by water or animals.

Delivery to the Illinois Tollway

The Contractor shall remove any Ethernet switches, video encoders, IP relays, and MVDS components from the ITS enclosure and deliver them to the Illinois Tollway at the M-4 Maintenance Facility located at I-94 M.P. 8.3, Gurnee, IL 60031. All salvaged equipment shall be logged by inventory (M tag) number via the Illinois Tollway's A-14 inventory form and then delivered and unloaded at the M-4 building.

The ITS enclosure and any mounting hardware removed from the site shall be disposed of by the Contractor in accordance with Article 202.03 of the Standard Specifications.

Method of Measurement. This work will be measured in units of each ITS enclosure removed.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE ITS POLE MOUNTED ENCLOSURE or REMOVE ITS STRUCTURE MOUNTED ENCLOSURE.

Pay Item Number	Designation	Unit of Measure
JT132800	REMOVE ITS POLE MOUNTED ENCLOSURE	EACH

CLOSED CIRCUIT TELEVISION (CCTV) CAMERA, ITS ASSEMBLY (Illinois Tollway)

Effective: August 15, 2014
Revised: March 1, 2018

DESCRIPTION:

This work shall consist of furnishing, installing, calibrating and testing a Closed Circuit Television (CCTV) camera per the plans and as directed by the Engineer, and as part of a fully functional ITS site.

The work under this special provision shall be in association with the installation of an ITS Pole Mounted Enclosure (CCTV or MVDS), ITS device pole, electrical service, grounding, MVDS ITS Assembly, and communications.

MATERIALS

The main components of the system are as described below. All other ancillary connection cables, brackets, and other items required for the installation of a fully functional CCTV camera assembly are included under this specification.

Digital Dome HD IP Camera

The CCTV camera shall be one of the following approved models:

- Cohu (Model 4224-1000) – 24 VAC
- Cohu (Model 4221-1000) – 60 W PoE
- Axis (Model Q6055-E) – 60 W PoE
- Panasonic (Model WV-SW598A) – 60 W PoE

Mounting Hardware

The CCTV camera shall be pole mounted with a Pelco IWM-GY (or an equivalent hollow pole) mounting arm, a Pelco PA402 (or an equivalent) mounting adapter. A ½" thick neoprene anti-vibration pad shall be installed with the mounting hardware.

- Anti-Vibration Pad (elastomeric, in accordance with Article 1083.02(a) of the Standard Specifications)

Cabling

All camera models shall be furnished with a 60-foot long Outdoor Rated 4 Pair 23 AWG 1000BASE-T CAT6 Cable, manufactured by Beldon, model number 7953A.

A 60-foot long Outdoor Rated #14 AWG 3/C power cable, manufactured by Beldon, model number 1034A shall be installed in the camera pole and left capped on both ends in the case of PoE camera models.

Power Injectors

PoE model CCTV cameras shall be furnished with a PoE injector recommended by the CCTV manufacturer. See the attached checklist for approved model numbers.

Surge Suppression

24 VAC CCTV camera models shall be furnished with a CAT6 Surge Protection Device (SPD) to protect against power surges in the communication cable.

- The surge suppression device shall be by Eaton (Cooper Crouse Hinds / MTL Technologies), model number ZB24590.

The PoE injector shall serve as the SPD for the CAT6 cable.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate the proposed work prescribed under this special provision with the Engineer. This includes, but is not limited to, the following:

Pre-Procurement Documentation Approval

The Contractor shall submit for approval to the Engineer, within 10 business days from Notice to Proceed (NTP), a detailed schedule showing dates for: product submittals and approvals; device configuration by the Illinois Tollway; construction/installation; calibration; testing; burn-in period; and warranty of each CCTV camera. This detailed schedule shall be included in the project schedule, as required per Illinois Tollway Supplemental Specifications Article 108.02. Schedules for each CCTV camera to be deployed within the larger construction contract and shall be staggered based on resources to be employed.

The Contractor shall submit for approval to the Engineer, within 10 business days from NTP, a completed Contractor Submittal Checklist and associated submittals.

The Contractor shall make all submissions to the Engineer through the Illinois Tollway Web Based Program Management (WBPM) system.

The Contractor must obtain approval of the schedule, catalog cut sheets, cabinet wiring diagrams, and calculations from the Engineer prior to purchasing any equipment and subsequently performing the installation per the approved documents, contract plans, and specifications.

Pre-Installation Requirements

Thirty (30) days prior to the scheduled field installation of each CCTV camera, the Contractor shall provide a form to the Engineer listing the specific serial number and field location of each camera. The Illinois Tollway will elect to have the contractor deliver the CCTV(s) to the Illinois Tollway's Central Administration (CA) Building for configuration and labeling prior to installation by the Contractor when there are less than 5 units requiring programming. When greater than 5 units need programming, the Illinois Tollway will program all ITS elements within that system (Enclosure, Switch, CCTV(s), IP Relay, and MVDS(s)) at the same time and at the contractor's location with a minimum of 10 systems ready and a minimum of 4 systems powered. The Contractor shall provide a form to the Engineer during acceptance of the equipment at CA showing the equipment, each equipment specific serial number, and the field location of the each piece of equipment. This form shall be signed by both the Engineer and the Contractor.

The Contractor shall take possession of the devices from the Illinois Tollway upon notification by the Engineer of configuration and labeling completion.

CCTV Camera Installation

The Contractor shall install the CCTV camera on the mounting arm and adaptor, as noted on the plans or as per the manufacturers' recommendations, including the mounting height and orientation/aiming. The CCTV camera shall be aligned such that there are no obstructed views of the Illinois Tollway mainline roadway, ramps, or plazas.

All camera materials, conduit, wire, circuit breakers, brackets, etc. shall be installed as shown on the plans, per manufacturer recommendation, and as directed by the Engineer. This includes all items and workmanship required to successfully pass the Site Test stated within this special provision.

The Contractor shall follow the Illinois Tollway ITS Labeling Guidelines Manual for all labeling of components. The manual can be found on the Illinois Tollway's website.

TESTING

The Contractor shall be required to perform the following tests after the installation of the CCTV camera. The Contractor shall use the test plans within this special provision to conduct the following tests in the presence of the Engineer.

- First Unit Factory Visual Inspection (If Required)
- Site Test
- System Test
- 30-Day Burn-in Period
- Final System Acceptance and Training

First Unit Factory Visual Inspection
(ONLY REQUIRED IF CCTV CAMERA ASSEMBLY IS DIFFERENT FROM THIS SPECIAL PROVISION)

The Contractor (or the Contractor's equipment fabricator) shall completely assemble one CCTV camera unit which includes the CCTV camera assembly, all equipment, modules, components and complete all internal wiring (including labeling), then provide 5 business days' notice that this assembly is ready for inspection. The Contractor shall have one set of contract plans and two sets of shop drawings on site to be redlined with any discrepancies noted. One set of redlines shall be submitted to the Illinois Tollway. The Contractor shall follow the Illinois Tollway ITS Labeling Guidelines Manual for all labeling of components. The manual can be found on the Illinois Tollway's website.

In lieu of the Factory Visual Inspection, the Contractor shall obtain from the manufacturer a product validation certification illustrating that the manufacturer has followed their quality processes and verifies that the unit meets the specifications for operations. This certificate must be submitted to the Engineer for review and approval for the Factory Visual Inspection acceptance.

Site Testing

The purpose of the Site Test is to have the Contractor demonstrate to the Engineer that all CCTV camera components have been installed, connected, labeled, and configured correctly as per contract plans and as per the manufacturers requirements, utilizing quality workmanship. This installation shall result in the reviewing of accurate (per manufacturers specification) video and camera control at the site before being connected to the Illinois Tollway switch and communications system.

The Site Test shall be performed in conjunction with all associated equipment installed at a common site, including but not limited to the following elements. A Site Test shall not be performed at the element or component level. Site Tests shall be performed for all relevant elements at a common site, meeting any Site Test requirements specified for each element.

- CLOSED CIRCUIT TELEVISION (CCTV) CAMERA, ITS ASSEMBLY
- MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY
- ITS POLE MOUNTED ENCLOSURE, ITS ASSEMBLY (CCTV or MVDS)
- FIBER OPTIC COMMUNICATIONS, ITS ASSEMBLY
- WIRELESS COMMUNICATIONS, ITS ASSEMBLY
- STATIC SIGN FLASHING BEACON ASSEMBLY INSTALLATION
- SOLAR POWERED GENERATOR ASSEMBLY
- CO-LOCATED SOLAR POWERED GENERATOR ASSEMBLY
- ITS ELEMENT SITE GROUNDING
- MONOPOLE CLOSED CIRCUIT TELEVISION (CCTV) CAMERA TOWER ASSEMBLY

For the Site Test to be accepted, the Contractor shall demonstrate to the Engineer that:

- The installation has been performed as per contract plans and as per the manufacturer's recommendations.
- All connections are tight and cannot be dislodged by incidental contact from the Engineer.
- All CCTV camera equipment inside the enclosure shall be properly labeled as per the Illinois Tollway ITS Labeling Guidelines Manual (located on the Illinois Tollway website).
- Power up each CCTV Camera to verify that it is wired correctly.
- All camera(s) have been tested in the presence of the Engineer to verify that a clear (no visible distortion) camera video stream can be viewed and that the camera can be panned, tilted and zoomed. The Contractor records the cameras performance on the CCTV Camera Site Acceptance Test form attached to this special provision. The form is signed by the Engineer.

System Test

The System Test demonstrates that the field devices can be operated at the Traffic Operations Center (TOC) utilizing the Traffic Information Management System (TIMS) software. The System Test will be conducted by the Illinois Tollway.

For the System Test to begin, the Contractor shall notify the Engineer in writing (via the WBPM system), within 5-Days prior to the start of System Testing, stating the CCTV camera site is

ready for integration into the Illinois Tollway's Traffic Information Management System (TIMS) software.

System Acceptance of the CCTV:

- Successfully complete a pre-final walk-through with the Illinois Tollway's ITS General Engineering Consultant (GEC).
- Contact the TOC Manager, after the 5-Day request from above, to request that the CCTV camera site is tested for:
    - Clear video without any distortion and interference/noise.
    - Pan, Tilt, Zoom, automatic/manual iris, automatic/manual focus, and camera pre-set capabilities.
    - Accurate CCTV camera data transmission from the CCTV camera site to TIMS.
- Receive written approval (via the WBPM system) from the Engineer and the TOC Manager verifying the communications connectivity and data transmission are within the Illinois Tollway requirements, and that the System Test has passed and the 30-Day Burn-In Period has immediately started.

The Illinois Tollway TOC Manager will complete the System Test within 2 weeks of notification from the Engineer requesting that all CCTV camera sites be tested.

30-Day Burn-in Period

The purpose of the 30-Day Burn-in Period demonstrates that the CCTV camera communicates 100% of the time to the TIMS software is being received during the duration of the test.

For every one (1) day the Contractor is required to mitigate/fix a problem, an additional one (1) day per testing will be added to the 30-Day test.

The Illinois Tollway TOC Manager will provide written approval upon successful completion of the 30-Day Burn-in period.

Final System Acceptance and Training

The final inspection of the CCTV camera will be performed by the Engineer in the presence of a representative of the Contractor. Final acceptance of all work associated with this pay item will be made after:

- Successful completion of the project final walk-through by the Illinois Tollway's ITS GEC.
- Submission (via the WBPM system) and written approval by the Engineer of all Record Drawings and Warranty documents including an electronic computer file (Microstation and PDF) including a sketch of each ITS element assembly, user/operator manuals, listing each device's location, identification number, wireless channel information and GPS coordinates to the Engineer.
    - The Contractor shall provide three hard and three electronic (PDF) copies of each of the operation and maintenance manuals to the Engineer for approval.
    - The Contractor shall add a new or updated laminated cabinet wiring diagram to each enclosure.
- Notification of Final Acceptance will be sent in writing (via the WBPM system) by the Engineer.

WARRANTY

All CCTV camera and associated components shall be warrantied and guaranteed against defects and/or failure in design, materials, and workmanship within the warranty period. The Contractor shall submit the warranty terms as part of each material item's shop drawing submittal for approval.

The warranty shall provide that, in the event of a malfunction during the warranty period, the defective system component shall be replaced with a new component by the manufacturer or his/her representative.

Any system component that, in the opinion of the Engineer, fails three (3) times prior to the expiration of the warranty will be judged as an unsuitable system and shall require the entire system be replaced by the device manufacturer or representative with a new system of the same type at no additional cost to the Illinois Tollway. The unsuitable system shall be permanently removed from the project. A failure shall also be defined as the field device becoming unable to comply with all applicable standards at the time of original construction.

All manufacturer's equipment guarantees or warranties shall be included in the maintenance manuals for the subject equipment.

METHOD OF MEASUREMENT

This work will be measured in units of each, completed in place and accepted.

BASIS OF PAYMENT

This work will be paid for at the contract unit price per each for CCTV CAMERA, ITS ASSEMBLY.

The payment to the Contractor will adhere to the following schedule:

Ten percent (10%) of the contract unit price will be paid upon receipt of submission and approval of all product submittal documentation, calculations, and shop drawings.

Sixty-five percent (65%) of the contract unit price will be paid by the Engineer at completion of the Site Test of the CCTV camera location. Written (via the WBPM system) approval from the Engineer of acceptance of the Site Test is required before payment is released.

Twenty-five percent (25%) of the contract unit price will be paid after the acceptance of the Final System Acceptance and Training by the Engineer in the presence of the Contractor. Written (via the WBPM system) approval from the Engineer that Final Acceptance is required before payment is released.

Pay Item Number	Designation	Unit of Measure
JT132820	CCTV CAMERA, ITS ASSEMBLY	EACH

CCTV CAMERA, ITS ASSEMBLY CHECKLIST

PAY ITEM # JT132820

Contract #

e-Builder Submittal Package #:

e-Builder Submittal Date:

Reviewed By (CM Staff Name):

Review Date:

SUBMITTAL STATUS

APPROVED ☐

APPROVED AS NOTED ☐

REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
COHU 4224 (24 VAC)								
SPEC. PROV.		CCTV CAMERA	COHU	4224-1000				
SPEC. PROV.		POLE MOUNT ADAPTER AND MOUNTING ARM	COHU	4221-8438-5				
SPEC. PROV.	AB	OUTDOOR RATED #14 AWG 3/C POWER CABLE (CCTV)	BELDEN	9495A OR APPROVED EQUAL				
SPEC. PROV.	V	CAT6 POE+ SURGE SUPPRESSOR	MTL INSTRUMENTS	ZB24590 OR APPROVED EQUAL				
COHU 4221 (POE)								
SPEC. PROV.		CCTV CAMERA	COHU	4221-1000				
SPEC. PROV.		POLE MOUNT ADAPTER AND MOUNTING ARM	COHU	4221-8438-5				
SPEC. PROV.		POE INJECTOR	COHU	7412007-003				
AXIS (POE)								
SPEC. PROV.		CCTV CAMERA	AXIS	Q6055-E				
SPEC. PROV.		POLE MOUNT ADAPTER AND MOUNTING ARM	AXIS	T91L61				
SPEC. PROV.		POE INJECTOR	AXIS	T8134				
PANASONIC (POE)								
SPEC. PROV.		CCTV CAMERA	PANASONIC	WV-SW598A				
SPEC. PROV.		POLE MOUNT ADAPTER	PANASONIC	WV-Q188				
SPEC. PROV.		CAMERA MOUNTING ARM	PANASONIC	WV-Q122A				
SPEC. PROV.		POE INJECTOR	PANASONIC	PPOEP01L1				
COMMON ITEMS								
SPEC. PROV.		ANTI-VIBRATION PAD (NEOPRENE)						
SPEC. PROV.	Z	OUTDOOR RATED 4PR 23AWG 1000BASE-T CAT6 CABLE	BELDEN	7953A OR APPROVED EQUAL				
SPEC. PROV.		DESICCANT PACKS	ULINE	S-3902				
SPEC. PROV.		DUCT SEAL	RECTORSEAL					

CCTV Camera Site Acceptance Test

1. INTRODUCTION

Site Acceptance Testing verifies that the installed CCTV camera(s) are fully operational at each device site, prior to connection to the field Cisco switch. This document provides the Site Acceptance Test procedure for CCTV Cameras.

2. PROCEDURE

From the Contractors IP camera tester, access the CCTV camera(s) IP address. Verify that the image is received. Also, verify that the camera can be controlled and all control functions are operational.

3. DEFINITIONS

Test	Action / Results
Image	Video Received at the site
Pan Right	Pans the camera to the right
Pan Left	Pans the camera to the left
Tilt Up	Tilts the camera up
Tilt Down	Tilts the camera down.
Zoom In	Zooms the camera in
Zoom Wide	Zooms the camera out
Variable Speed	Holding down a control button causes the camera to move faster
Auto Focus	Pressing FOCUS NEAR and FAR buttons manually overrides auto-focus
Iris Override	Pressing IRIS OPEN and CLOSE buttons manually overrides auto-iris

CCTV Camera Site Acceptance Test Form

Project Number and Name: _____

Route (Circle One): I-88 / I-90 / I-94 / I-294 / I-355 / IL-390

Mile Post: _____ Direction (Circle One): NB / SB / EB / WB / Median

Latitude: _____Longitude:_____

Date / Time: _____ Camera Type: _____

Camera Brand: _____ Camera Model: _____

PoE++ Brand: _____ PoE++ Model: _____

Function	Pass	Comment
Image	☐	_____
Pan Right	☐	_____
Pan Left	☐	_____
Tilt Up	☐	_____
Tilt Down	☐	_____
Zoom In	☐	_____
Zoom Wide	☐	_____
Variable Speed	☐	_____
Auto Focus	☐	_____
Iris Override	☐	_____
Preposition Pan	☐	_____
Preposition Tilt	☐	_____
Preposition Zoom	☐	_____

Additional Comments: _____

_____

_____

Test Conducted By:_____Date:_____

Engineer*:_____Date:_____

* The Site Test shall not be official until the Engineer signs and dates this sheet. The Illinois Tollway will not accept any form that is not signed by both the Test Conductor and the Engineer.

MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY (Illinois Tollway)

Effective: August 15, 2014
Revised: March 1, 2018

DESCRIPTION

This work shall consist of furnishing, installing, calibrating and testing a Microwave Vehicle Detection System (MVDS) per the contract plans and as directed by the Engineer, and as part of a fully functional ITS site.

The work under this specification shall be in association with the installation of an ITS Pole Mounted Enclosure (CCTV or MVDS), ITS device pole, electrical service, grounding, CCTV Camera ITS Assembly, and communications.

MATERIALS

The main components of the system are as described below. All other ancillary connection cables, brackets, and other items required for the installation of a fully functional MVDS assembly are included under this provision.

- Microwave Vehicle Detector and Mounting Brackets
- Associated detector cabling
- Surge Protection Device (SPD)
- RS-232/RS-485 to Ethernet Converter

There are two approved systems for Microwave vehicle detection systems:

- Wavtronix SS-126
- ISS (Image Sensing Systems) SX-300

The following are the specific materials required for the system component for the Wavetronix system:

- The MVDS(s) shall be a SmartSensor HDSS-126 as manufactured by Wavetronix and be capable of detecting bi-directional traffic. The MVDS(s) shall be pole mounted with appropriate Wavetronix mounting brackets.
- Each MVDS unit shall be furnished with a 60 foot UV-protected cable kit (Model WX-SS-706-060 - SmartSensor Power and Communication Cable w/ Connector - 60 feet) for connection to other electronics within the enclosure.
    - Cabling between the MVDS sensor and the pole mounted ITS cabinet shall be routed through the interior of the pole, if hollow, and shall be sealed at the pole entry location as shown in the plans. A rubber grommet shall be installed at the cable entry to the pole. All cable(s) and connector(s) required to connect each component associated to the MVDS are incidental to this pay item.
- The surge protection device (SPD) shall be a Wavetronix Click 200.
- The RS-232/RS-485 to Ethernet Converter shall be a Wavetronix Click 301.

The following are the specific materials required for the system component for the ISS system.:

- The MVDS(s) shall be a SX-300 as manufactured by ISS and be capable of detecting bi-directional traffic. The MVDS(s) shall be pole mounted with appropriate ISS mounting brackets.

- Each MVDS unit shall be furnished with a 60 foot UV-protected cable kit (Model G4-CBL-60 power and Communication Cable w/ Connector - 60 feet) for connection to other electronics within the enclosure.
    - Cabling between the MVDS sensor and the pole mounted ITS cabinet shall be routed through the interior of the pole, if hollow, and shall be sealed at the pole entry location as shown in the plans. A rubber grommet shall be installed at the cable entry to the pole. All cable(s) and connector(s) required to connect each component associated to the MVDS are incidental to this pay item.
- The surge protection device (SPD) shall be a Zone barrier model ZB24510.
- The RS-232/RS-485 to Ethernet Converter shall be a Moxa NPort 5150 or approved equal.

All MVDS equipment installed inside the pole mounted ITS enclosure shall be mounted on the cabinet's grounded DIN rail.

The Contractor shall submit to the Engineer a request for variance when changing equipment prescribed on the MVDS Checklist attached to this special provision. The variance shall be the formal request of an approval of an equal or better substitute for a specified part by providing justification and supporting manufacturer's specifications and other relevant documentation.

CONSTRUCTION REQUIREMENTS:

The Contractor shall closely coordinate with the Engineer. This includes, but is not limited to, the following:

Pre-Procurement Meeting and Documentation Approval

- The Contractor shall submit for approval to the Engineer, within 10 business days from Notice to Proceed (NTP), a detailed schedule showing dates for: product submittals and approvals; device configuration by the Illinois Tollway; construction/installation; calibration; testing; burn-in period; and warranty of each MVDS. This detailed schedule shall be included in the project schedule, as required per Illinois Tollway Supplemental Specifications Article 108.02. Schedules for each MVDS to be deployed within the larger construction contract and shall be staggered based on resources to be employed.
    - If this installation is part of a larger ITS deployment or construction project, then the furnishing, installation, calibration and testing of the MVDS site(s), shall be specifically noted in the overall project schedule.
- The Contractor shall submit for approval to the Engineer, within 10 business days from NTP, a completed Contractor Submittal Checklist and associated submittals.

The Contractor shall make all submissions to the Engineer through the Illinois Tollway Web Based Program Management (WBPM) system.

The Contractor must obtain approval of the schedule, catalog cut sheets, cabinet wiring diagrams, and calculations from the Engineer prior to purchasing any equipment and subsequently performing the installation per the approved documents, contract plans, and specifications.

Pre-Installation Requirements

- Thirty (30) days prior to the scheduled field installation of each MVDS, the Contractor shall notify the Engineer of the anticipated delivery date of any MVDS.

The Illinois Tollway will elect to have the contractor deliver to the MVDS(s) to the Illinois Tollway's Central Administration (CA) Building for configuration and labeling prior to installation by the Contractor when there are less than 5 units requiring programming. When greater than 5 units needing programming, the Illinois Tollway will program all ITS elements within that system (Enclosure, Switch, CCTV(s), IP Relay, and MVDS(s)) at the same time and at the contractor's location with a minimum of 10 systems ready and a minimum of 4 systems powered.

- The Contractor shall provide a form to the Engineer during acceptance of the equipment at CA showing the equipment, each equipment specific serial number, and the field location of the each piece of equipment. This form will be signed by both the Engineer and the Contractor.
- The Illinois Tollway shall have a minimum of 10 working days to configure ten (10) or fewer device(s). More than ten (10) devices, the Illinois Tollway requires 20 working days to configure.
- The Contractor shall take possession of the devices from the Illinois Tollway upon notification by the Engineer of configuration and labeling completion.

MVDS Installation

- The Contractor shall install the MVDS on the mounting structure, as noted on the plans or as per the manufactures recommendations, including the mounting height and orientation/aiming.
    - The material for attaching the MVDS sensor to the pole shall include all mounting hardware, conduit, and cable from the pole mounted ITS enclosure up to the MVDS sensor.
    - The MVDS shall be aligned per manufacturer aiming/alignment requirements.
    - All associated conduit, wire, circuit breakers, brackets, etc. as shown on the contract plans, and all items and workmanship required to successfully pass the Site Test stated within this special provision.
- The Contractor shall calibrate the MVDS and correctly complete the calibration forms, within this special provision, to be approved by the Engineer.
- The Contractor shall follow the Illinois Tollway ITS Labeling Guide for all labeling of components. The manual can be found on the Illinois Tollway website.

TESTING

The Contractor shall be required to perform the following tests after the installation of the MVDS. The Contractor shall use the test plans within this special provision to conduct the following tests in the presence of the Engineer.

- First Unit Factory Visual Inspection (If Required)
- Site Test
- System Test
- 30-Day Burn-in Period
- Final System Acceptance and Training

First Unit Factory Visual Inspection

(ONLY REQUIRED IF DETECTOR ASSEMBLY IS DIFFERENT FROM THIS SPECIAL PROVISION)

The Contractor (or the Contractor's equipment fabricator) shall completely assemble one MVDS unit which includes the MVDS assembly, all equipment, modules, components and complete all internal wiring (including labeling), then provide 5 business days' notice that this unit is ready for inspection. The Contractor shall have one set of contract plans and two sets of shop drawings on site to be redlined with any discrepancies noted. One set of redlines will be retained by the Illinois Tollway. The Contractor shall follow the Illinois Tollway ITS Labeling Guide for all labeling of components. The manual can be found on the Illinois Tollway's website.

In lieu of the Factory Visual Inspection, the Contractor shall obtain from the manufacturer a product validation certification illustrating that the manufacturer has followed their quality processes and verifies that the unit meets the specifications for operations. This certificate must be submitted to the Engineer for review and approval for the Factory Visual Inspection acceptance.

Site Testing

The purpose of the Site Test is to have the Contractor demonstrate to the Engineer that all MVDS components have been installed, connected, labeled, and configured correctly as per contract plans and as per the manufactures requirements, utilizing quality workmanship. This installation shall result in the reviewing of accurate (per manufactures specification) volume and speed data at the site before being connected to the Illinois Tollway switch and communications system.

The Site Test shall be performed in conjunction with all associated equipment installed at a common site, including but not limited to the following elements. A Site Test shall not be performed at the element or component level. Site Tests shall be performed for all relevant elements at a common site, meeting any Site Test requirements specified for each element.

- CLOSED CIRCUIT TELEVISION (CCTV) CAMERA, ITS ASSEMBLY
- MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY
- ITS POLE MOUNTED ENCLOSURE, ITS ASSEMBLY (CCTV or MVDS)
- FIBER OPTIC COMMUNICATIONS, ITS ASSEMBLY
- WIRELESS COMMUNICATIONS, ITS ASSEMBLY
- STATIC SIGN FLASHING BEACON ASSEMBLY INSTALLATION
- SOLAR POWERED GENERATOR ASSEMBLY
- CO-LOCATED SOLAR POWERED GENERATOR ASSEMBLY
- ITS ELEMENT SITE GROUNDING
- MONOPOLE CLOSED CIRCUIT TELEVISION (CCTV) CAMERA TOWER ASSEMBLY

For the Site Test to be accepted, the Contractor shall demonstrate to the Engineer that:

- The installation has been performed as per contract plans and as per the manufacturer's recommendations.
- All connections are tight and cannot be dislodged by incidental contact from the Engineer.
- All MVDS equipment inside the enclosure shall be properly labeled as per the ITS Labeling Guide (located on the Illinois Tollway website).

- The MVDS Calibration form and MVDS configuration spreadsheet (Available on WBPM) has been fully completed, signed by the Engineer and provided to the Illinois Tollway Traffic Operations Center (TOC) at the finish of the Site Test.
    - A minimum of 20 vehicles count per lane of traffic, per site (manual and via the MVDS) has been conducted, has accurately recorded the counts on the Volume Verification Sheet (attached to this specification), and the Volume Verification Sheet has been signed by the Engineer.
        - The counts from the MVDS shall be within 10% of the manual counts taken.
    - A one for one vehicle comparison has been conducted when calibrating the speed and has recorded the results on the Speed Verification Sheets (attached to this special provision).
        - The Contractor shall test a minimum of 20 vehicles per lane of traffic, per site. The observed average speed of the detector shall be within 10% of the average speed measured with a calibrated Lidar gun by a trained Lidar gun operator. If this requirement cannot be attained, then the Contractor shall adjust the unit and repeat the entire volume and speed tests.
- The Illinois Tollway is receiving and has validated data in accordance with the MVDS Calibration and Verification form, as well as within the manufactures requirements. The Illinois Tollway has provided the Contractor a Contractor a Data Validation Confirmation via eBuilder.

System Test

The System Test shall be conducted by the Illinois Tollway.

The System Test demonstrates that the field devices can be operated at the TOC utilizing the Traffic Information Management System (TIMS) software.

For the System Test to begin, the Contractor shall notify the Engineer in writing (via WBPM), within 5-Days prior to the start of System Testing, stating that all project MVDS sites are ready for integration into the Illinois Tollways Traffic Information Management System (TIMS) software:

System Acceptance of the MVDS

- Successfully complete a pre-final walk-through with the Illinois Tollway's ITS General Engineering Consultant (GEC).
- Contact the TOC Manager, after the 5-Day request from above, to request that all MVDS sites within the project are tested for:
    - Communications connectivity from TIMS to each MVDS device.
    - Accurate MVDS data transmission from each MVDS site to TIMS.
- Receive written approval (via email) from the TOC Manager verifying the communications connectivity and data transmission are within the Illinois Tollway requirements.
- Receive written approval (via WBPM) from the Engineer and the TOC Manager verifying the communications connectivity and data transmission are within the Illinois Tollway requirements, and that the System Test has passed and the 30-Day Burn-In Period has immediately started.

The TOC Manager will complete the System Test within 2 weeks of notification from the Engineer requesting that all MVDS sites be tested.

30-Day Burn-in Period

The purpose of the 30-Day Burn-in Period demonstrates that the MVDS communicates 100% of the time to the TIMS software and that accurate speed and volume data (as per manufactures specifications) is being received during the duration of the test.

- For every one (1) day the Contractor is required to mitigate/fix a problem, an additional one (1) day per testing will be added to the 30-Day test.
- The Traffic operations manager will provide written approval upon successful completion of the 30-Day Burn-In period. The TOC Manager will provide the Engineer with a Burn-in Test Log at the end of successful completion.

Final System Acceptance and Training

The final inspection of the MVDS will be performed by the Engineer in the presence of a representative of the Contractor. Final acceptance of the all work associated with this pay item will be made after:

- Successful completion of the project final walk-through by the Illinois Tollway's ITS GEC.
- Submission (via WBPM) and written approval by the Engineer of all Record Drawings and Warranty documents including an electronic computer file (Microstation and PDF) including a sketch of each ITS element assembly, user/operator manuals, listing each device's location, identification number, wireless channel information and GPS coordinates to the Engineer.
  - The Contractor shall provide three hard and three electronic (PDF) copies of each of the operation and maintenance manuals to the Engineer for approval.
- Notification of Final Acceptance will be sent in writing (via WBPM) by the Engineer.

WARRANTY

All MVDS and associated components shall be warranted and guaranteed against defects and/or failure in design, materials, and workmanship within the warranty period. The Contractor shall submit the warranty terms as part of each material item's shop drawing submittal for approval.

The warranty shall provide that, in the event of a malfunction during the warranty period, the defective system component shall be replaced with a new component by the manufacturer or his/her representative.

Any system component that, in the opinion of the Engineer, fails three (3) times prior to the expiration of the warranty will be judged as an unsuitable system and shall require the entire system be replaced by the device manufacturer or representative with a new system of the same type at no additional cost to the Illinois Tollway. The unsuitable system shall be permanently removed from the project. A failure shall also be defined as the field device becoming unable to comply with all applicable standards at the time of original construction.

All manufacturer's equipment guarantees or warranties shall be included in the maintenance manuals for the subject equipment.

METHOD OF MEASUREMENT

This work will be measured in units of each, completed in place and accepted.

BASIS OF PAYMENT

This work will be paid for at the contract unit price per each for MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY.

The payment to the Contractor will adhere to the following schedule:

Ten percent (10%) of the contract unit price will be paid upon receipt of submission and approval of all product submittal documentation, shop drawings, and calculations.

Sixty-five percent (65%) of the contract unit price will be paid by the Engineer at full completion of the requirements listed under the Site Test of the MVDS location. Written (via WBPM) approval from the Engineer of acceptance of the Site Test is required before payment is released.

Twenty-five percent (25%) of the contract unit price will be paid after the acceptance of the 30-Day Burn-In period, Final System Acceptance, and Training by the Engineer in the presence of the Contractor. Written (via WBPM) approval from the Engineer that Final Acceptance is required before payment is released.

The installation and testing of the ITS Pole Mounted Enclosure (CCTV or MVDS), ITS device pole, electrical service, grounding, CCTV Camera ITS Assembly, and communications will be paid separately.

Pay Item Number	Designation	Unit of Measure
JT132845	MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY	EACH

MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY CHECKLIST

PAY ITEM # JT132845
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
MICROWAVE VEHICLE DETECTION SYSTEM (MVDS)								
SPEC. PROV.	AK	MVDS	WAVETRONIX	SMARTSENSOR HDSS-126				
SPEC. PROV.		MVDS MOUNTING BRACKETS	WAVETRONIX					
SPEC. PROV.	AO	50 FT. UV-PROTECTED CABLE KIT	WAVETRONIX	WX-SS-706-100				
SPEC. PROV.	AA	SURGE PROTECTION DEVICE (SPD)	WAVETRONIX	CLICK-200				
SPEC. PROV.	AE	RS-232/RS-485 TO ETHERNET CONVERTER	WAVETRONIX	CLICK-301				
SPEC. PROV.	AK	MVDS	ISS	SX 300				
SPEC. PROV.		MVDS MOUNTING BRACKETS	ISS					
SPEC. PROV.	AO	50 FT. UV-PROTECTED CABLE KIT	ISS	G4-CBL-50				
SPEC. PROV.	AA	SURGE PROTECTION DEVICE (SPD)	Zone Barrier	ZB 24510				
SPEC. PROV.	AE	RS-232/RS-485 TO ETHERNET CONVERTER	Moxa	NPort 5150				

MVDS Sensor Calibration Sheet

Project Number and Name: _____

Route (Circle One): I-88 / I-90 / I-94 / I-294 / I-355 / IL-390

Mile Post: _____ Direction (Circle One): NB / SB / EB / WB / Median

Latitude: _____Longitude:_____

Date / Time: _____

Contractor: _____

CM: _____

Manufacture: **Wavetronix** Manufacture: **ISS**

Model: ss125 ss126 Model: Sx-300

Protocol: Smart Sensor G4

Zone Number	Lane Number	Lane Direction	Actual Count	Sensor Count	% Difference	Speed Observed	Actual Speed	% Difference

Site Checklist					
Site Number Verification		Lane Configuration		Message Period @ 60 Sec	
Vehicle Classification		Speed Set to KPH		Lane minimum 20 vehicle count	
Speed Calibration		Returned to STAT Mode		Saved to Sensor	
Saved to File		Lane speed at minimum 20 vehicle count			

Comments

Contractor:_____

Contractor signature:_____

CM:_____

CM signature:_____

GUIDE

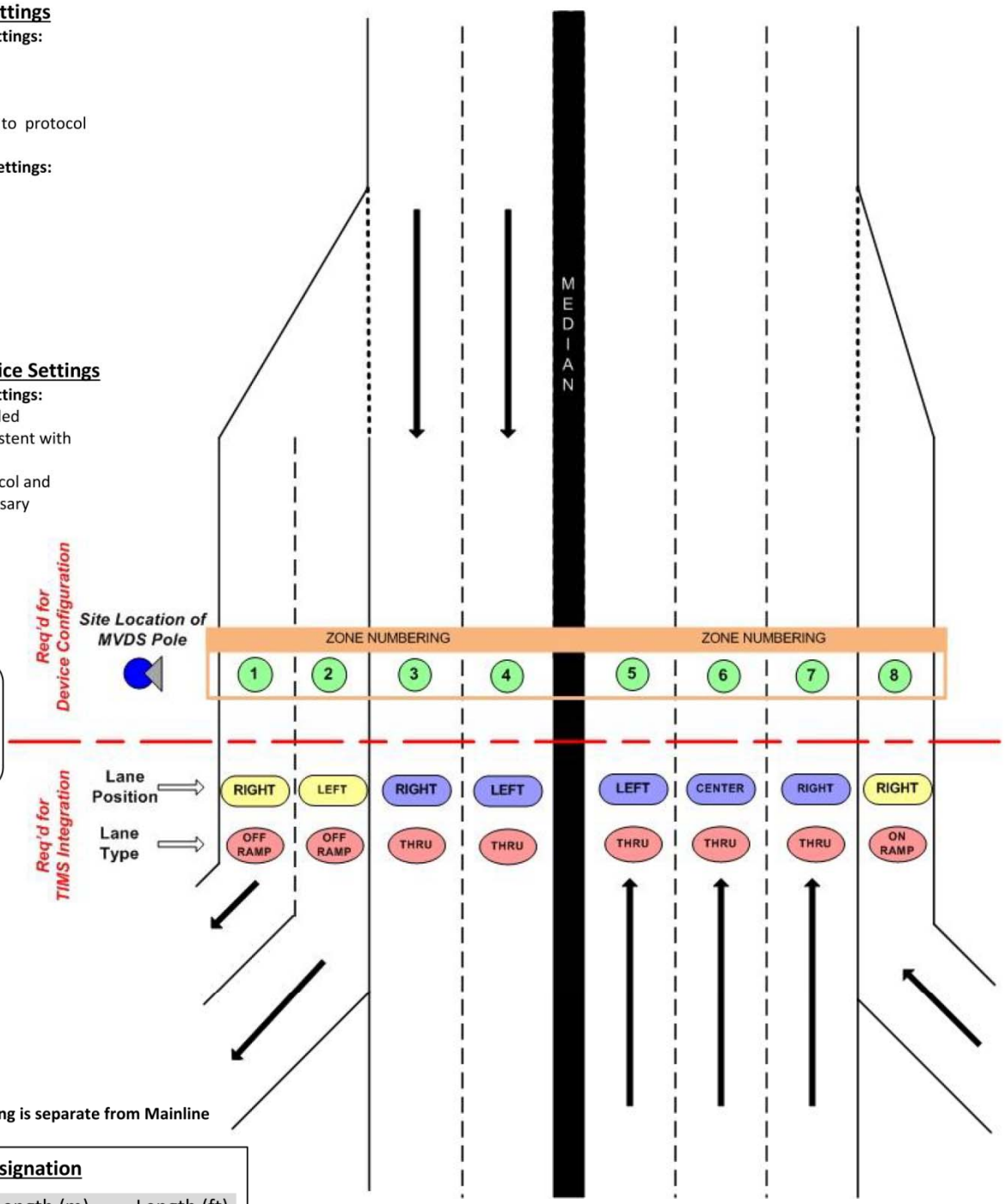
X3/G4 Device Settings

Preferred Device Settings:
Speed = KPH
Interval = 60 sec
Data mode = stat
Message comp = set to protocol

Preferred Modem Settings:
Data port = 12345
Protocol = RS232
Baud = 9600
Data bits = 8
Flow Control = none
Parity = none
Stop bits = 1

Wavetronix Device Settings

Preferred Device Settings:
-Interval mode enabled
-Serial port set consistent with modem
-Format set to protocol and broadcasted if necessary
-60 sec data interval



Note:

Ramp lane positioning is separate from Mainline

Classification Designation

Class/Bin	Length (m)	Length (ft)
1	up to 6.1m	up to 20'
2	6.1 – 7.9m	20 – 26'
3	7.9 – 15.5m	26 – 51'
4	> 15.5m	> 51'

MVDS Site Acceptance Test Form

Project Number and Name: _____

Route (Circle One): I-88 / I-90 / I-94 / I-294 / I-355 / IL-390

Mile Post: _____ Direction (Circle One): NB / SB / EB / WB / Median

Latitude: _____Longitude:_____

Date / Time: _____ MVDS Type: _____

Site Acceptance Testing verifies that the installed MVDS(s) are fully operational at each device site, **prior** to connection to the field Cisco switch.

PROCEDURE

From the Contractor's laptop, access the MVDS**.** Verify that the MVDS is communicating with vendor supplied software.

Use manufactured software to start automatic setup.

Use manufactured supplied software to adjust settings as required to meet

Fill out the MVDS calibration sheet.

Fill out the MVDS configuration spreadsheet.

Save setting to MVDS.

Save file to storage device.

Submit calibration sheet(s) and save file to CM via e-builder.

Additional Comments: _____

_____

_____

Test Conducted By:_____Date:_____

Engineer*:*_____Date:_____

* The Site Test shall not be official until the Engineer signs and dates this sheet. The Tollway will not accept any form that is not signed by both the Test Conductor and the Engineer.

ITS ELEMENT SITE GROUNDING (Illinois Tollway)

Effective: January 20, 2014
Revised: March 1, 2018

DESCRIPTION

This work shall consist of furnishing and installing an ITS element site grounding system in place as shown in the Plans and in accordance with the Special Provisions. This work shall also include the performance of Three-Point, Fall-of-Potential grounding electrode earth resistance test which shall be performed for the Contractor by an independent professional testing service that is equipped and qualified to perform the test and certify the test results. The Three-Point, Fall-of-Potential grounding electrode earth resistance test shall be performed on both new work and on existing installations involved with the work.

CODES AND STANDARDS

This special provision was developed in accordance with the applicable chapters of the Motorola Standards and Guidelines for Communications Sites (R56).

Also incorporated are the applicable elements of the following standards:

1. ANSI/TIA-222, Section 10.0 – Structural Standard for Steel Antenna Towers and Antenna Supporting Structures, Protective Grounding
2. Illinois Tollway Supplemental Specifications, Section 806 – Grounding
3. NFPA 70 – National Electric Code (NEC)
4. NFPA 780 – Standard for the Installation of Lightning Protection Systems
5. UL 96A – Standard for Installation Requirements for Lightning Protection Systems

Where there are conflicts found between the above standards, the more stringent standard shall govern. Government and local codes shall take precedence over the requirements of this special provision.

SOIL ANALYSIS

The Contractor shall perform a soil analysis to determine the acidity (pH) and the porosity (aeration) of the soil. The analysis shall also test for the presence of organic acids in the soil commonly associated with poorly drained or poorly aerated soils. Test reports for each ITS Element site shall be provided. In acidic soils with a pH of 5 or lower and in soils where organic acids are found to be present, the ground rod shall be encased as specified elsewhere herein.

GENERAL GROUNDING MATERIAL REQUIREMENTS

Within 10 business days from Notice to Proceed, the Contractor shall submit via the Illinois Tollway's Web Based Program Management (WBPM) system a completed ITS ELEMENT SITE GROUNDING CHECKLIST (ILLINOIS TOLLWAY), (attached to this special provision), and associated submittals for review and approval by the Engineer. The Contractor shall submit to the Engineer a request for variance when changing equipment prescribed on the ITS ELEMENT SITE GROUNDING CHECKLIST (ILLINOIS TOLLWAY). The variance shall be the formal

request of an approval of an equal or better substitute for a specified part by providing justification and supporting manufacturer's specifications and other relevant documentation.

a) All grounding materials shall be listed for the intended application.

b) Ground rods shall be per Section 806 of the Illinois Tollway supplemental specifications.

c) Aluminum or copper-clad aluminum grounding conductors **SHALL NOT** be used.

d) All grounding electrode conductors shall be 1/C, bare, stranded, soft drawn, tinned-copper unless otherwise specified herein. Grounding electrode conductors shall be per ASTM B 8 for stranded conductors and ASTM B 33 for tinned conductors.

e) All grounding hardware, except ground busses and conductors, must be stainless steel or galvanized rigid steel. (See installation requirements pertaining to dissimilar metals.)

f) Groundings bushings shall be malleable iron, threaded, with insulated liner and solderless lug.

g) Unless otherwise noted, bus bars must be solid annealed copper and be equipped with insulating mounting supports. Bus bars must be pre-drilled with holes suitably sized for terminating up to No. 2/0 AWG grounding conductors with two-hole lugs.

h) Copper or copper-clad ground rods shall not be used in soils where organic acids are present unless protective measures are taken, such as encasing the ground rods in a grounding enhancement material.

i) Grounding Enhancement Material (GEM) shall absorb water from surrounding soil and have hydrogen and water retention properties. The suggested grounding electrode encasement (backfill) material shall be a mixture of 75% gypsum, 20% bentonite clay and 5% sodium sulfate.

GENERAL GROUNDING INSTALLATION REQUIREMENTS

a) An ITS Element site shall include but is not limited to a Dynamic Message Signs (DMS) (any type), a DMS Control Cabinet, electrical work for a DMS (any type), an overhead sign structure, a Closed Circuit Television (CCTV) camera (pole mounted, tower mounted, or otherwise), Microwave Vehicle Detector System (MVDS), Sensys System, Roadway Weather Information System (RWIS), Weigh In Motion (WIM) system, ITS Pole Mounted Enclosure, and Solar Powered Generator Assembly.

b) The ITS Element site grounding electrode system shall be provided at all ITS Element site locations as indicated in the Plans.

c) A bonding jumper between the neutral and grounding bus bars shall be installed at the electrical service entrance panel or enclosure ONLY unless a separately derived system is identified as defined by the National Electric Code (NEC). For example, if a transformer is utilized (unless it is an autotransformer) there exists no direct electrical connection between the primary and secondary sides. In this case, a bonding jumper between the neutral and grounding bus bars on the secondary side would be required.

d) All metallic members either attached to the ITS Element supporting structure and those which comprise the supporting structure shall be bonded together by means of copper bonding jumpers as specified herein to create a continuous low impedance path to the ITS Element site grounding electrode system.

e) All metallic housings with energized components or metallic structures which may become energized under fault conditions shall be bonded to the ITS Element site grounding electrode system.

f) All grounded metal objects within 25 feet of a component of the ITS Element site must be tied into the ITS Element site grounding electrode system using approved grounding electrode conductors, bonding conductors and connection methods as described herein and/or shown in the Plans, or as directed by the Engineer.

g) All equipment bonds must be made to bare metal surfaces as specified herein.

h) All ground rods shall include a ground test well (access well) to allow inspection of connections to the ground rod with exception of any ground rods which are installed beneath roadway shoulder pavement.

i) Exothermic welded joints on galvanized material shall be coated as specified herein to prevent corrosion.

j) Copper/Aluminum joints shall be avoided wherever possible. In cases where this cannot be avoided, the connections shall be as specified herein.

k) Bare copper shall not come in contact with galvanized steel. However, a connection of copper and stainless steel, and a connection of tinned copper and galvanized steel are acceptable.

l) There shall be no coils of power cables internal to any enclosure containing electronic equipment.

m) Contractor shall provide all necessary materials and labor even if not shown specifically on the Plans or specified herein to provide an ITS Element site grounding system in accordance with NEC and Motorola R56 requirements.

ITS ELEMENT SITE COMPONENTS

a) Grounding/Bonding Conductors

1. To prevent arcing, all grounding/bonding conductors shall be as short, straight, and with as few kinks as possible. A minimum bending radius of 8 inches shall be maintained. “U” shaped bonding jumpers may be utilized for the bonding of doors and gates only.

2. A UL listed, lightning protection T-splice is an acceptable means of installing grounding/bonding conductors with 90 degree angles provided it can withstand a 200 pound pull test. The T-splice must be listed for use with a 1/C No. 2/0 AWG conductor.

3. All bare copper conductors must be tinned. All copper used for lightning protection or equipment bonding must have 95% conductivity when annealed. See Article 1066.02(a) of the Standard Specifications for additional requirements.

4. Care shall be exercised during the installation of tinned conductors to ensure surfaces are not damaged. Any tinned conductors damaged during installation shall be replaced at no additional cost to the Illinois Tollway.

5. Any above grade grounding/bonding conductor which is not in conduit shall be supported by a UL listed connector a minimum of every 3 feet.

6. If grounding/bonding conductors are routed in a continuous run of metallic conduit, the conduit system shall be provided with properly installed grounding bushings. Both ends of a metallic conduit containing a grounding conductor must be bonded with a listed grounding bushing.

b) Equipment Grounding Conductor

1. In all cases, equipment grounding conductors originating at the electrical service entrance shall be provided. This equipment grounding conductor shall be bonded to the service reference ground system. The equipment grounding conductor shall be a 1/C copper sized as shown on the plans but at a minimum shall meet the requirements of the NEC Table 250.122.D.

2. Power conductors routed between structures must include an equipment grounding conductor as shown on the plans. This equipment grounding conductor shall be bonded to the site ground by means of direct copper connection to either a grounding bus bar or to the grounding electrode conductor.

3. If conductors are routed in a continuous run of metallic conduit, an equipment grounding conductor shall be provided and the conduit system shall be provided with properly installed grounding bushings. Both ends of a metallic conduit containing a grounding conductor must be bonded with a listed grounding bushing.

c) Bonding Jumper

1. All bonding jumpers shall be 1/C No. 2/0 AWG tinned copper minimum or as required by the NEC Article 250 and as specified herein.

2. At the electrical service entrance, a bonding jumper shall be provided between the neutral and grounding bus bar.

3. At any separately derived system as defined by the NEC, a bonding jumper shall be provided between the neutral and grounding bus bars of the separately derived system. The grounding bus bar of the separately derived system shall also be connected to the overall system ground by direct copper conductor connection.

4. A bonding jumper shall be provided for all metallic enclosures containing electrical conductors or components including but not limited to service entrance panels,

disconnect switches, and junction boxes. Any metallic lids and/or doors of said enclosures shall also be bonded by means of a bonding jumper between the main enclosure and the lid and/or door. This bonding jumper shall not impede the function of opening the door or removing the lid for service.

5. When an ITS element is mounted to a metallic structure , all metallic members either attached to the structure and those which comprise the structure shall be bonded together as shown on the plans to create a continuous low impedance path to the ITS element site grounding electrode system. All conductors for the bonding of metallic members either attached to the structure and/or those which comprise the structure shall be a stranded tinned-copper bonding jumper, minimum No. 2/0 AWG in size

d) Grounding Electrode Conductors

1. All grounding electrode conductors terminating on a ground rod shall be a 1/C, stranded, soft drawn, tinned-copper, minimum No. 2/0 AWG in size, or as specified in the Plans.

2. Grounding electrode conductors shall be installed without any splices.

3. All grounding electrode conductors must be individually run to a ground bus bar or ground rod. The only exception to this “no-daisy chaining” rule is when joining two ground rods together in order to obtain 5 ohms or less.

4. Grounding electrode conductors shall not be run through concrete structure foundations.

e) Ground Well

1. Ground well shall be Neenah Foundry model number R7506-E 10” or approved equal.

2. Each ground well shall have concrete surrounding the access well and shall be of Class SI with a rating of 4000 Pounds per square inch.

3. The stone shall be CA-6.

f) Grounding/Bonding Connections

1. All connectors shall be rated for both the intended use and the surface upon which it to be installed.

2. Grounding clamps and bushings, wherein specified, must be galvanized steel or a high copper content alloy. For applications involving Dynamic Message Signs (DMS), aluminum bonding plates attached with four screws shall be used in the grounding of the DMS aluminum chassis.

3. Insulation piercing connections shall not be used in the installation of conductor lugs. Only connection devices which require the complete removal of the conductor jacket

and which provide a complete connection between the inside of the lug and the outer circumference of the grounding wire shall be permissible.

4. A UL listed, irreversible, pressure-typed crimp connection shall be used to connect a ground rod connected grounding conductor to an internal grounding bus bar. All other internal connections to a bus bar by conductors larger than No. 6 AWG must be made by two-hole lugs.

5. No more than one connection shall be made at each bus bar position unless the connector is listed for multiple conductors.

6. All external and underground connections shall be by exothermic welding.

7. Exothermically welded connections to metal surfaces must be completed with a weld area roughly twice the diameter of the conductor. The area of the connection must first be sanded or filled to expose the bare metal prior to the exothermic weld being performed.

8. Exothermically welded connections to galvanized material shall be coated with a zinc-enriched paint to prevent corrosion.

9. Where copper/aluminum connections cannot be avoided, the connections shall be exothermically welded using an aluminum/copper listed bimetallic transition connector and a listed conductive anti-oxidant compound on all metallic connections.

10. For all mechanical connections, a listed conductive anti-oxidant compound shall be applied between the two metals.

g) <u>ITS Element Site Master Grounding Bus Bar (MGB):</u>

1. Each ITS Element shall have a Master Grounding Bus Bar (MGB) made of solid annealed copper installed in a specific location as shown in the Plans. For example, a pole mounted CCTV camera shall have the MGB attached to the pole below the enclosure. For applications involving DMS, the MGB shall be approximately 12 inches long, 4 inches tall, and ¼ inches thick, and shall be mounted in a NEMA 4X enclosure on the galvanized steel panel as shown on the Plans. The bus bar mounts shall provide electrical isolation from the steel panel.

2. The MGB hole pattern shall permit connecting two-hole lugs for up to No. 2/0 AWG grounding conductors.

3. The MGB shall be provided with a bare tinned-copper 1/C No. 2/0 AWG conductor which shall be connected via an exothermic weld to an ITS Element site ground triad/halo electrode system ground rod located below the MGB in a grounding well.

h) <u>ITS Element Site Grounding Electrode System:</u>

1. In the case when a DMS or any other ITS element is installed on an overhead sign structure (cantilever or span type), the overhead sign structure shall be provided with a site grounding electrode system to provide a single ground reference. This

grounding electrode system shall consist of ground rods installed in ground wells and oriented around the concrete foundation(s) of the overhead sign structure as shown on the Plans (grounding halo). The ground rods within the grounding halo(s) shall be connected to each other by a stranded continuous 1/C No. 2/0 AWG bare tinned-copper conductor. The grounding halo(s) shall also be bonded to the MGB as specified elsewhere herein.

2. Where a span type overhead sign structure is specified including concrete foundations, grounding halos shall be provided oriented around both concrete foundations as shown on the Plans. Where the distance between the two grounding halos is less than 200 feet, the grounding halos shall be bonded together at no less than two separate points on each by a stranded 1/C No. 2/0 AWG bare tinned-copper conductor installed a minimum of 30 inches below grade or at the frost line, whichever is deeper.

3. All ground rods shall be installed such that the top of the ground rod is accessible inside the ground well. All ground rods installed beneath a paved roadway shoulder (void of a ground access well) shall be installed such that the top of the ground rod is a minimum of 30 inches below grade or at the frost line, whichever is deeper.

4. Whenever possible, ground rods shall be installed a nominal distance of 1.1 times the length of a rod and a minimum of 36 inches from all foundations or other underground structures. In no case shall a ground rod be installed through a foundation or beneath travelled roadway pavement.

5. Whenever possible, the spacing between adjacent ground rods shall be 2 times the length of the ground rod and a minimum of 6 feet in any direction.

6. When the ITS Element site grounding electrode system as shown on the plans does not result in a resistance less than or equal to 5 ohms, the Contractor shall install additional ground rods and stranded continuous 1/C No. 2/0 AWG bare tinned-copper conductors in an expanding star-burst pattern until the resistance is brought down to acceptable levels. Typically the additional ground rods would be located further out from the MGB than the original equipment ground rods. However, it is permissible to install additional rods between the equipment and MGB as long as the required separation distances are maintained. Any additional ground rods and conductors as required bringing the resistance down to 5 ohms or less shall be included in this work.

7. No more than three grounding electrode conductors shall be connected to a single ground rod.

i) <u>Handholes:</u>

1. All handholes shall be provided with a ground rod extending up into the handhole cavity. The resistance to ground of this ground rod shall be 5 ohms or less.

2. Any handhole located adjacent to the ITS Element shall be equipped with a 12-inch x 4-inch x ¼-inch solid annealed copper grounding bus bar.

3. In all cases, power conductors routed between structures include an equipment grounding conductor as shown on the Plans. This equipment grounding conductor shall be bonded to the handhole ground rod or to the handhole grounding bus bar.

4. All metallic components of the handhole including but not limited to the frame, lid and any metallic conduits entering the cavity shall be bonded together and to the ground rod utilizing a 1/C braided tinned-copper bonding jumper, minimum No. 2/0 AWG in size.

5. A grounding bushing shall be used if the entire conduit run is metallic.

6. Neutral conductor(s) shall not be bonded to the handhole grounding bus bar or ground rod; neutral conductor(s) shall pass through the handhole non-spliced.

7. Cable with no metallic components (for example, a direct-burial, non-armored, fiber optic cable) need not be connected to the ground bar however, the metallic conduit sheath which it entered the handhole shall be connected to the ground bar.

8. Any handholes located within 200 feet of the ITS Element site grounding electrode system shall also be bonded to the ITS Element site electrode system by a stranded continuous 1/C No. 2/0 AWG bare tinned-copper conductor installed a minimum of 30 inches below grade or at the frost line, whichever is deeper.

9. All grounding/bonding connections within the handhole shall be by exothermic welds.

j) ITS Element Enclosure or Control Cabinet

1. The Contractor shall ensure that every ITS element Control Cabinet is grounded as described herein and on the Plans.

2. For ITS applications involving dynamic message signs, both the DMS control cabinet and the DMS structure shall be provided with a site grounding electrode system. These grounding electrode systems shall consist of ground rods oriented in a triad/halo next to the concrete foundations of the DMS controller cabinet and the DMS structure as shown on the plans. The ground rods within the grounding triad/halo shall be connected to each other by a stranded continuous 1/C No. 2/0 AWG bare tinned-copper conductor.

3. Grounding/bonding of the equipment inside the DMS enclosure shall be similar to the grounding of the DMS Control Cabinet as applicable to the equipment installed. The equipment grounding conductor originating from the electrical service entrance of the DMS system shall be routed to within this enclosure. This conductor shall be bonded to an internal insulated grounding bus bar similar to that of the DMS Controller Cabinet specified elsewhere herein. This equipment grounding conductor shall also be bonded to the MGB specified elsewhere herein. This conductor routed between the MGB and the DMS Enclosure grounding bus bar shall be a stranded continuous 1/C No. 2/0 AWG bare tinned-copper conductor installed on the structure to the MGB.

4. The DMS enclosure shall be equipped with at least one internal grounding lug that is installed by the manufacturer. The Contractor shall connect any internal grounding lug(s) to the grounding bus bar.

5. Any non-welded conductive part of the DMS enclosure shall also be bonded together utilizing 1/C braided bare tinned-copper bonding jumpers, minimum No. 2/0 AWG in size. Portions of the enclosure which are welded together do not require a bonding jumper. U-bolt connections or metal to metal contact do not offer a sufficiently conductive path and so must be equipped with bonding jumper. Connections through a painted DMS enclosure surface shall not offer a sufficient conductive path and shall be equipped with a bonding plate for connection to the bonding jumper. See General Grounding Installation Requirements section for discussion on bonding the dissimilar metals of the steel DMS truss and the aluminum DMS enclosure.

6. Where the distance between the DMS controller cabinet and the DMS site grounding electrode system is less than 200 feet, the DMS controller site grounding electrode system shall be bonded to the DMS site grounding electrode system at no less than two separate points on each by a stranded continuous 1/C No. 2/0 AWG bare tinned-copper conductor installed a minimum of 30 inches below grade or at the frost line, whichever is deeper.

7. All ITS equipment grounds inside the ITS element cabinet shall be connected to a copper bus bar which shall then be connected to the ITS element site grounding electrode system by means of a stranded bare tinned-copper 1/C No. 2/0 AWG conductor routed to each ground rod comprising ITS element site grounding electrode system.

8. The copper bus bar shall be mounted such that it is insulated from all metallic items, including the cabinet chassis itself, except by equipment grounding jumpers.

k) Testing

The Contractor shall use the test plans within this special provision to conduct the following tests per ITS Element grounding site in the presence of the Engineer, in accordance with the test requirements identified and found on the ITS Site Grounding Acceptance Test Form included herein.

1. All testing shall be conducted in the presence of the Engineer after a minimum 48 hour notification period. All test results, including those where the design criteria was not achieved, shall be documented. All retests shall be witnessed by the Engineer and documented by the Contractor (via the WBPM system).

2. As stated above, the installed grounding system at ITS Element sites shall be tested by the Contractor to confirm that there is a maximum 5 ohms resistance to ground within the grounding system. Proper grounding of AC power disconnect shall be verified by the use of a clamp-on ohmmeter. Testing of resistance to ground from the chassis of electronic equipment is not recommended due to the potential to damage of the electronics; however, the Contractor shall be required to test resistance to ground from each bus bar after all chassis grounds have been disconnected and taped to avoid accidental contact during testing.

3. Three-Point Fall-of-Potential. The site grounding electrode systems shall be tested using the three-point fall-of-potential method as detailed in ANSI/IEEE STD 81, BS 7430, NFPA 7800-2004, and MIL-HDBK-419A. Test results must be documented and submitted to the Engineer via the WBPM system.

METHOD OF MEASUREMENT

This work will be measured for payment in units of each ITS element site for all ITS Element Grounding as required herein and shown on the plans. Each ITS Element type listed below shall be considered a unit of 1 each per type of site. Adjacent sites shall be measured separately. Co-located devices on a single pole mounted site shall be considered a single site.

- ITS Element Pole Mounted assembly
- Solar Powered Generator assembly
- ITS Monopole CCTV Tower assembly
- Weigh-in-Motion/Virtual Weigh-in-Motion system
- Static Flashing Sign Beacon assembly

Grounding for Dynamic Message Sign and Controller Cabinet will not be measured for payment.

BASIS OF PAYMENT

This work will be paid for at the contract unit price per each for ITS ELEMENT SITE GROUNDING, of the assembly or system specified. Grounding for Dynamic Message Sign and Controller Cabinet shall be included in DMS ELECTRICAL WORK of the Type specified.

The payment to the Contractor will adhere to the following schedule:

Ten percent (10%) of the contract unit price will be paid upon receipt of submission and approval of all system documentation (product submittals and checklist, shop drawings).

Eighty percent (80%) of the contract unit price will be paid upon completion of the installation of the ITS ELEMENT SITE GROUNDING.

Ten percent (10%) of the contract unit price will be paid upon receipt of submission and approval of final documentation (as-builts and testing).

The installation and testing of the ITS Pole Mounted Enclosure (CCTV or MVDS), ITS device pole, foundation, electrical service, grounding, MVDS ITS Assembly, and communications shall be paid separately.

Pay Item Number	Designation	Unit of Measure
JT134039	ITS ELEMENT SITE GROUNDING – SOLAR POWERED GENERATOR ASSEMBLY	EACH
JT134041	ITS ELEMENT SITE GROUNDING – ITS MONOPOLE CCTV TOWER ASSEMBLY	EACH

ITS ELEMENT SITE GROUNDING (TOLLWAY)

Revision: 1/14/15

PAY ITEM #
Contract #
e-Builder Submittal Package #:
e-Builder Submittal Date:
Reviewed By (CM Staff Name):
Review Date:

SUBMITTAL STATUS
APPROVED ☐
APPROVED AS NOTED ☐
REJECTED ☐

LOCATION OF REFERENCE	DETAIL SHEET ITEM	ITEM DESCRIPTION	APPROVED MANUFACTURER	APPROVED MODEL No.	SUBMITTED AS SPECIFIED?	PROPOSED EQUIVALENT DETAILS		
						MANUFACTURER	MODEL No.	NOTES
ITS ELEMENT SITE GROUNDING SYSTEM								
SPEC. PROV.		GROUNDING CLAMPS & BUSHINGS						
SPEC. PROV.		MASTER GROUND BUS BAR (MGB)						
SPEC. PROV.		GROUND INSPECTION/TEST WELL	NEENAH	R-7506-E				
SPEC. PROV.		**#2 AWG STRANDED BARE TINNED COPPER GROUND CABLE**						
SPEC. PROV.		2/0 AWG STRANDED BARE TINNED COPPER GROUND CABLE						
SPEC. PROV.		2/0 AWG BRAIDED TINNED COPPER BONDING JUMPER (*if required*)						
SPEC. PROV.		GROUND RODS (PER TOLLWAY SUPP SPEC SEC 806)	5/8" DIA. X 10' LONG					
SPEC. PROV.		GROUNDING HARDWARE						
SPEC. PROV.		GROUND ENHANCEMENT MATERIAL (*if required*)						
SPEC. PROV.		BUS BARS,CONNECTORS, LUGS, W/ BARRIER SHIELD						
SPEC. PROV.		UL LISTED T-SPLICE (*if required*)						
SPEC. PROV.		CONDUIT						
SPEC. PROV.		CABLE MOUNTING CONNECTIONS						

ITS Site Grounding Acceptance Test Form

4. INTRODUCTION

Site Acceptance Testing of the ITS Site Grounding verifies that the soil conditions and grounding elements achieve the required resistance to ground to properly ground ITS elements at each device site. This document provides the Site Acceptance Test procedure for ITS Site Grounding and shall be used in addition to other Site Acceptance Tests required for the installation of ITS devices.

5. PROCEDURE

Test soil conditions to determine if additional grounding measures are required. Grounding tests shall measure the resistance to ground for ITS sites by 3-point/fall of potential method to determine if site is properly grounded. Grounding test shall be made prior to connecting/bonding external grounding with ITS equipment/control cabinets to prevent damage to equipment. The grounding shall be retested if results indicate additional ground measures are required.

ITS Site Grounding Acceptance Test Form

Project Number and Name: _____

Route (Circle One): I-88 / I-90 / I-94 / I-294 / IL-355

Mile Post: _____ Direction (Circle One): NB / SB / EB / WB / Median

Date / Time: _____ Camera Type: _____

Soil Analysis:

Test Element	Test Value	Additional Measures Required?	Comment
Acidity (pH > 5)		☐ Yes ☐ No	
Porosity (aeration)?	☐ Poor ☐ Well	☐ Yes ☐ No	
Organic Acids?	☐ Present ☐ None	☐ Yes ☐ No	

Grounding enhancement materials required? ☐ Yes ☐ No

Grounding Test (3-point/Fall of Potential):

Test Element	Test Value	Additional Measures Required?	Comment
Resistance to Ground (≤ 5 ohms)		☐ Yes ☐ No	

Additional ground rods required (record retest below)? ☐ Yes ☐ No

Test Element	Retest Value	Additional Measures Required?	Comment
Resistance to Ground (≤ 5 ohms)		☐ Yes ☐ No	

Additional Comments: _____

Test Conducted By: _____ **Date:** _____

Engineer*: _____ **Date:** _____

*** The Site Test shall not be official until the Engineer signs and dates this sheet. The Illinois Tollway will not accept any form that is not signed by both the Test Conductor and the Engineer.**

REMOVE MICROWAVE VEHICLE DETECTION ASSEMBLY (Illinois Tollway)
Effective: March 1, 2018

Description. This work shall consist of removal of a microwave vehicle detection system (MVDS) assembly from an ITS pole at locations shown in the Plans.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate with the Engineer. This includes, but is not limited to, the following:

EQUIPMENT REMOVAL

The Contractor shall remove the MVDS sensor, mounting hardware, conduit LB's, and associated cabling at locations as shown in the Plans. Any openings that will not be reused shall be sealed with a material, approved by the Engineer, which prevents entry by water or animals. A 1½ inch PVC coated galvanized steel conduit LB shall be reinstalled after removal of the existing LB.

DELIVERY TO THE ILLINOIS TOLLWAY

The Contractor shall deliver the MVDS assembly to the Illinois Tollway at the M-4 Maintenance Facility located at I-94 M.P. 8.3, Gurnee, IL 60031. All MVDS shall be logged by inventory (M tag) number via the Illinois Tollway's A-14 inventory form and then delivered and unloaded at the M-4 building.

Any mounting hardware removed from the site shall be disposed of by the Contractor in accordance with Article 202.03 of the Standard Specifications.

Method of Measurement. This work will be measured in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE MICROWAVE VEHICLE DETECTION ASSEMBLY.

Pay Item Number	Designation	Unit of Measure
JT135006	REMOVE MICROWAVE VEHICLE DETECTION ASSEMBLY	EACH

REMOVE CCTV CAMERA

Description. This work shall consist of removal of an ITS CCTV camera assembly from an ITS pole, radio tower, or sign structure at locations shown in the Plans.

CONSTRUCTION REQUIREMENTS

The Contractor shall closely coordinate with the Engineer. This includes, but is not limited to, the following:

Equipment Removal
The Contractor shall remove the ITS CCTV camera assembly, video encoder, and associated cabling at locations as shown in the Plans. Existing mounting hardware for cameras on radio towers and sign structures shall be reused. Mounting arms, brackets, conduit LB's, and other hardware used to attach cameras to poles shall be removed. Any openings that will not be reused shall be sealed with a material, approved by the Engineer, which prevents entry by water or animals. A 1½ inch PVC coated galvanized steel conduit LB shall be reinstalled after removal of the existing LB.

Delivery to the Illinois Tollway
The Contractor shall deliver the CCTV camera assembly and encoder to the Illinois Tollway at the M-4 Maintenance Facility located at I-94 M.P. 8.3, Gurnee, IL 60031. All CCTV cameras shall be logged by inventory (M tag) number via the Illinois Tollway's A-14 inventory form and then delivered and unloaded at the M-4 building.
Any mounting hardware removed from the site shall be disposed of by the Contractor in accordance with Article 202.03 of the Standard Specifications.

Method of Measurement. This work will be measured in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE CCTV CAMERA, POLE MOUNTED or REMOVE CCTV CAMERA, STRUCTURE MOUNTED.

Pay Item Number	Designation	Unit of Measure
JT135098	REMOVE CCTV CAMERA, STRUCTURE MOUNTED	EACH

CONTRACT ALLOWANCES (Illinois Tollway)

Effective: March 16, 2007
Revised: April 1, 2016

Description of Contingent Items. This work shall consist of various items of Work which may be required to be done by the Contractor, the scope of which cannot be determined at the time of submittal of the Proposal. This item will provide a line item against which payment may be made for:

JT154001 Pavement patching and traffic control in lanes being used by traffic in a construction zone. Article 701.04 (e) of the Illinois Tollway Supplemental Specifications.

JT154002 Disposal of previously unidentified hazardous waste. Article 107.19 (a) of the Illinois Tollway Supplemental Specifications.

JT154003 Additional Elastomeric Bearing Pads when required for testing. Article 521.09 of the Standard Specifications.

JT154004 Sawcutting and removal of edge deterioration repair prior to pavement widening. Illinois Tollway Standard Drawing A1

JT154005 Emergency Pavement and Shoulder Maintenance Repairs, including delaminated and/or rutted pavement overlays within the contract limits, and along the designated detour routes.

JT154008 Maintenance of traffic due to unforeseen circumstances, including additional signage, as deemed necessary by the Engineer.

JT154009 Temporary signal installation and Maintenance.

GENERAL REQUIREMENTS

Work shall be done under this item as directed by the Engineer.

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

Basis of Payment. Payment for this work will be made as specified in Article 109.04 of the Illinois Tollway Supplemental Specifications using a force account basis. Payment for this work will not exceed the costs incurred by the Contractor and approved by the Engineer.

Pay Item Number	Designation	Unit of Measure
JT154002	DISPOSAL OF UNIDENTIFIED HAZARDOUS WASTE	UNIT
JT154008	UNFORESEEN ADDITIONAL MAINTENANCE OF TRAFFIC	UNIT

ALLOWANCE FOR UNFORESEEN DRAINAGE WORK

Description. This work shall consist of various drainage related items of work which may be required to be done by the Contractor, the scope of which cannot be determined at the time of submittal of the Proposal. This item will provide a line item against which payment may be made for drainage work due to unforeseen circumstances

General Requirements. Work shall be done under this item as directed by the Engineer.

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

Basis of Payment. Payment for this work shall be made as specified in Tollway Supplemental Specifications Article 109.04 using a force account basis. Payment for this work shall not exceed the costs incurred by the Contractor and approved by the Engineer.

Pay Item Number	Designation	Unit of Measure
JT154015	ALLOWANCE FOR UNFORESEEN DRAINAGE WORK	UNIT

ALLOWANCE FOR ROADWAY LIGHTING REPAIRS

Description. This Special Provision establishes a budgetary allowance for additional light pole repairs that may be required at existing and/or relocated light poles within the project limits, as directed by the Engineer.

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

Basis of Payment. Payment for this work will be made as specified in Tollway Supplemental Specifications Article 109.04 using a force account basis. Payment for this work will not exceed the costs incurred by the Contractor and approved by the Engineer.

Pay Item Number	Description	Unit of Measure
JT154145	ALLOWANCE FOR ROADWAY LIGHTING REPAIRS	UNIT

CONTRACTOR'S QUALITY PROGRAM (Illinois Tollway)

Effective: May 1, 2007
Revised: April 1, 2016

Description. This work shall consist of the Contractor establishing, implementing, and maintaining an effective Quality Program in accordance with the Illinois Tollway Contractor's Quality Program Manual.

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

Basis of payment. This work will be paid for at the contract lump sum price for CONTRACTOR'S QUALITY PROGRAM (CQP), which payment shall constitute full compensation for all labor, bonds, insurance, taxes, materials, equipment, sublet work, and incidentals required to develop, maintain, perform and as necessary modify an acceptable CQP, with the exception of the work described below.

The work for CONTRACTOR'S QUALITY PROGRAM (CQP) that involves quality control activities at a fabrication and/or material production facility is not to be paid under this pay item. This includes but is not limited to activities at fabrication and/or production facilities for steel, precast concrete, Portland Cement Concrete, and hot-mix asphalt. Field (that is, job-site) quality control activities for materials fabricated and/or produced off-site including but not limited to Portland Cement Concrete and Hot –Mix or Warm –Mix Asphalt are to be included for payment under this pay item. For Portland Cement Concrete, field activities include job-site testing such as air content, slump, and temperature. For Hot-Mix Asphalt, field activities include nuclear density testing, coring, and the subsequent density testing of cores. Not included as a field activity for hot-mix asphalt is any work involved with test strips, which is paid for under a separate pay item.

Payment will be made based on the percent complete of the original Contract amount.

Pay Item Number	Designation	Unit of Measure
JT155001	CONTRACTOR QUALITY PROGRAM	L SUM

QC/QA OF CONCRETE MIXTURES (Illinois Tollway)

Effective: September 15, 2014

Description. This work shall consist of providing quality control/quality assurance for concrete mixtures.

CONSTRUCTION REQUIREMENTS

Concrete mixtures shall be tested and evaluated using the Illinois DOT Recurring Special Provision for Quality Control/Quality Assurance for Concrete Mixtures, except as revised herein.

Compressive strength, as measured using Illinois Modified AASHTO T22, shall be determined using only 6-inch diameter by 12-inch long cylinders for mixtures having a maximum aggregate size equal to or greater than ¾-inches.

ARTICULATED CONCRETE BLOCK REVETMENT SYSTEM

Description. This work consists of furnishing and installing an articulated concrete block revetment system at the lines, grades, and locations shown on the plans. This work shall be performed in accordance with the applicable portions of Section 285 of the Standard Specifications, as modified herein.

Materials. Articulated concrete block revetment mat shall consist of open concrete blocks interconnected with flexible polyester cable to provide articulation and flexibility between adjacent blocks. The revetment system shall be Armorflex™, Class 30S Open Cell, or approved equivalent. Filter fabric and revetment anchors shall be as specified by the manufacturer.

The Contractor shall furnish acceptable evidence of inspection for all materials used with this item. Certifications from the manufacturer shall accompany all shipments of material to the project site. Submittal of certifications and/or evidence of inspection shall be necessary before payment is made for this item.

General Requirements. All work shall be performed in accordance with the recommendations of the revetment system manufacturer. A representative of the revetment system manufacturer shall be present during all phases of construction, including preparation of the subgrade under the revetment system and installation of the filter fabric.
Prior to beginning construction of this item, the Contractor shall submit to the Engineer a written plan for revetment system construction, which addresses the following:

1. Site preparation
2. Details of filter fabric and concrete revetment blocks
3. Types and locations of revetment system anchors
4. Filter fabric and revetment system installation details
5. Methods for maintaining drainage and providing erosion control at the work site, and
6. Schedule of activities where the presence of manufacturer's representative is required.

The plan shall indicate its acceptance by the manufacturer's representative. No work shall begin until the plan has been reviewed and deemed acceptable by the Engineer. Once accepted, changes to the plan must be submitted in writing to the Engineer for acceptance.

Prior to placing the concrete revetment system, the underlying area shall be graded, shaped and suitably compacted to the required template. All work shall be in accordance with the recommendations of the manufacturer's representative, and to the satisfaction of the Engineer. After the subgrade has been prepared, the filter fabric shall be placed in accordance with the manufacturer's recommendations.

The articulated concrete revetment mat system shall be installed in accordance with the accepted written plan for construction, and to the lines and grades shown on the Plans. If recommended by the revetment manufacturer, revetment mat anchors, of the type and size recommended by the manufacturer's representative, shall be furnished and installed at locations determined by the representative.

Excavation and backfilling required for the placement of revetment mat anchors, as well as burying the ends of the revetment system, shall be performed per the recommendations of the revetment manufacturer, and to the satisfaction of the Engineer.

Seams over two (2) inches wide between mats and joints, created where openings in the mats are required to accommodate passage of pipes, headwalls, inlets, manholes or other facilities, shall be filled completely with a suitable colloidal permeable concrete grout, as recommended by the manufacturer and to the satisfaction of the Engineer. The size of the joint between concrete revetment mats and the above-noted facilities shall be held to a minimum. Additional open-cell concrete blocks shall be used, as recommended by the revetment manufacturer, to reduce the size of the opening between the mat and the facility to be accommodated.

The revetment system shall be backfilled with topsoil and promptly seeded and fertilized per the pavement marking and erosion control plans, in order to establish vegetation in the open cells of the revetment mat.

Method of Measurement. This work will be measured in place, and the area computed in square yards. The area of measurement will include the upper surface of the finished mat. The end portions of the mat, which may be buried to anchor the mat, will also be measured unless it is determined by the Engineer that they extend beyond the intended limits of the revetment system.

Earthwork required to bring the general area of the concrete revetment to the proposed lines and grades shown on the Plans will be measured for payment as established in the contract for EARTH EXCAVATION. Earthwork required to inlay the concrete revetment mats will be considered included in the cost of ARTICULATED CONCRETE BLOCK REVETMENT SYSTEM.

Topsoil excavation and placement will be measured for payment as established in the contract for TOPSOIL EXCAVATION AND PLACEMENT. Seeding, fertilizing and related items will be measured for payment as established in the contract for these respective pay items.

Basis of Payment. This work will be paid at the contract unit price per square yard for ARTICULATED CONCRETE BLOCK REVETMENT SYSTEM, which payment shall constitute full compensation for inlay excavation and backfill (excluding topsoil), preparation of subgrade, filter fabric, concrete block revetment mat, mat anchors (if required), and grout, and for all labor, equipment, tools and incidentals necessary to complete the work as specified.

Pay Item Number	Designation	Unit of Measure
JT285050	ARTICULATED CONCRETE BLOCK REVETMENT SYSTEM	SQ YD

AGGREGATE FOR BASE COURSE RESTORATION, SPECIAL (Illinois Tollway)

Effective: November 16, 2012
Revised: April 1, 2016

Description. This work shall consist of furnishing, placing, and compacting aggregate materials for the replacement of existing granular subbase or stabilized subbase materials as required under the provisions of the special provision for Precast Replacement of Concrete Pavement Slabs, all as directed by the Engineer.

The removal and replacement of concrete pavement materials are not part of this item of work.

Materials. All materials shall conform to the requirements of Section 1004 of the Standard Specifications. Grading shall be CA-10.

Equipment. Equipment used for placing and compacting aggregate for base course restoration shall conform to the requirements of Section 1101 of the Standard Specifications, shall be adequate to place and compact the material as specified, and shall be subject to the approval of the Engineer.

CONSTRUCTION REQUIREMENTS

The placement and compaction of aggregate for base course adjustment or restoration shall be in accordance with Article 311.05(a) of the Standard Specifications except as modified herein.

Revise the second paragraph of Article 311.05(a) of the Standard Specifications to read:

"The aggregate shall be placed and compacted in lifts with a minimum thickness of 2 inches when compacted."

Add the following paragraph to Article 311.05(a) of the Standard Specifications:

"Aggregate containing free water at the time of delivery will be rejected by the Engineer and shall not be incorporated in the work."

Method of Measurement. This work will be measured by weight in tons delivered in trucks to the site of the work. Truck weight measurements and scales (whether furnished by the Contractor or commercial) shall be in accordance with the applicable provisions of Article 109.01 of the Illinois Tollway Supplemental Specifications. No deductions will be made for moisture in the aggregate at the time of weighing.

Basis of Payment. This work will be paid at the Contract unit price for AGGREGATE FOR BASE COURSE RESTORATION, SPECIAL measured as specified.

Pay Item Number	Designation	Unit of Measure
JT415010	AGGREGATE FOR BASE COURSE RESTORATION, SPECIAL	TON

PRECAST CONCRETE PAVEMENT SLAB SYSTEMS (Illinois Tollway)

Effective: March 30, 2009
Revised: July 19, 2017

DESCRIPTION

This work shall consist of fabricating, transporting, and constructing precast concrete pavement slabs systems as specified herein for either jointed plain or continuously reinforced concrete pavements. The precast concrete pavement slab system shall be the Illinois Tollway's generic system or an alternate system approved by the Illinois Tollway.

SYSTEM APPROVAL

An alternate precast concrete pavement slab system designer for jointed plain pavement repairs shall submit the following information to the Illinois Tollway for review. After the Illinois Tollway reviews the submitted information, the system designer shall be required to perform a trial installation as detailed herein.

A. Fabricator Standard Drawings. Section 504 of the Standard Specifications shall apply. Include the following details:

- Transverse joint support type, locations, spacing, and the mechanism used to transfer loads across transverse joints after slabs are placed.
- Longitudinal joint tie type, locations, spacing and the mechanism used to tie adjacent slabs together.
- Lifting insert type, location, positioning, and capping or backfill method.
- Grout port type, location, positioning, and capping or backfill method.
- Exterior forms during fabrication shall be steel. Side forms shall have form plates of sufficient thickness, shall be sufficiently braced, and shall be anchored, so as to withstand the forces due to vibratory placement of the concrete and to maintain correct alignment. The ends or sides of adjacent sections of form, which are butt joined, shall match smoothly and tightly and shall result in proper alignment. The side forms shall be cross tied above the finished surface of the member at sufficiently close spacing to maintain true cross sectional dimensions.
- Maximum dimensional tolerances are ± ¼" depth and ± ½" length and/or width. It is intended that the dimensions of all members shall be well within these tolerances and that the maximum values shall be permitted to be approached or equaled only occasionally.
- Reinforcement bars shall be rigidly fastened together by wire ties, and extra tie bars shall be furnished as may be necessary for maintaining satisfactory rigidity during handling and placing. Spot welding will be permitted where approved by the Engineer. Sufficient thermoplastic or wire chairs shall be furnished for supporting the reinforcement at the proper distance from horizontal surfaces. Wire chairs may also be used as spacers to hold reinforcement at the proper distance from vertical surfaces. The concrete cover over all reinforcements shall be within plus or minus ¼ inch of the specified cover. All metal chairs and miscellaneous metal left in the concrete shall be hot dip galvanized to at least 1 ½ inches from concrete surfaces.

- Miscellaneous accessories to be cast into the concrete or for forming holes or recesses shall be carefully located and rigidly held in place by bolts, clamps, or other effective means.

B. Installation Instructions. Twenty-one (21) days prior to constructing and erecting precast concrete pavement slabs, the Contractor shall submit detailed installation working drawings to the Engineer for approval in accordance with Article 105.04 of the Illinois Tollway Supplemental Specifications, except as may be otherwise specified herein. Erection drawings shall be prepared and signed by a Structural Engineer licensed in the State of Illinois. It is specifically understood that the approval of the Engineer shall not be considered as relieving the Contractor of either responsibility for the safety method and equipment, or responsibility from carrying out the work in full accordance with the Plans and Specifications.

Provide installation instructions, including any special equipment and materials to address the following:

1. Removal and Subbase Preparation. Specific procedures for sawcutting and removal if needed and instructions for any recommended subbase preparation.

2. Slab Installation. Instructions, methods, and equipment for lifting, moving, protecting, lowering, and adjusting the slabs into position.

3. Bed and Level Slabs. Instructions to ensure slabs are fully supported by underlying layers at the correct line, grade, and cross slope while meeting contract smoothness requirements. Slabs may be either:

    - Placed on a precisely graded bedding layer and grouted in-place to fill any small, isolated voids between the slabs and bedding layer (grade-supported).
    - Placed at final position on flowable fill material, or placed or held near final position and jacked into place (grout-supported).
    - Placed by other methods approved by the Illinois Tollway Materials Manager.

    For grade-supported slabs, include all pertinent bedding and leveling instructions, including:

    - Bedding material composition and gradation.
    - Bedding grout mix design and anticipated strength gain. Bedding grouts shall develop a minimum compressive strength of 500 psi in 1 hour.
    - Method used to place the bedding material and grout beneath the slab.
    - Method used to ensure complete bedding when placed.

    For grout-supported slabs, include all pertinent bedding and leveling instructions, including:

    - Material properties, composition, mix design, and anticipated strength gain of any slab-jacking or flowable fill material.
    - Method used to place the flowable fill before slab installation or place the slab-jacking material beneath the slab after installation.
    - Method used to ensure complete slab contact with jacking material when placed.

4. Backfilling Pavement Hardware. Instructions to completely encase load transfer tie devices, longitudinal joint ties, lifting inserts, and grout ports. Include all pertinent information, including:

   • Material properties, composition, mix design, and anticipated strength gain of any backfill material that is not named in Backfill Material for Pavement Hardware, or, revised instructions for those materials if the manufacturer's instructions are not followed.

   • Method used to place backfill material.

   • Method used to ensure complete hardware encasement.

5. Joint Sealing. Instructions, methods, and equipment for filling all joints with hot poured sealant.

Subsequent to system approval, any change to approved installation instructions shall be submitted to, and approved by, the Engineer. The Engineer reserves the right to require additional trial installations if the changes are deemed significant.

C. Trial Installation. Perform a trial installation at a location agreeable to the Engineer. Ensure Illinois Tollway personnel are present. Place 4 (minimum) 12 foot x 12 foot slabs simulating 2 lanes of traffic. Provide a drill rig, with operator, capable of retrieving 4-inch mm diameter cores through any portion of the slab, and a technician capable of fabricating test specimens in accordance with AASHTO T106. As a minimum, the following will be evaluated:

1. Bedding Grout Properties and Completeness of Placement. Fabricate 24 cubes meeting AASHTO T106.

2. Leveling Material Properties and Completeness of Placement. Fabricate 24 cubes meeting AASHTO T106.

3. Backfill Material Properties and Completeness of Placement. If a material identified in this specification as Backfill Material for Pavement Hardware (under Material Requirements) is used in accordance with the manufacturer's written instructions, no further material testing is required. If a different material is used (or if a material is not used in accordance with the manufacturer's instructions), fabricate a sufficient amount of test specimens to determine the properties identified in Section C of the Backfill Material Requirements for either mortar or polymer materials as required by the manufacturer, when tested in accordance with AASHTO T106 or the referenced ASTM Standard.

4. Dimensions and Tolerances. Slabs shall conform to the Precast Fabricator Standard Drawings and be capable of being placed in an essentially true plane.

5. Instruction Completeness. Manufacturer's instructions shall accurately reflect the processes used in the trial installation.

6. Load Transfer Efficiency (LTE). The Illinois Tollway reserves the right to conduct falling weight deflectometer testing to determine LTE at the joints. Poor LTE (≤ 70 %) is cause for rejection.

Engineer approval of any alternate precast pavement system for repair or placement of continuously reinforced concrete pavements shall be based on historical data of the system that was placed within an unconfined continuously reinforced pavement and indicates no signs of distress after a minimum of one year of placement.

MATERIAL REQUIREMENTS

Section 504 of the Standard Specifications shall apply, except as noted herein.

A. Concrete. The concrete for the fabrication of precast concrete pavement slabs shall be a Class PC according to Section 1020 of the Standard Specifications, and shall have a minimum compressive strength of 4500 psi at 28 days.

B. Reinforcement. Article 1006.10 of the Standard Specifications shall apply. Reinforcement shall be epoxy coated. Provide 2-inch (minimum) concrete cover between the mat and the slab bottom. Fabricate mats using a size and spacing of steel (in both directions) that results in a steel area to cross-sectional area ratio of 0.002 (minimum). Maximum bar spacing is 18 inches.

   The manufacturer may provide additional reinforcement based on jobsite loading conditions. (A typical example is when slabs must be loaded before a bedding grout is placed.)

C. Backfill Material for Pavement Hardware. If the precast slab system requires a backfill material around pavement hardware or tie device, use DBR Retrofit Mortar, HD-50, Five Star Highway Patch or a two component urethane polymer system as recommended by the manufacturer, or an alternate material submitted as an approved equal. If the brands or material types named above are mixed in accordance with their manufacturer's written instruction, no further testing is required. If an alternate material is proposed for use, the material shall meet the Backfill Material Requirements listed below when tested in accordance with AASHTO T106 or the referenced ASTM Standard.

BACKFILL MATERIAL REQUIREMENTS FOR MORTARS		
Property	Minimum	Maximum
Compressive Strength, Opening to Traffic	2500 psi	-
Compressive Strength, 28 Day	4000 psi	-
Expansion	-	0.40 %
Contraction	-	0.05 %
Freeze - Thaw Loss (25 cycles at 10% NaCl)	-	1.0 %
Bond Strength (to dry PCC)	300 psi	-
Initial Set Time	15 minutes	-
Chloride Content	-	0.05 %
Sulfate Content	-	5.0 %

BACKFILL MATERIAL REQUIREMENTS FOR URETHANE POLYMERS		
Cured Property	Minimum	Maximum
Compressive Strength, (ASTM C-39)	3,282 psi	-
Hardness, Durometer D, (ASTM D-2240)	70	-
Specific Gravity, (ASTM D-792)	1.07	-
Tensile Strength, (ASTM D-412)	4,300 psi	-
Elongation at Break, (ASTM D-412)	-	10%
Tear Strength, (ASTM D-624)	275	-
Bond Strength to PCC	350 psi	500 psi

D. Undersealing Grout. For grade supported slabs, undersealing grout shall be used after slab installation to fill all voids beneath the precast panels. The mixture used for undersealing grout shall be a mixture of cement, water, admixture, and accelerator proportioned in accordance with ASTM C938 or a prepackaged grout complying with ASTM C1107. Fine aggregate, if used, shall meet grading two (2) in ASTM C637. Proportion the ingredients and mix the grout to meet the following properties:

1. Compressive strength as measured in accordance with ASTM C942 shall be no less than 500 psi at one (1) hours age and no less than 2,500 psi at 7 days age.

2. Expansion as measured in accordance with ASTM C940 shall be 0 to 3%.

3. Bleeding at 30 minutes age as measured in accordance with ASTM C940 shall be 0.1% maximum.

4. Eflux time as measured in accordance with ASTM C939 shall be 15 to 30 seconds.

5. For tests at 45°F, condition materials to 45°F for 24 hr. before fabrication and store specimens at 45°F until testing.

E. Flowable Fill Leveling Material. The flowable fill mix placed only on tangent sections before slab installation to level the precast concrete pavement slabs shall consist of Portland cement, fly ash, coarse and / or fine aggregates, water, air entraining admixture (optional), and any other admixture needed to control the initial and final set times of the mixture. The contractor shall submit the proposed mix design for flowable fill to the Engineer for Illinois Tollway approval prior to placement. Trial batches shall be required on any mix design that has not been previously approved. The flowable fill produced shall be in accordance with the following:

1. Portland cement shall be Type 1 cement in accordance with Section 1001 of the Standard Specifications.

2. Fly Ash shall be in accordance with Section 1010 of the Standard Specifications.

3. Fine aggregate shall be in accordance with Section 1003 of the Standard Specifications.

4. Coarse aggregate, if used, shall be in accordance with Section 1004 of the Standard Specifications with a maximum aggregate size of 12.5 mm.

5. If an air entrainment admixture is used, the air content of the flowable fill shall not exceed 35% of the flowable fill volume.

6. The compressive strength of the flowable fill mixture shall not be less than 50 psi at 3 days, nor less than 75 psi or greater than 150 psi at 28 days.

7. The final set time for each mix design shall be determined through trial batch sampling and test procedure ASTM C 403 performed on a trial batch specimen. Recorded final set times shall be no more than 1 1/2 hours after the batch time.

F. High Density Polyurethane Leveling/Support Material. For precast slabs supported and leveled by high-density foam placed after the slab installation, the high-density form shall be expanding polyurethane foam having a water insoluble diluent and shall be in accordance with the following:

Density	6.0 min.
Tensile Strength (psi) ASTM D 1623	100 min.
Elongation	5.1
Compressive Strength (psi) ASTM D 1621 (At Yield)	100 min.
Volume Change (% of original)	0

The manufacturer shall provide documentation that the lot(s) of foam meet the specified properties. Manufacturer's certification shall list lot number(s) and documentation of compliance with the specification.

G. Joint Sealer. Hot poured joint sealer shall be in accordance with Article 1050.02 of the Standard Specifications. Any proposed sealant product shall be approved in writing by the Engineer prior to the delivery to the work site.

H. Leveling Bolts. Leveling bolts, nuts, and washers shall be in accordance with Article 1006.09 of the Standard Specifications. Steel plates shall be in accordance with Article 1006.04 Grade 36 of the Standard Specifications. Steel plates, bolts, nuts, and washers shall be hot-dipped galvanized in accordance with AASHTO M 111.

I. Neoprene sheet. The elastomeric sheet shall be in accordance Article 1083.02(a) of the Standard Specifications.

J. Ultra High Performance Concrete. The fiber reinforced concrete that will be used to backfill all splice headers for CRC precast pavement slabs shall be in accordance with the Tollway special provision "Ultra High Performance Concrete Jointing of Precast Pavements".

DRAWINGS

Section 504 of the Standard Specifications shall apply, except as noted herein. Provide job-specific Fabricator Working Drawing(s), from the system designer, for each contract. Use these drawings, in conjunction with approved Precast Fabricator Standard Drawing(s), to manufacture the concrete pavement slabs. Copies of approved working drawings will be returned to the system designer. If the manufacturer is not the system designer, include the manufacturer's name, address, and telephone number on the drawings.

FABRICATION

Section 504 of the Standard Specifications shall apply, except as noted herein. Precast concrete pavement slabs can be produced by any IDOT Certified Precast Concrete Producer.

TEXTURE

Either an astro turf drag finish or a combination of the turf drag finish followed by a tined finish in accordance with Article 420.09(e)(1) of the Standard Specifications shall be applied to the top surface of the slab as required in the precast concrete pavement slab design schedule on the contract documents.

CURING
When membrane curing compound is the selected curing method and the slabs are exposed to sunlight while curing, use a white pigmented membrane curing compound from the Illinois Department of Transportation Approved List instead of a clear compound with fugitive dye.

SAMPLING AND TESTING
The Illinois Department of Transportation's Manual for Fabrication of Precast Prestressed Concrete Products as referenced in Section 504 of the Standard Specifications shall apply.

FINAL PRODUCTION INSPECTION
The Illinois Department of Transportation's Manual for Fabrication of Precast Prestressed Concrete Products as referenced in Section 504 of the Standard Specifications shall apply.

HANDLING, STORING AND TRANSPORTING
Section 504 of the Standard Specifications shall apply.

BASIS of ACCEPTANCE
Section 504 of the Standard Specifications shall apply in addition to the following:

- The system must be approved by the Illinois Tollway based on compliance with the special provision for Precast Concrete Pavement Slab Systems.
- Written approval from the system designer to use the approved system if the manufacturer is not the system designer.

PRECAST REPLACEMENT OF CONCRETE PAVEMENT SLABS (Illinois Tollway)

Effective: March 30, 2009
Revised: April 1, 2016

DESCRIPTION. This work shall consist of the removal of existing concrete pavement, restoration of the subbase material, the installation of precast concrete pavement slabs in accordance with the contract documents, and the sealing of joints at locations designated by the Engineer, or as shown in the Plans, or described in the Special Provisions. The precast slab system shall be the Illinois Tollway's generic system or an alternate system approved by the Illinois Tollway based on compliance with the Illinois Tollway special provision for Precast Concrete Pavement Slab Systems.

MATERIALS. The materials must meet the requirements of the Illinois Tollway special provision for Precast Concrete Pavement Slab Systems and the requirements of the designer of the approved system.

CONSTRUCTION REQUIREMENTS.

1. General. For replacements using the Illinois Tollway's generic precast system, the pavement areas to be repaired will be initially delineated by the Engineer on shoulder pavement using spray paint furnished by the Contractor and noted to qualify for either a 12'-6" or 13'-6" standard slab repair or require a custom slab repair. Standard slab placement shall only be allowed where the length of the patch is no longer than 6'-0", the width between existing longitudinal joints is measured at a right angle to the joints to be either between 11'-6" and 12'-6" or between 12'-6" and 13'-6", and if on-site saw cutting of the slabs is possible to be performed. At all locations initially marked to possibly receive a standard precast slab, the widths between existing longitudinal joints shall be measured by the Contractor under maintenance of traffic provided by the Contractor. The Contractor's width measurements shall be used to determine the need for any on-site sawcuts of the longitudinal edges of standard slabs to fit the opening and to align the saw cut edge(s) with any existing longitudinal joints. The longitudinal edges of any standard slab shall not be sawed cut more than 6 inches off the original edge. No new longitudinal joint shall, of a cut standard slab, be allowed inside of the existing longitudinal joint by more than ¼ inch. If the tolerances for Illinois Tollway standard slabs can not be met, then a custom slab shall be required at the location. The locations designated to receive a custom precast slab shall be fully surveyed by the Contractor under maintenance of traffic provided by the Contractor to determine the specific dimensions and diagonals required by the system manufacturer to fabricate the precast slab. The dimension requirements for fabrication of all custom slabs shall be summarized in a table that complies with the example table shown on the Illinois Tollway's Standard Drawing A18 and submitted to the Engineer for review and approval before any fabrication work proceeds.

   For replacements using any Illinois Tollway approved alternate (non-generic) precast system, the pavement areas to be repaired will be initially delineated by the Engineer on shoulder pavement using spray paint furnished by the Contractor. It shall be the Contractor's responsibility to survey all slab locations and mark saw cut locations that comply with the alternate system requirements for alignment. The locations designated to receive an alternate system slab shall be fully surveyed by the Contractor to determine the

specific dimensions and diagonals required by the system manufacturer to fabricate the precast slab.

For replacements using any precast system, the slab lengths of any designated repair area shall comply with the menu for precast concrete slabs as identified on the design detail drawings unless concrete deterioration that occurred since the initial design survey was performed requires a modified length to the repair area. Any areas of pavement removed and replaced outside the final limits established by the Engineer shall be done entirely at the Contractor's expense. After removal of the concrete pavement and any aggregate subbase in a repair area, the Engineer shall determine the suitability of the existing subbase material and the steps necessary to restore the subbase in accordance with the Illinois Tollway special provision for "Aggregate For Base Course Restoration, Special".

2. Quality Control Plan. The Contractor's Quality Control Plan (QCP) shall include a detailed back up plan for temporary filling of any removed repair location where the precast slab cannot be set before the time for peak hour traffic arrives. Any placement and removal of temporary fill material to allow for the pavement to be opened to traffic during peak hours shall be at the Contractor's expense. The backfill material shall be cement or asphalt treated material approved by the Engineer that will support traffic for 24 hours or more until the precast pavement is able to be placed.

3. Meetings. Convene a pre-placement meeting within 14 calendar days of the planned start of slab installation with the Engineer, manufacturer, supplier, system designer of an alternate precast slab system, and any relevant subcontractors to review and coordinate all aspects of pavement removal, placement and inspection including equipment and personnel requirements to install slabs to the line and grade depicted in the contract documents ± ¼ inch.

4. Technical Assistance for Alternate Precast Systems. Several processes in this specification are performed in accordance with the system designer's instructions. The system designer must supply on-site technical assistance at the beginning of the installation until the Engineer determines the assistance is no longer required. Provide approved system designer instructions to the Engineer at least 30 calendar days before starting work associated with slab installation.

5. Weather Limitations. Article 420.07 of the Standard Specifications shall apply.

6. Pavement Removal. Removal of existing pavement shall be in accordance with Section 440 of the Standard Specifications except as modified herein.

   The outer limits of the repair area will be sawcut full depth and transverse cuts shall not extend (overcut) by more than 10 inches into the adjacent concrete that is to remain in place. Overcuts shall be filled with a product acceptable to the Illinois Tollway Materials Engineer. The outer limits for repair shall be marked out by the Contractor and approved by the Engineer prior to any sawcutting. Removal of concrete within the perimeter sawcuts shall be by the lift-out method, and any concrete removed between sawcuts for dowel bar retrofits shall be removed using the jackhammer and hand tool equipment specified in the Illinois Tollway special provision for Dowel Bar Retrofit.

Equipment and methods used for removing old pavement shall be such as to prevent cracking, shattering or spalling of the pavement remaining in place. Should the remaining pavement be damaged by this operation the Contractor shall immediately change equipment and/or methods to prevent damage to any more pavement. Care shall be exercised in the removal of the pavement to prevent damage to load transfer devices, tie bars, or adjacent concrete surfaces or edges in portions of the pavement that are to remain in place. Adjacent pavement or bars damaged as a result of the removal process shall be replaced at the Contractor's expense to the satisfaction of the Engineer.

7. Disposal of Excavated Materials. Materials resulting from the removal of concrete pavement and materials removed for base course restoration, as required, shall be disposed of by the Contractor at his expense, in accordance with the applicable portions of Article 202.03 of the Standard Specifications.

8. Subbase Course. The subbase shall be prepared to the requirements of Illinois Tollway special provision "Subgrade Aggregate, 12-inch" for new construction and add-on lanes. For pavement repair over dense graded capping aggregates, any areas of a dense graded subbase that are below the required elevation of the finished subbase, due to the Contractor's operations in breaking or removing old pavement, shall be built up to meet the level of the surrounding subbase to the satisfaction of the Engineer in accordance with the contract documents at the Contractor's expense. For repairs over porous granular subbase or if the Engineer determines that the existing granular subbase is unsuitable for the intended purpose, the Contractor shall remove the unsuitable material in the pavement removal areas to the depth specified by the Engineer and no less than 2 inches and replace the material removed with an equal thickness of new material placed and compacted in accordance with the requirements of the Illinois Tollway special provision for "Aggregate For Base Course Restoration, Special". Follow the system designer's instruction for any final subbase preparation prior to slab installation. Do not disturb the prepared surface before installation.

9. Slab Installation. Install the slabs in accordance with the approved system instructions. Set grade-supported slabs to achieve maximum contact with the prepared subbase.

10. Joints for an Alternate Precast System. Submit a proposed joint layout with the Fabricator Working Drawings, in accordance with the Illinois Tollway special provision for "Precast Concrete Pavement Slab Systems." Align joints both transversely and longitudinally between abutting precast slabs, i.e., do not stagger joints, except where approved on the joint layout. When tying precast slabs to existing concrete pavement, such as an add-on lane, joint alignment is not required. However, do not drill and anchor longitudinal joint ties within 24 inches of a transverse joint in the existing pavement.

11. Joint Widths. Install slabs such that the joint widths on the remaining concrete surfaces are less than ½ inch, regardless of joint orientation. These dimensions apply to joints between adjacent precast slabs or joints between precast slabs and existing pavement.

12. Bed and Level Slabs. Bed and level slabs in accordance with the system instructions such that the vertical differential across any corner is ¼ inch or less.

13. Backfill Pavement Hardware. Backfill around pavement hardware in accordance with the approved system instructions.

14. Smoothness (Pavement's Remaining Concrete Surface). Where profile grinding of a precast repair is required by design, the Illinois Tollway special provision for Profile Diamond Grinding of Concrete Pavements shall apply for pavement smoothness.

15. Corrective Action for Smoothness. Immediately after the slab has been set and leveled, survey the vertical elevation across all corners to verify that the vertical difference between adjacent slabs across any corner does not exceed ¼ inch. If the difference exceeds ¼ inch, then the slab shall be removed and reset or the surface shall receive a corrective diamond grind at the contractor's expense after any required bedding grout or leveling material has been placed.

    Upon completion of any corrective work, the surface of the patch shall be resurveyed. Corrective work shall be at no additional cost to the Illinois Tollway.

16. Opening to Traffic shall be per the approved system requirements

METHOD OF MEASUREMENT. This work will be measured for payment in square feet of area of slab delivered and placed, and accepted in accordance with the Contract.

Reinforcement and other such items incidental and necessary to provide complete assemblies, as shown on the Plans, will not be measured separately for payment.

BASIS OF PAYMENT. This work will be paid for at the contract unit price per square foot for STANDARD PRECAST CONCRETE PAVEMENT SLABS of the width specified, and CUSTOM PRECAST CONCRETE PAVEMENT SLABS.

The work for any required profile grinding of precast slabs will be paid at the contract unit price per square yard for PROFILE DIAMOND GRINDING OF CONCRETE PAVEMENT.

The work for any necessary restoration to the existing subbase will be paid at the contract unit price per ton for AGGREGATE FOR BASE COURSE RESTORATION, SPECIAL.

Pay Item Number	Designation	Unit of Measure
JT485012	STANDARD PRECAST CONCRETE PAVEMENT SLABS, 12.5'	SQ FT
JT485014	STANDARD PRECAST CONCRETE PAVEMENT SLABS, 13.5'	SQ FT
JT485015	CUSTOM PRECAST CONCRETE PAVEMENT SLABS	SQ FT
JT415010	AGGREGATE FOR BASE COURSE RESTORATION, SPECIAL	TON

BEAM END ENCASEMENT

Description. This work consists of removing and disposing of all damaged or deteriorated concrete at ends of the PPC I-Beams as indicated on the Plans and as directed by the Engineer, and repairing the beam end (or near end) with reinforced formed concrete as detailed on the Plans. 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 (27,000 kPa) compressive or 675 psi (4650 kPa) flexural at 14 days. A high range water-reducing admixture shall be used to obtain a 5-7in. (125-175 mm) slump, but the cement factor shall not be reduced. This cement factor restriction shall also apply if a water-reducing admixture is used. This work shall also include the construction of necessary formwork and scaffolding and installing supplemental epoxy coated reinforcement bars, drilled and grouted high strength dowels and dowel bars as shown on the Plan details and as directed by the Engineer. The equipment, materials and construction methods shall conform to the applicable provisions of Sections 503 and 504 of the Standard Specifications except as modified herein.

Materials. Materials shall conform to the requirements specified in the Special Provision STRUCTURAL REPAIR OF CONCRETE for the depth of repairs which is anticipated to be less than 5 inches.

CONSTRUCTION METHODS

The Contractor shall provide ladders or other appropriate equipment for the Engineer to mark the removal areas. The depth of a removal shall be to sound concrete as determined by the Engineer. Repair configurations will be kept simple, and squared corners will be preferred. The repair perimeter shall be sawed a depth of 1/2 inch or less, as required to avoid cutting the reinforcement or tendons. Cutting or nicking existing reinforcement or prestressing strands is not permitted. A pacometer or bar locator shall be used to locate existing reinforcement and prestressing strands. 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. The outermost layer of reinforcement bar within the repair area shall be undercut to a depth of 3/4 inch (19 mm) or the diameter of the reinforcement bar, whichever value is larger. The underlying transverse reinforcement bar shall also be undercut as previously described, unless the reinforcement is not corroded, and the reinforcement bar is encased and well bonded to the surrounding concrete.

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 inch The substrate profile shall be ± 1/16 inch. The perimeter of the repair area shall have a vertical face.

The Contractor shall have a maximum of 14 calendar days to complete each repair location, once concrete removal has started for the repair.

The Engineer shall be notified of concrete removal that exceeds 6 inches in depth, 1/4 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 inches 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.

Longitudinal cracking along the length of the beam at the bottom flange is also an indication of repair required. However, in this case, the cracks shall be sealed with very low pressure epoxy and no concrete removed prior to encasement.

Minimum length of encasement along the beam shall be 10”, limits of unsound web or flange concrete or as determined by the Engineer – whichever is greater. The typical length of repair is not expected to exceed 1’-0”. Removal outside of the areas authorized by the Engineer will not be measured for payment.

When directed by the Engineer, all loose, unsound concrete shall be removed completely by the use of an electric chisel or other mechanical tools approved by the Engineer. Care shall be taken not to damage existing prestressing strands in the beams. If any of the prestressing strands are damaged, concrete removal shall be stopped immediately and the Engineer informed. All the necessary repair work suggested by the Engineer to compensate for the damaged strands, including but not limited to wrapping fiber reinforced plastic material to strengthen the area, shall be performed at no cost to the Authority.

Existing reinforcement bars shall be cleaned by abrasive blasting. 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. An approved “squeeze type” mechanical bar splicer capable of developing in tension at least 125 percent of the yield strength of the existing bar shall be used when it is not feasible to provide the minimum bar lap. No welding of bars will be permitted. The furnishing and replacing of supplemental reinforcement bars shall be included in this item.

No cutting, drilling or welding of or in the vicinity of the prestressing strands will be permitted.

After all the high strength drill and grout dowels are installed, proposed epoxy coated reinforcing bars shall be placed lapped to dowel bars as shown on the Plan details. All proposed reinforcing shall be secured in place so that placing of concrete will not displace the bars.

The formwork shall provide a smooth and uniform concrete finish most nearly matching the existing surface of the concrete structures. Formwork shall be completely 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 shall use exterior mechanical vibration, as approved by the Engineer, to release air pockets that may be entrapped.

Prior to placing the new concrete the Contractor shall prepare the surface of the existing concrete against which the new concrete is placed as a bonded construction joint. The surface cleaning shall be done by abrasive air or water blasting. The surface shall be free of oil, dirt, and loose concrete. Just prior to concrete placement the surface shall be thoroughly wetted to a saturated surface dry condition or as directed by the Engineer.

New concrete shall be placed and finished in accordance with applicable provisions of Sections 503 and 504 of the Standard Specifications or as indicated in the special provision STRUCTURAL REPAIR OF CONCRETE.

New concrete shall be cured in accordance with applicable portions of Sections 503 and 504 of the Standard Specifications for a minimum of 7 days moist cure and as directed by the Engineer.

All new concrete areas of repair beyond the original outlines of the concrete girder, under this item shall have a minimum concrete thickness of 3 in. unless specified otherwise on the Plans or in the details. The minimum thickness of girder repairs shall be 1.5 in.

At all locations, where the removal of deteriorated concrete reaches a total depth including all sides greater than 3 in. or half the depth or width of the flange or web member, The Authority's Engineering Department shall be contacted for structural evaluation.

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, 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 repaired area shall be removed and replaced, as determined by the Engineer, for nonconformance with original dimensions, surface cracks greater than 0.01 inch in width, map cracking with a crack spacing in any direction of 18 inches or less, voids, or delaminations.

If a nonconforming repair is allowed to remain in place, cracks 0.01 inch or less shall be repaired with epoxy according to Section 590. For cracks less than 0.007 inch, the epoxy may be applied to the surface of the crack. Voids shall be repaired according to Article 503.15.

Method of Measurement. This Work will be measured for payment in place and measure by units each. Each location of 10" or longer length measured at the end of a beam of repaired bottom flange and/or web of beam where additional concrete beyond the original beam outlines has been formed and placed and cured shall be measured as a single occurrence. Encasement of both sides shall be paid for as a single occurrence.

Basis of Payment. Payment for BEAM END ENCASEMENT will be made at the Contract unit price per EACH beam end or near end that is repaired without regard to whether the web or flange or both repairs are performed. Complete, measured as specified, which payment shall constitute full compensation for removal and disposal of concrete; surface preparation; applying an epoxy resin adhesive or polyvinyl acetate homopolymer bonding agent; furnishing, placing and finishing Class SI Modified concrete; epoxy coated reinforcing bars, high strength dowels, curing; disposal of all concrete removed; and for furnishing all labor, tools, equipment and incidentals necessary to complete the work as specified.

Pay Item Number	Designation	Unit of Measure
JT503102	BEAM END ENCASEMENT	EACH

DOWEL BAR RETROFIT (Illinois Tollway)

Effective: March 30, 2009
Revised: April 19, 2011

Description. This work shall consist of furnishing and installing epoxy coated round steel dowels into existing concrete pavement across transverse joints and/or cracks, in accordance with this Specification, at locations shown in the Plans and/or as directed by the Engineer. This work shall include sawing channels into the pavement, cleaning the channels, placing dowel into the channels, filling the channels and transverse joints with adhesive, sawing and sealing the retrofitted joints, cleanup and other related work.

Materials.

(a) Dowels. The dowel bars shall consist of a smooth, round, epoxy and bond breaker coated 14-inch long, 1.5-inch diameter steel dowels meeting the requirements of Article 1006.06(b) of the Standard Specifications.

(b) Bond Breaker. Acceptable bond-breaker compounds include white pigmented curing compound, concrete form oil, or other approved bond breaker materials.

(c) Expansion Caps. Use tight-fitting, commercial quality end caps made of a non-metallic, non-organic material that allows for ½ inch of movement at each end of the dowel bar.

(d) Dowel Bar Support Chairs. Use chair devices for supporting the dowel bars that conform to the epoxy-coated steel requirements of ASTM A 884. Dowel bar chairs are used to firmly hold the dowels centered in the slots during backfill operations. The dowel bar chairs must hold the bar a minimum of ½ inch above the bottom of the slot while the backfill material is placed and consolidated.

(e) Caulking Filler. Caulking filler used for sealing the existing transverse or crack at the bottom and sides of the slot shall be concrete sealant that is compatible with the patch material being used.

(f) Non-Shrink Concrete Backfill Material. The backfill material shall be:

(1) Five Star Highway Patch, as manufactured by Five Star Products, Inc., Fairfield, Connecticut;
(2) Highway DB Retrofit Mortar, as manufactured by Dayton Superior, Miamisburg, Ohio; or
(3) An Illinois Tollway approved equivalent tested as Rapid Set Concrete Patching materials per AASHTO National Transportation Product Evaluation Program (NTPEP) which conforms to ASTM C 928.

The material shall :

(1) Provide a compressive strength of 4,000 psi in 24 hours (opening to traffic after 3,000 psi) per ASTM C 39;
(2) Exhibit expansion of less than 0.10 percent per ASTM C 531; and
(3) have a calculated durability factor of 90.0 percent minimum at the end of 300 freeze-thaw cycles per ASTM C 666.

The Contractor shall submit the proposed concrete backfill material to the Engineer 14 days prior to any placement operations. For any backfill material that is extended with aggregate, the maximum aggregate size shall be no more than 3/8 inch.

(g) Curing Compound. Use a Type I, II, or IIII curing compound to cure the approved concrete backfill material that conforms to Article 1022.01 of the Standard Specifications.

(h) Joint / Crack Sealer. Hot poured joint / crack sealer used at retrofitted joints shall be in accordance with Article 1050.02 of the Standard Specifications. Any proposed sealant product shall be approved in writing by the Engineer prior to the delivery to the work site. The backer rod if needed shall consist of a material capable of withstanding the application temperatures of hot poured sealant to 400° F. The backer rod shall be extruded from a cross-linked, closed cell polyolefin and shall be available in a variety of diameters to readily meet the requirements of any particular application.

Equipment

(a) A template shall be used to locate the sawcuts on any nonskewed crack or joint in order to align the sawcuts consistently. Either single diamond bladed saws or diamond bladed gang saws shall be used to make the saw cuts to allow for dowel bar placements within the specified tolerances.

(b) Chipping hammers shall be hand held and have a maximum weight of 30 lbs. prior to any handle modification where applicable to minimize damage to the concrete pavement that remains.

(c) The compressor for air blasting shall have a minimum capacity of 120 cu. ft. per minute. The compressed air shall be free from oil and other contaminants.

(d) Consolidation equipment used to consolidate the concrete repair material in the dowel bar slats shall be internal vibrators with a maximum diameter of 1 inch and shall have a resilient covering that will not damage the epoxy coated reinforcement during use.

(e) Equipment for mixing and pumping any backfill materials for retrofitting the dowel bars shall be in accordance with the material manufacturer's instructions and specifications.

(f) Routing or sawing equipment for crack sealant, where required, shall be power driven and be capable of cutting the cracks to the required dimensions without excessive spalling of the adjacent surface. Equipment for heating and placing hot poured sealant material shall be an oil jacketed, double boiler type, heating kettle or other thermostatically controlled equipment of a type approved by the Engineer, capable of heating the material to 400° F (205° C) and pumping the material into the prepared crack or joint.

Submittals. Submit samples to the Engineer for approval prior to the installation of the following items:

a. Dowel bars
b. Dowel bar chairs
c. Dowel bar end caps
d. Backfill material
e. Aggregate for extension of backfill material

Submit the material samples, except for the backfill and aggregate, at least 10 days prior to use. Submit backfill material and aggregate used for extension 30 days prior to use.

Drawings. The proposed location of the dowel bars is shown in the Plans. Before any fabrication is started, the Contractor shall prepare and submit shop drawings and/or catalog cuts to the Engineer for approval, in accordance with the provisions of Article 105.04 of the Illinois Tollway Supplemental Specifications. The shop drawings shall give full detailed dimensions and sizes of the channels to be sawed and the dowel bar retrofit.

CONSTRUCTION REQUIREMENTS

Install dowel bars in the existing portland cement concrete pavement as shown on the Plans and in the Specifications.

(a) Concrete Removal. Create slots to a depth and length that allows the center of the dowel to be placed at mid-depth in the pavement slab and parallel to the pavement surface. Slots can be created with a gang saw, or by making two saw cuts and removing the concrete between the sawcuts with a 30-lb maximum jackhammer or handtools. Slots are to be parallel to each other and to the centerline of the roadway with a maximum tolerance of ¼ inches per 12 inches of dowel bar length to allow for the dowel bar to be placed parallel to the centerline of the roadway. For non-skewed cracks and joints, the saw cut locations shall be pre-marked using a template. Skewed joints or cracks may require slots longer than the length specified in the plans to allow for equal length of the dowel bar to be placed across the transverse joint or crack. Remove water and residue immediately after sawing. If the concrete removal operations cause damage to the pavement that is to remain, discontinue concrete removal operations and only resume after taking corrective measures. Repair or replace pavement damaged during concrete removal operations at no additional cost to the Illinois Tollway. The bottom of the slot must be flat and level. Dispose of any concrete removal debris.

(b) Slot Cleaning and Preparation. Sandblast all exposed surfaces in the dowel bar slot to remove saw slurry and debris such that clean aggregate is exposed. After sandblasting, clean the slot by blowing with moisture-free, oil-free compressed air having a minimum capacity of 120 cu. ft. per minute to remove any dust, residue or debris left in the slot.

(c) Sealing Joints and Cracks in Slot before Backfilling. Seal the existing transverse contraction joint and/or all cracks at the bottom and the sides of the dowel bar slot with an approved caulking or silicone filler to prevent any of the backfill material from entering these areas. The caulking filler should not be placed any farther than ½ inch outside either side of the joint. Excessive sealant around the slot does not allow the concrete patching material to bond to the sides of the slot. Prior to slot sealing, ensure that surfaces receiving the caulking filler are clean and free of moisture. Do not extend the caulking filler beyond 3/8 inches of each side of the existing joint or crack.

(d) Placing Dowel Assembly in Slot. Prevent contamination of the cleaned slot before or while placing dowel assemblies to limit the potential of bonding loss with the backfill material. Place the dowel bars to within 0.5 inches of the midpoint of the slab. Ensure that the bar is parallel to the traffic lane centerline and the top of the roadway surface within a tolerance of ¼ inch per 12 inches of dowel bar length. Center dowels at the nonskewed transverse joints

such that at least 6 inches of the dowel extends into each adjacent panel. For dowel bars at any skewed joint and at all cracks, the dowel shall be centered over the joint or crack in each slot. Cease and adjust operations if the chairs do not hold dowel bars securely in place during placement of the backfill material.

Place a foam core insert at the middle of the dowel bar and to the surface of the pavement. Place insert so it covers the existing transverse joint or crack and is capable of remaining in a vertical position, tight to all edges during backfill placement operations. Re-establish the joint or crack above the foam core insert within 4 hours of backfill placement by sawing after the backfill material has hardened sufficiently.

(e) Mixing and Placing Backfill Material. Mix backfill material in accordance with the manufacturer's instructions and the specifications. Refer to manufacturer's information on handling, mixing, and placing backfill material.

Fill each dowel bar slot with backfill material after placement of the caulking filler, the coated dowel bar, expansion caps, support chairs, and the foam core insert. Ensure that the foam core inserts remain upright, extends to the surface of existing pavement, and is over the existing joint or crack during the backfill process. Vibrate the backfill material with a small hand held vibrator capable of thoroughly consolidating the backfill material into the slot around the dowel bars and support chairs.

Slightly overfill the slot and finish the surface of the filled slot level with to no more than ¼" above the existing concrete. Any slots insufficiently filled below existing pavement surfaces shall be redone at no additional cost to the Illinois Tollway. Cure the backfill material in accordance with the manufacturer's recommendations. Apply curing compound per the manufacturer's recommendation.

(f) Sawing Cracks after Backfilling. After installation of dowel bars and backfill material is completed for retrofitting mid-slab cracks, where the foam insert is not observed present on the finished surface of the patch the patched channels shall be saw cut by the Contractor between existing crack openings within 24 hours of placement to a nominal 1.5 inch depth to reduce surface stress and spalling at the surface of the backfilled slot. Such sawcutting will be at no additional cost to the Illinois Tollway.

Method of Measurement. This work will be measured for payment in units of each dowel bar assembly installed.

Basis of Payment. This work will be paid at the contract unit price per each for DOWEL BAR RETROFIT.

Pay Item Number	Designation	Unit of Measure
JT527020	DOWEL BAR RETROFIT	EACH

TELEVISION INSPECTION OF SEWER (Illinois Tollway)

Effective: May 29, 2015
Revised: April 1, 2016

Description. This work shall consist of the inspection and video televising sewers, taking photos, locating drainage structures, and furnishing written reports of the sewers, as shown in the Plans. The work shall be completed in accordance with the National Association of Sewer Service Contractors (NASSCO) Pipeline Assessment & Certification Program (PACP).

CONSTRUCTION REQUIREMENTS

The Contractor shall perform one pass of a hydraulic flusher to remove loose debris. Should additional cleaning be required, as determined by the Engineer on the basis of the initial pass, that work will be paid for separately.

Television equipment shall be remote controlled from above ground by a skilled technician controlling the camera. The camera shall be a pan and tilt color unit with sufficient lighting for inspection of the sewer. If the contractor has cameras with an automatic iris, they shall use them for all mainline televising; otherwise lighting shall be manually adjusted so no glares, bright spots, etc. are recorded. The contractor shall pan and tilt up each lateral that is in the main and up and around the entire manhole where the inspection is ending. The camera shall be pulled through the sewer line in either direction at a speed not greater than 30 feet per minute, stopping as necessary to permit proper documentation of the sewer's condition. If the camera is submerged due to a sag or dip in the pipe, a high velocity jet shall be utilized to pull water from the camera lens. If, during the inspection operations the inspection camera will not pass through the entire manhole section, the contractor shall reset his equipment so that the inspection can begin at the opposite manhole. If the contractor is unable to televise the entire manhole-to-manhole segment, he shall notify the Engineer prior to abandoning the attempt. Payment will be based on only the length televised with no additional cost to the Illinois Tollway for the extra setups.

The view seen by the television camera shall be transmitted to a monitor located inside a mobile TV studio, which has the capabilities to produce a transmittable digital copy. The contractor's mobile studio shall be large enough to accommodate at least two people for the purpose of viewing the monitor while the inspection is in progress. The Engineer shall have access to view the television screen at all times.

Pipe identification and location shall be displayed on the video at the beginning and end of each segment for a minimum of 15 seconds. The pipe location and information shall include: Pipe identification, Starting drainage structure location with station and offset, Ending drainage structure location with station and offset, Material, Pipe Size, Date, and Length. If the segment is reversed, the display shall say "Reversal" to differentiate the video from the original run. The date and pipe length counter shall be displayed for the entire length of sewer segment. The contractor shall display all pipe spalling, obtrusions, or obstructions, for a minimum of five seconds.

Inspection reports shall be prepared for each line segment televised. A separate inspection report shall be included where segments are abandoned and a reverse TV is required. Each inspection report shall include the following information:

a) Illinois Tollway logo
b) Contractor logo
c) Unit number

d) Pipe identification
e) Roadway name/route
f) Direction of Traffic
g) Nearest cross street
h) Starting drainage structure (number, station and offset)
i) Ending drainage structure (number, station and offset)
j) Total length
k) Pipe Material
l) Pipe Shape
m) Pipe Size
n) Pipe joint length
o) Manufactured Year
p) Flow direction
q) Surveyor's name (name & certification number)
r) Date Recorded
s) Weather
t) Pre-cleaning
u) Date cleaned
v) Drainage structure condition & type of construction
w) Location of all service connections
x) Location & description of all PACP items
y) Report generation date
z) Page number

The contractor shall produce an electronic copy of the inspection report (pdf), video files, and spreadsheet summarizing all inspection records. The electronic data shall be provided to the Engineer on an external hard drive and uploaded to the Illinois Tollway WBPM system contract folder: 03 Construction - 08 Reports and Logs - 05 Sewer Television Reports.

Method of Measurement. This work will be measured for payment in feet, based on only the length televised and regardless of the diameter of the sewer being televised.

Basis of Payment. This work will be paid for at the contact unit price per foot for TELEVISION INSPECTION OF SEWER, regardless of the diameter of the sewer being televised.

Pay Item Number	Designation	Unit of Measure
JT546000	TELEVISION INSPECTION OF SEWER	FOOT

SLOTTED DRAINS TO BE CLEANED AND TRENCH DRAINS TO BE CLEANED

Description. This work shall consist of cleaning the trench and slotted drain installations as shown on the plans and directed by the Engineer.

CONSTRUCTION REQUIREMENTS

Cleaning shall be by water jet method or method approved by the Engineer. The Contractor shall make provision so that debris is not blown out the top of the drain assemblies and onto the gore pavement or traffic lanes. Should plywood or other sheeting be used for this purpose the Contractor shall weight said material down so that it is not blown off the assemblies into the adjacent traffic lane(s). Trench Drain cover grates shall be removed and the bearing seats/rails shall be cleaned. Any material that is deposited on the pavement shall be promptly cleaned and removed by the Contractor. Disposal of material removed shall be incidental to the applicable pay item. Any damage as a result of the Contractor's operations shall be repaired at no cost to the Tollway.

Method of Measurement. This work will be measured for payment in feet. The length shall be from the upstream end of the trench or slotted drain assembly to the nearest downstream structure or end section. Assemblies with intermediate structures shall be measured through the structure.

Basis of Payment. This work will be paid for at the contract unit price per foot, for SLOTTED DRAINS TO BE CLEANED and TRENCH DRAINS TO BE CLEANED, which payment shall constitute full compensation for complete removal and disposal of all debris in the specified assemblies.

Pay Item Number	Designation	Unit of Measure
JT546200	SLOTTED DRAINS TO BE CLEANED	FOOT

NOISE ABATEMENT WALL PANEL REMOVAL, STORAGE AND RE-ERECTION

Description. This work shall consist of removing, storing, and re-erecting noise wall panels that are required to access the drainage structures for cleaning and televising as shown in the plans and/or directed by the Engineer.

GENERAL REQUIREMENTS

Panels shall be removed at locations shown on the Plans and as directed by the Engineer. Lifting and rigging methods are at the option of the Contractor; however, any damage to the panel shall be repaired at no cost to the Illinois Tollway up to and including replacement of the entire panel. Storage on site will only be permitted if the panel is to be re-erected in the same day and with the permission of the Engineer. Any clearing of vegetation required to access the work site prior to or after the panel has been removed shall be considered as included in the work described herein.

Panels shall be re-erected using all new hardware and fasteners that conform to Article 1006.08 of the Standard Specifications.

Method of Measurement. This work will be measured for payment in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each, for NOISE ABATEMENT WALL PANEL REMOVAL, STORAGE, AND RE-ERECTION, which payment shall constitute full compensation for all labor, equipment, tools, and incidentals necessary to complete the work as specified.

Pay Item Number	Designation	Unit of Measure
JT599044	NOISE ABATEMENT WALL PANEL REMOVAL, STORAGE, AND RE-ERECTION	EACH

TRENCH DRAIN (Illinois Tollway)

Effective: February 8, 2011
Revised: April 1, 2016

Description: This work shall consist of furnishing and installing a trench drain system as shown in the Plans and/or directed by the Engineer. The work includes all necessary excavation, frames, grates, fittings, coupling systems, connections, concrete collars, concrete backfill, and accessories.

Materials: Trench drain shall be manufactured from polymer concrete. The polymer concrete shall be made from a composition of aggregate and polyester resin or vinylester resin and shall have the following properties when tested as specified below:

Property	Test Method	Value (Minimum)
Tensile Strength	ASTM C307	1,200 psi
Compressive Strength	ASTM C597	12,000 psi
Flexural Strength	ASTM C580	2,000 psi
Moister Absorption	ASTM C140	0.5%
Salt Proof	ASTM B117	Pass
Chemical Resistant	ASTM C267	Pass
Frost Proof	ASTM C666	Pass

Fabrication Requirements.

Access and Outlet Channels. Trench drains shall have an inside width of not less than 4 inches and not more than 8 inches and a minimum wall thickness of ¾ inch. The interior surface of trench drains, below the level of the frame and associated connections shall be smooth. Trench drain channel sections shall be made of precast monolithic polymer concrete. There shall be no obstructions within the trench drain channel.

Each unit will feature a full radius in the trench bottom and a male to female interconnecting end profile. Units shall have cast in anchoring features on the outside wall to ensure maximum mechanical bond to the surrounding encasement material and pavement surface.

The trench drain channel system shall be designed for the hydraulic inlet capacity required and to the drainage structures discharge rate. The channel slope shall be maximized for each segment run to provide the maximum velocity when hydraulically loaded. Detailed shop drawings for the trench drain installation shall be submitted with design calculations indicating the systems hydraulic features.

Frame and Grates. Trench drain frames and grates shall be made of ductile iron conforming to Article 1006.15 of the Standard Specifications. Bolts, nuts, frame anchors and other connecting hardware shall conform to Article 1006.09 of the Standard Specifications and shall be galvanized. Furnish grates that attach into frames without rocking or movement.

Frames, grates and covers, when installed in accordance with manufacturer's recommendations and these special provisions, shall be capable of withstanding load testing as specified in

AASHTO Specification H-25 AND S-25 for Frames, Covers, Gratings, Steps, Manhole Sump and Catch Basin.

Frames shall be secured to the surrounding concrete backfill with steel anchoring rods a minimum of ¼ inch in diameter and a minimum of 6 inches in length or as shown on the plans. Alternatively, other methods of securing the frame to the concrete backfill or trench drain wall are acceptable, provided that a minimum pullout resistance of 700 lb/ft. of length of trench drain frame is assured.

Grates may be either integral with the trench drain or removable. However, a minimum of 1.5 feet of removable grates shall be provided at the end points of the trench drain and at a 100 feet spacing. Removable grates shall be held in place by locking devices that are tamper resistant and provide a minimum repetitive pullout resistance of 350 lb/ft. of length of trench drain grate after completion of 1000 hours of salt spray testing in accordance with ASTM Designation B117.

Grates shall have openings to accept inflow of runoff equivalent to between 30 and 70 percent of the total top surface area of the grate, with individual openings or slots having a dimension of not greater than 2 inches measured in the direction of the trench drain flow line.

CONSTRUCTION REQUIREMENTS

The trench drain system shall be installed in accordance with the manufacturer's installation instructions and drawings.

Trench drains shall be installed in a trench excavated to the lines and grades established by the Engineer. Excavate a trench that will ensure a minimum concrete thickness of 12 inches along the bottom and 12 inches along each side. Excavation shall conform to Section 202 of the Standard Specifications.

Grade and prepare a firm and uniform trench bottom throughout the entire length of the trench drain system. Remove all obstructions and debris from the trench excavation prior to backfilling.

Install the trench drain system in conformance with the line, grade and grate type as shown in the plans.

Join the precast trench drain sections according to the recommendations of the manufacturer. Furnish sections that are closely jointed and secured to prevent separation of the trench drain during backfilling.

Trench drains shall be positioned in the excavated trench so that, when finished, the surrounding concrete backfill will be a minimum of 1/8 inch and a maximum of 3/16 inch above the level of the trench drain frame. In no case shall the frame or grate of the trench drain extend above the level of the surrounding backfill.

New trench drains shall be connected to new or existing drainage facilities as directed by the engineer. No reduction in the cross sectional area of the trench shall be permitted at the connection.

Place concrete backfill in the trench against undisturbed material at the sides and bottom of the trench in a manner that will prevent floating or shifting of the trench drain, and will prevent voids

in, or segregation of the concrete. Tamp and spade to prevent honeycombing. Form the top surface to the lines shown in the plans. Remove any foreign material that falls into the trench prior to or during placement of concrete. Where necessary, earth plugs shall be constructed and compacted at the ends of the planned backfill to contain the concrete backfill within the trench. Concrete shall conform to Section 353 of the Standard Specifications.

Furnish a textured surface on the concrete that is even with the adjacent surface with a broom or burlap drag to produce a durable skid-resistant surface.

Method of Measurement: This work will be measured for payment in units of feet, from the inside wall of the structure as shown on the plans, along the center line of the channel complete in place.

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

Pay Item Number	Designation	Unit of Measure
JT601900	TRENCH DRAIN	FOOT

LIGHT POLE PROTECTION BOX

Description. This work shall consist of the constructing LIGHT POLE PROTECTION BOX at the locations shown on the plans. The LIGHT POLE PROTECTION BOX shall be constructed in accordance with the details shown in the plans.

Materials. All steel shall conform to the requirements of ASTM A 36.

All stainless steel countersunk bolts shall meet the requirements of ASTM F 593 type 304.

CONSTRUCTION REQUIREMENTS

Welding shall be completed using E70XX low hydrogen electrodes.

After fabrication, each piece shall be galvanized per ASTM A 123.

Care shall be taken to not damage the existing barrier wall or any new construction. The Contractor shall repair any damage to existing or new items to the satisfaction of the Engineer.

Method of Measurement. The LIGHT POLE PROTECTION BOX will be measured for payment per each.

Basis of Payment. This work will be paid for at the contract unit price per each for LIGHT POLE PROTECTION BOX which shall include all labor, equipment and material necessary to complete this work.

Pay Item Number	Designation	Unit of Measure
JT637029	LIGHT POLE PROTECTION BOX	EACH

OVERHEAD TRUSS SUPPORT PROTECTION BOX

Description. This work shall consist of the constructing OVERHEAD TRUSS SUPPORT PROTECTION BOX at the locations shown on the plans. The OVERHEAD TRUSS SUPPORT PROTECTION BOX shall be constructed in accordance with the details shown in the plans.

Materials. All steel shall conform to the requirements of ASTM A 36.

All stainless steel countersunk bolts shall meet the requirements of ASTM F 593 type 304.

Threaded anchor rods shall conform to article 1006.09 of the STANDARD SPECIFICATIONS. If the anchor rods in accordance with the STANDARD SPECIFICATIONS have insufficient shear or tensile strength by maximum dimensions, they may conform to the requirements of ASTM F1554. Anchor rod assemblies shall be furnished with either anchorage plates meeting the requirements of Article 1006.09 of the STANDARD SPECIFICATIONS, or plate washers in accordance with ASTM A572 (AASHTO M223) Grade 50. Anchor plates and plate washers shall be hot-dip galvanized after fabrication in accordance with ASTM A 153 (AASHTO M 232).

CONSTRUCTION REQUIREMENTS

Welding shall be completed using E70XX low hydrogen electrodes. All welding shall be completed per the latest AWS D1.5 bridge welding code.

After fabrication, each piece shall be galvanized per ASTM A 123.

Care shall be taken to not damage the existing barrier wall or any new construction. The Contractor shall repair any damage to existing or new items to the satisfaction of the Engineer.

Method of Measurement. The LIGHT POLE PROTECTION BOX will be measured for payment per each.

Basis of Payment. This work will be paid for at the contract unit price per each for LIGHT POLE PROTECTION BOX which shall include all labor, equipment and material necessary to complete this work.

Pay Item Number	Designation	Unit of Measure
JT637032	OVERHEAD TRUSS SUPPORT PROTECTION BOX	EACH

CONCRETE MEDIAN BARRIER EXTENSION

Description. This work shall consist of the cleaning and surface preparation of the existing concrete median barrier and extension of the existing barrier at the locations and per the details indicated on the plans. Transitions between barriers of different designs shall be constructed according to the detail shown on the plans. This work shall be in accordance with the applicable requirements of Sections 501, 503 and 1020 of the Standard Specifications

CONSTRUCTION REQUIREMENTS

Drains, reinforcement and/or existing transverse and longitudinal joints which are to remain in place shall be protected from damage during removal and cleaning operations. All damage caused by the Contractor shall be corrected, at the Contractor's expense, to the satisfaction of the Engineer.

1. Concrete Removal: Where the concrete median barrier transitions between barriers of different designs, the concrete shall be removed to a depth as indicated in the plan details.

2. Surface Preparation: All loose, disintegrated and unsound concrete shall be removed from portions of the barrier as designated by the Engineer. The Contractor shall take care not to damage reinforcement bars or expansion joints which are to remain in place. Any damage to reinforcement bars or expansion joints shall be corrected at the Contractor's expense.

   The newly exposed concrete shall be thoroughly blast cleaned. Concrete adjacent to any exposed reinforcement bars shall be removed to a depth that will permit new concrete to bond to the entire periphery of the exposed bar.

3. Reinforcement Treatment. Care shall be exercised during concrete removal to protect the reinforcement bars and structural steel from damage. Any damage to the reinforcement bars or structural steel to remain in place shall be repaired or replaced to the satisfaction of the Engineer at the Contractor's expense.

4. Cleaning. Immediately after completion of the concrete removal and reinforcement repairs, the repair areas shall be cleaned of dust and debris. Once the initial cleaning is completed, the repair areas shall be thoroughly blast cleaned to a roughened appearance free from all foreign matter. Particular attention shall be given to removal of concrete fines. Any method of cleaning which does not consistently produce satisfactory results shall be discontinued and replaced by an acceptable method. All debris, including water, resulting from the blast cleaning shall be confined and shall be immediately and thoroughly removed from all areas of accumulation. If concrete placement does not follow immediately after the final cleaning, the area shall be carefully protected with well-anchored polyethylene sheeting.

   Exposed reinforcement bars shall be free of dirt, detrimental scale, paint, oil, or other foreign substances which may reduce bond with the concrete. A tight non-scaling coating of rust is not considered objectionable. Loose, scaling rust shall be removed by rubbing with burlap, wire brushing, blast cleaning or other methods approved by the Engineer.

5. Bonding Method: The patch area shall be cleaned to the satisfaction of the Engineer and shall be thoroughly wetted and maintained in a dampened condition with water for at least 12 hours before placement of the concrete. Any excess water shall be removed by compressed air or by vacuuming prior to the beginning of concrete placement. Water shall not be applied to the patch surface within one hour before or at any time during placement of the concrete.

Method of Measurement. CONCRETE MEDIAN BARRIER EXTENSION TRANSITION and CONCRETE MEDIAN BARRIER EXTENSION will be measured for payment in feet, in place along the centerline of the barrier.
Basis of Payment. This work will be paid for at the contract unit price per foot for CONCRETE MEDIAN BARRIER EXTENSION TRANSITION of the maximum height specified and for CONCRETE MEDIAN BARRIER EXTENSION of the height specified.

PROTECTIVE COAT will be paid for separately.

Pay Item Number	Designation	Unit of Measure
JT637044	CONCRETE MEDIAN BARRIER EXTENSION, 18” WIDTH	FOOT
JT637048	CONCRETE MEDIAN BARRIER EXTENSION TRANSITION, 18” WIDTH	FOOT

SUPPLEMENTAL TRAFFIC CONTROL DEVICES (Illinois Tollway)

Effective: April 27, 2007
Revised: April 1, 2016

Description. This work shall consist of furnishing, installing, maintaining, relocating and removing additional traffic control devices at locations not anticipated during the preparation of the Contract Documents but for which a specific need arises during construction.

GENERAL REQUIREMENTS
Requirements for all devices furnished under this specification shall be governed by the Specifications and procedures of Section 701 of the Illinois Tollway Supplemental Specifications, Work Zone Traffic Control and Protection. The Contractor shall obtain the prior written authorization of the Engineer for the furnishing and placing of any Supplemental Traffic Control Devices.

Supplemental Barricades. SUPPLEMENTAL BARRICADES shall be placed at the locations and for the duration directed in writing by the Engineer.

Barricades used, together with their placement, maintenance, necessary realignment, and removal shall be in accordance with the applicable provisions of Section 701 of the Illinois Tollway Supplemental Specifications.

SUPPLEMENTAL BARRICADES shall be equipped with warning lights as required in accordance with the provisions of Section 701 of the Illinois Tollway Supplemental Specifications at no additional cost to the Illinois Tollway.

Supplemental Signing. SUPPLEMENTAL SIGNING shall be placed at the locations and for the duration directed in writing by the Engineer.

The signs shall be ground-mounted or skid-mounted at the height and distance from traffic as directed by the Engineer, and shall be securely attached to supports of sufficient strength and/or sufficiently weighted to assure that the signs will remain in place without hazard to vehicular traffic regardless of weather or traffic conditions. Signs shall comply with those in the Temporary Traffic Control Section of the current edition of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD).

The Contractor shall promptly relocate supplemental signing when and where necessary for stage changes or modification of lane closures without additional cost to the Illinois Tollway.

SUPPLEMENTAL SIGNING shall be equipped with warning lights when so directed and shall be maintained in accordance with the applicable provisions of Illinois Tollway Supplemental Specifications Section 701 at no additional cost to the Illinois Tollway.

Supplemental Flashing Arrow Boards. SUPPLEMENTAL FLASHING ARROW BOARDS shall be placed at the locations and for the duration directed in writing by the Engineer.

Arrow boards used together with their placement, maintenance, necessary realignment, and removal shall be in accordance with the applicable provisions of Illinois Tollway Supplemental Specifications Section 701.

Method of Measurement. SUPPLEMENTAL BARRICADES will be measured for payment per each per day for barricades ordered and placed, which measurement shall include all warning lights required to be attached thereto.

SUPPLEMENTAL SIGNING will be measured for payment in square feet edge to edge (horizontally and vertically) of the aggregate actual sign face surface area of all supplemental signs ordered and erected in place.

SUPPLEMENTAL FLASHING ARROW BOARD will be measured for payment per each per day, each per week and each per month for arrow boards ordered, placed, and functioning properly. No measurement will be made for any arrow board that fails to function for any day or fraction thereof.

Measurement will be in accordance with the following example.

PERIOD OF USE	**MEASURED AS**
1 to 6 consecutive days	number of days
7 to 13 consecutive days	1 week + No. days in excess of 7
14 to 20 consecutive days	2 weeks + No. of days in excess of 14
21 to 27 consecutive days	3 weeks + No. of days in excess of 21
28 to 34 consecutive days	1 month + No. of days in excess of 28
35 to 41 consecutive days	1 month + 1 week + No. of days in excess of 35
42 to 48 consecutive days	1 month + 2 weeks + No. of days in excess of 42

Basis of Payment. Payment for SUPPLEMENTAL BARRICADE will be made at the Contract unit price per each per day, for each barricade.

Payment for SUPPLEMENTAL SIGNING will be made at the Contract unit price per square foot for the aggregate total of all supplemental signs.

Payments for SUPPLEMENTAL FLASHING ARROW BOARD will be made at the Contract unit price per each per day, each per week and each per month for each arrow board.

Pay Item Number	Designation	Unit of Measure
JT701030	SUPPLEMENTAL BARRICADE	EACH/DAY
JT701031	SUPPLEMENTAL SIGNING	SQ FT
JT701032	SUPPLEMENTAL FLASHING ARROW BOARD (PER DAY)	EACH/ DAY
JT701033	SUPPLEMENTAL FLASHING ARROW BOARD (PER WEEK)	EACH/ WEEK
JT701034	SUPPLEMENTAL FLASHING ARROW BOARD (PER MONTH)	EACH/ MONTH

SUPPLEMENTAL MAINTENANCE OF TRAFFIC (Illinois Tollway)

Effective: May 14, 2007
Revised: April 1, 2016

Description. This work shall consist of providing the requirements of Section 701 of the Illinois Tollway Supplemental Specifications in the event that the Contractor receives an extension of time for the completion of the Contract and the Engineer has requested that maintenance of traffic be provided.

GENERAL REQUIREMENTS

The Contractor shall provide all necessary daily maintenance, realignment and surveillance of the maintenance of traffic devices installed by him/her in accordance with the requirements of Section 701 of the Illinois Tollway Supplemental Specifications.

Method of Measurement. This work will be measured on a per day basis for each calendar day after the Date for Completion, regardless of the number of lane closures to be maintained, installed or removed.

Basis of Payment. This work will be paid at the Contract unit price per day.

Pay Item Number	Designation	Unit of Measure
JT701035	SUPPLEMENTAL MAINTENANCE OF TRAFFIC	DAY

PORTABLE CHANGEABLE MESSAGE SIGN

Description. This work shall consist of furnishing, placing, and maintaining changeable message sign(s) at the location(s) shown on the plans or as directed by the Engineer and shall be in accordance with the Tollway Supplemental Specifications Section 701.

The sign(s) shall be trailer mounted. The message panel shall be at least 7 ft. above the pavement, present a level appearance, and be capable of displaying up to eight characters in each of three lines at a time. Character height shall be 18 in.

The message panel shall be of either a bulb matrix or disc matrix design controlled by an onboard computer capable of storing a minimum of 99 programmed messages for instant recall. The computer shall be capable of being programmed to accept messages created by the operator via an alpha-numeric keyboard and able to flash any six messages in sequence. The message panel shall also be capable of being controlled by a computer from a remote location via a cellular linkage. The Contractor shall supply the modem, the cellular phone, and the necessary software to run the sign from a remote computer at a location designated by the Engineer. The Contractor shall promptly program and/or reprogram the computer to provide the messages as directed by the Engineer.

The message panel shall be visible from ¼ mile under both day and night conditions. The letters shall be legible from 750 ft.

The sign shall include automatic dimming for nighttime operation and a power supply capable of providing 24 hours of uninterrupted service.

The Contractor shall provide all preventive maintenance efforts deemed necessary to achieve uninterrupted service. If service is interrupted for any cause and not restored within 24 hours, the Engineer will cause such work to be performed as may be necessary to provide this service. A penalty will be assessed per MOT non-compliance.

When the signs(s) are displaying messages, they shall be considered a traffic control devise. At all times when no message is displayed, they shall be considered equipment.

Method of Measurement. This work shall be measured for payment per calendar day, per week and per calendar month for message signs placed, and functioning properly. No measurement will be made for any arrow board that fails to function for any day or fraction thereof. Any portion of one calendar day during which the sign is operated as directed by the Engineer shall be paid as one full calendar day. Measurement will be in accordance with the following example:

PERIOD OF USE	MEASURED AS
1 to 6 consecutive days	number of days
7 to 13 consecutive days	1 week + No. days in excess of 7
28 to 34 consecutive days	1 month + No. of days in excess of 28
35 to 41 consecutive days	1 month + 1 week + No. of days in excess of 35

Basis of Payment. This work will be paid for at the contract unit price per calendar day, per week and per calendar month for PORTABLE CHANGEABLE MESSAGE SIGN for each arrow board placed, and accepted, which payment shall constitute full compensation for furnishing,

placing, maintaining, realigning, and removing the arrow boards, and to provide supplemental arrow boards as specified.

Pay Item Number	Designation	Unit of Measure
JT701200	PORTABLE CHANGEABLE MESSAGE SIGN	CAL DAY
JT701210	PORTABLE CHANGEABLE MESSAGE SIGN	WEEK
JT701220	PORTABLE CHANGEABLE MESSAGE SIGN	CAL MO

LATE SEASON TEMPORARY PAVEMENT MARKINGS (Illinois Tollway)

Effective: August 13, 2014
Revised: November 16, 2017

Description. This work shall consist of furnishing and applying temporary pavement marking during late season, after October 15th and before April 15th.
The Contractor shall be on the latest IDOT qualified list for "Thermoplastic, Epoxy and Polyurea Pavement Marking Contractors".

Before applying the pavement marking material, the pavement shall be cleaned according to the manufacturer's recommendations, dry, and free of debris or any other material that would reduce the adhesion of the markings on the pavement.

When air or surface temperatures fall below 25°F, no work shall be performed and no pavement markings shall be applied.

Materials. Materials shall be according to the following.

Item	Article
Epoxy Pavement Marking	1095.04
Polyurea Pavement Marking	1095.08

Equipment. Equipment shall be according to the following.

Item	Article
Epoxy	1105.02
Polyurea	1105.03

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

Basis of Payment. This work will be paid for at the contract unit prices per foot of applied line width, as specified. The unit prices include the cost of maintenance of traffic required for placement of pavement markings.

The replacement of Late Season Temporary Pavement Markings of the various line widths will be paid for on a force account basis in compliance with Article 109.04, Payment for Extra Work as described in the Illinois Tollway Supplemental Specifications.

Pay Item Number	Designation	Method of Measure
JT703104	LATE SEASON TEMPORARY PAVEMENT MARKING, 4"	FOOT
JT703106	LATE SEASON TEMPORARY PAVEMENT MARKING, 6"	FOOT
JT703110	LATE SEASON TEMPORARY PAVEMENT MARKING, 10"	FOOT
JT703112	LATE SEASON TEMPORARY PAVEMENT MARKING, 12"	FOOT
JT703135	LATE SEASON TEMPORARY PAVEMENT MARKING - LETTERS AND SYMBOLS	SQ FT

REMOVE AND REINSTALL MILEPOST MARKER

Description. This work shall consist of the removal of existing Mile Post Markers and installation in their permanent plan location at the end of contract to ground mount supports, wood posts or telescoping steel posts as shown in the Plans and herein specified. Included is the transportation, storage, reinstallation of sign panels and ground mount supports, wood posts or telescoping steel posts as required.

Materials. Post clip bolts shall be stainless steel conforming to ASTM A193, Class I Type 304, Grade 33. Aluminum flat washers shall conform to ASTM B209, Alloy 2024-T4 and shall be used under each nut to prevent gouging of the clip. Elastic stop nuts shall be stainless steel conforming to ASTM A194 (AASHTO M292), Grade B8. Aluminum hardware for sign mounting panels shall conform to ASTM B211, Alloy 2024-T4.

CONSTRUCTION REQUIREMENTS

The Contractor shall load, transport, and re-erect the signs in the new locations as shown in the Plans and directed by the Engineer. If interim storage of such signs is necessary for any reason the Contractor shall store the signs and be solely responsible for them until they are acceptably re-erected.

The Contractor shall assemble sign sections in the field as needed, erect and attach the signs to the supports. The Contractor shall supply hardware for attaching the signs to the supports. Extreme care shall be used in tightening elastic stop nuts to avoid excessive torque and cracking. Any nuts so damaged during installation shall be replaced.

The Contractor shall exercise due care in handling the signs during all phases of this operation. Any sign that is damaged due to the Contractor's handling or operations shall be repaired by the Contractor to the satisfaction of the Tollway, at no additional cost to the Illinois Tollway, and without cause for the Contractor claiming delay.

Any sign that is lost or damaged beyond use shall be replaced by the Contractor at no additional cost to the Tollway and without cause for the Contractor claiming delay.

Milepost marker removed and reinstalled which includes the removal of the sign panel, supports and foundations from the original location of the marker, storage of the mile marker till such time that it shall be reinstalled per plan location, and the installation itself.

Method of Measurement. This work shall be measured for payment in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE AND REINSTALL MILEPOST MARKER.

Pay Item Number	Designation	Unit of Measure
JT726040	REMOVE AND REINSTALL MILEPOST MARKER	EACH

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 ± 1 mil in thickness on concrete/asphalt pavements and 25 mils ± 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.

A. Multi-Polymer Resins

a) 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. (50 mm) 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 hybridized 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 muli-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
JT780340	MULTI-POLYMER PAVEMENT MARKING – LETTERS (8 FT)	SQ FT
JT780355	MULTI-POLYMER PAVEMENT MARKING – SYMBOLS (LARGE)	SQ FT

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 the application 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
JT780JH1	GROOVING FOR RECESSED PAVEMENT MARKINGS, LETTERS, NUMBERS AND SYMBOLS – TYPE I	SQ FT

PAVEMENT MARKING AND MARKER REMOVAL (Illinois Tollway)

Effective: September 27, 2006
Revised: November 11, 2015

This work shall consist of removing existing pavement markings and raised pavement lane markers according to Section 783 of the Standard Specifications except as modified herein.

Revise Article 783.02 of the Standard Specifications to read:

"783.02 Equipment. Equipment shall be according to the requirements of the following Articles of Section 1100 of the IDOT Standard Specifications – Equipment.

Item		Article/Section
(a)	Portable Shot Blast Equipment	1101.13
(b)	Grinders (note 1)	

Water Blaster with Vacuum Recovery. The water blaster shall remove the stripe from the pavement using a high pressurized water spray with a vacuum recovery system to provide a clean, almost dry surface, without the use of a secondary cleanup process. The removal shall be to the satisfaction of the Engineer. The equipment shall contain a storage system that allows for the storage of the wastewater while retaining the debris. The operator shall be in immediate control of the blast head. Water blasting shall be used only when the air temperature is a minimum of 32 ºF and rising.

Note 1. Grinding and Water Blasting equipment shall be approved by the Engineer."

Revise the first paragraph of Article 783.03(a) to read:

"(a) Pavement Markings. The existing pavement markings on permanent pavements shall be removed from the pavement by a method that does not materially damage the surface or texture of the pavement or surfacing. Very 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. Any damage to the pavement or surfacing caused by pavement marking removal shall be repaired by the Contractor at his/her own expense by methods acceptable to the Engineer. Where blast cleaning is used for the removal of pavement markings, care should be taken to protect all vehicular traffic from damage. Removal by Hydro blasting shall be required on new permanent pavement. Removal by shot blasting or grinding shall be allowed only on temporary short life pavements or on existing permanent pavements as approved by the Engineer."

Revise Article 783.06 to read:

783.06 Basis of Payment. This work will be paid for at the contract unit price per each for RAISED PAVEMENT LANE MARKER REMOVAL, RAISED PAVEMENT LANE MARKER, REFLECTOR REMOVAL or at the contract unit price per square foot for PAVEMENT MARKING REMOVAL by means of shot blasting or grinding, or at the contract unit price per square foot for WATERBLAST PAVEMENT MARKING REMOVAL WITH VACUUM RECOVERY.

Pay Item Number	Designation	Unit of Measure
JT783001	PAVEMENT MARKING REMOVAL	SQ FT
JT783005	WATERBLAST PAVEMENT MARKING REMOVAL WITH VACUUM RECOVERY	SQ FT
JT783007	RAISED PAVEMENT LANE MARKER REMOVAL	EACH
JT783009	RAISED PAVEMENT LANE MARKER, REFLECTOR REMOVAL	EACH

UPGRADE EXISTING LIGHTING CONTROLLER

Description. This work shall consist of providing specific upgrades to specific existing lighting controllers (LC-94-24.65 at mile post 24.65 and LC-94-23.85 at mile post 23.85), as noted on the plans and include providing connections, cleanup, equipment, tools, labor, and incidentals necessary to complete the work.

This work also consists of furnishing and installing a convenience receptacle with 15-ampere breaker protecting it, controller label decal, and providing circuit directory.

Materials. Wire and cable shall be in according to Article 1066.02 in accordance with the Tollway Supplemental Specifications.

Cable Insulation shall be in according to 1066.0302 in accordance with the Tollway Supplemental Specifications.

Splicing and Termination of Electric Cable shall be in according to Article 1066.06 of the Standard Specifications.

Wiring and Identification Markers shall be in according to Article 1066.07 of the Standard Specifications.

Receptacle shall be 15 or 20- amp Ground Fault Circuit Interrupting type receptacle in NEMA 1 enclosure. Circuit breaker protecting receptacle shall be 15-ampere NEMA 1 type.

Paint

Cleaning solvent conforming to ASTM D838

Primer meeting Section 4 and Section 5 of the Steel Structures Painting Council's Paint Specification No. 25 for red iron oxide, zinc oxide, raw linseed oil and alkyd primer.

Intermediate Coat shall have the same requirements as the primer except it should be tinted or shaded to produce a distinct contrast.

Finish Coat Section 4 and Section 5 of the Steel Structures Painting Council's Paint Specification No. 21 for lead free white or colored silicone alkyd paint.

Junction Box Cover shall match the existing junction box size and type.

Secondary Surge Arrestors shall be model number Z2-650-0 as manufactured by Joslyn Manufacturing and Supply Company, or approved equal.

CONSTRUCTION REQUIREMENTS

As listed for each controller on the detail plans, distribution panels shall be replaced, additional equipment and parts installed, and specified non-stainless steel control cabinets painted. Exterior paint and primer shall be removed, exterior shall be primed and repainted with weather-resistant finish, Rust-Oleum or approved equal.

Remove relay board and replace existing lighting contactor with new lighting contactor electrically held mounted on the sub panel 200A, 2P, 600V with 240V coil. Contractor is to replace NEMA type 1 enclosure of contactor if new contactor does not fit within the existing enclosure.

Clean all foreign debris from the controller.

Provide and install a new meter. Coordinate with utility to power lighting controller to upgrade the existing service to meter.

Remove and reseal all conduits exiting the controller with new gasketing material.

Trace all circuits. Provide legible circuitry directory on panel door.

Install controller label on the outside back wall opposite of the doors.

Furnish and install the junction box cover.

Furnish and install the new surge protection devices.

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

Make connection to all energized and ground conductors, in new handhole, or underpass luminaire as applicable, intercepting existing cable to lighting standard. Provide additional cable to provide 3 feet of slack, minimum. New connections shall be tested for conductivity and ground impedance. Inside controller, conductors are to be tagged with new circuit numbers, and durable circuit directory provided on panel door. test for proper operation using GFCI tester.

Method of Measurement. This work will be measured for payment, completed and tested, in units of each.

Basis of Payment. This work will be paid for at the contract lump sum price for UPGRADE EXISTING LIGHTING CONTROLLER, at the specified locations, complete in place, accepted.

Pay Item Number	Designation	Unit of Measure
JT825110	UPGRADE EXISTING LIGHTING CONTROLLER	EACH

REFURBISH EXISTING LIGHTING POLE

Description. This work shall consist of refurbishing existing light poles as noted on the plans and include equipment, tools, labor and incidentals necessary to complete the work.

Materials. Wire and cable shall be according to Article 1066.02 and in accordance with the Tollway Supplemental Specifications.

Cable Insulation shall be according to 1066.0302 and in accordance with the Tollway Supplemental Specifications.

Splicing and Termination of Electric Cable shall be according to Article 1066.06 of the Standard Specifications.

Wiring and Identification Markers shall be according to Article 1066.07 of the Standard Specifications.

CONSTRUCTION REQUIREMENTS

A final written compiled report for all poles within the project limits shall be provided for all poles being refurbished. The report shall document work performed on each pole and include the listed work identified below at a minimum. Identifiers for each pole shall include direction of travel, mile post and station.

Pole work should consist of the following:

- Visual inspection of the anchor bolts to ensure there is no metal fatigue.
- Visual Inspect mast arms welds to ensure there is no metal fatigue. Look for signs that the structural integrity of the bracket and the method of attachment has been compromised.
- Visual Inspect pole shaft for areas of rust, corrosion and any dents or signs that the structural integrity has been compromised.
- Inspect the anchor bolts to ensure that all anchor bolt nuts are in place and securely tightened.
- Signs of vibration:
    - Noise or humming in the pole.
    - Visual movement of the luminaire and / or pole.
    - Loosening of attachments.
    - Rust just above the weld at the base of the pole.
- Remove existing and install new interior pole cables
- Remove existing and install new fuses/surge protection

- Inspect and test ground rod and connections per specifications. Inspect handhole covers and light pole plates.

Should additional repairs to the light pole be required for work not already covered under this specification, they will be covered under ALLOWANCE FOR ADDITIONAL LIGHT POLE REPAIRS

Method of Measurement. This work will be measured for payment, completed and tested, in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each for REFURBISH EXISTING LIGHTING POLE.

Pay Item Number	Designation	Unit of Measure
JT830065	REFURBISH EXISTING LIGHTING POLE	EACH

RELOCATE EXISTING LIGHTING UNIT, SPECIAL

Description. This work shall consist of relocating an existing lighting unit as specified in Illinois Department of Transportation Standard Specifications for Road and Bridge Construction Adopted April 1, 2016 article 844.03 with the modifications below.

Remove paragraph six from Article 844.03 (b).

Add the following paragraph to Article 844.03 (b)

Method of Measurement. This work will be measured in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each, which payment shall constitute full compensation for removing and re-installing the lighting unit as described above.

Pay Item Number	Designation	Unit of Measure
JT844006	RELOCATE EXISTING LIGHTING UNIT, SPECIAL	EACH

DITCH CLEANING

Description. This work shall consist of regrading and shaping existing ditches which have accumulated debris and vegetation over time, at locations shown in the plans, and as directed by the Engineer, in order to re-establish existing ditch grade lines.

CONSTRUCTION REQUIREMENTS

All restoration areas shall have positive longitudinal drainage patterns. Ditch bottoms and side slopes shall be re-cut to conform to Tollway Standards and as shown in the plans. All regraded material shall be redistributed and regraded within the existing ROW and shall be placed outside the areas of any wetlands or Waters of the US (WOUS) as shown in the plans unless approved by the Engineer.

Restoration shall be paid for separately. Re-cut areas shall be deep enough to accommodate restoration top soil, if removal of material results in remaining topsoil to be less than 4 inches in depth.

Method of Measurement. This work shall be measured in feet, measured longitudinally along the ditch invert.

Basis of Payment. This work shall be paid for at the contract unit price per foot for DITCH CLEANING.

Pay Item Number	Designation	Unit of Measure
JT900105	DITCH CLEANING	FOOT

REMOVE AND REINSTALL ENERGY ATTENUATOR

Description. This work shall consist of the complete removal, temporary storage and re-installation of energy attenuators at locations shown on the plans and as directed by the Engineer.

This work shall be performed in accordance with the application sections of the Tollway Supplemental Specification for Energy Attenuator.

Materials. New materials, when required, shall be according to Article 1207.02 of the Tollway Supplemental Specifications.

Attenuator Removal. Attenuator removal shall be in accordance with Article 1207.03 of the Tollway Supplemental Specification. The salvageable attenuators shall be properly stored by the Contractor.

Attenuators damaged by the Contractor during removal, transit or while in storage shall be repaired and/or replaced to the satisfaction of the Engineer, at no additional cost to the Illinois Tollway.

Attenuator Reinstallation. The energy attenuators shall be reinstalled at the existing locations. Installation shall be in accordance with Article 1207.04 of the Tollway Supplemental Specification. The existing concrete pads may be raised due to an overlay. Special longer anchors will be required for reinstallation to the overlaid pad in accordance with the manufacturer's specifications and installation details. New bolts, nuts, washers, and anchors shall be used throughout in the re-erection work.

Attenuators damaged by the Contractor during reinstallation shall be repaired and/or replaced to the satisfaction of the Engineer, at no additional cost to the Illinois Tollway.

Method of Measurement. The complete removal and reinstallation of the energy attenuators will be measured for payment, complete in place, at the location of reinstallation, in units of each.

Basis of Payment. This work will be paid for at the contract unit price per each for REMOVE AND REINSTALL ENERGY ATTENUATOR.

Pay Item Number	Designation	Unit of Measure
JT990154	REMOVE AND REINSTALL ENERGY ATTENUATOR	EACH

WARRANTY (Illinois Tollway)

Effective: January 11, 2010
Revised: June 30, 2017

GENERAL

This special provision amends and supersedes any previous warranty provisions, and is in addition to the warranty requirements of Article 105.18 of the Illinois Tollway Supplemental Specifications.

The Contractor warrants that all work completed under the contract pay items, including all materials and workmanship furnished by the Contractor and subcontractors shall comply with the contract, and that the work shall be free from defects or failures for the period specified after commencement of the warranty period. The Contractor does not warrant the work against failures due to design defects, due to the Illinois Tollway's routine maintenance operations or due to the occurrence of acts of nature that the finished work was not designed to withstand.

The Contractor guarantees that after receipt of notice from the Illinois Tollway as provided herein, he/she shall perform the warranty work as specified in the notice in accordance with the warranty work actions specified herein including all necessary incidental work to complete the action and restore the complete facility, and damage to adjoining structures caused by failure of the warranted work, including but not limited to removal, engineering, material procurement, reinstallation, or replacement at the Contractor's cost and expense. The Illinois Tollway's remedies under this warranty are not exclusive but are in addition to any other remedies provided by this contract or law. The additional obligations undertaken by the Contractor to provide this warranty for the work and to perform in accordance herewith shall be secured by a performance and payment bond provided by the Contractor in a form furnished by the Illinois Tollway, and said bond to remain in full force and effect for the duration of the warranty period.

For the purpose of this special provision, the following definitions shall apply:

Warranty: An assurance by the seller and/or manufacturer of a product that the goods or property will continue to perform as promised or represented and which provides for a specific remedy, such as repair or replacement, in the event the goods or property fails within a specific timeframe.

Guaranty: An assurance by the contractor that the specific Work will meet expected workmanship standards as stated in the contract or in accordance with industry standards and provides for a specific remedy, such as repair or replacement of the Work, if it fails within a specific timeframe.

Std. Sp. / S.P.	DESCRIPTION	CONTRACTOR	MANUFACTURER
ROADWAY and BRIDGES			
109.08(b) Illinois Tollway Suppl.	GUARANTY AGAINST DEFECTIVE WORK	1 year	
1067.01(n) Illinois Tollway Suppl.	LUMINAIRE		
	Electrical system inside the luminaires (consisting of the core and coil ballast, starting aid, capacitor, socket, terminal board and wiring).	1 year	4 years
	All other parts of the luminaires.	1 year	2 years
1067.09(j) Illinois Tollway Suppl.	LIGHT EMITTING DIODE (LED) LUMINAIRE		
	complete luminaire (consisting of the housing, optical assembly, LED arrays or assemblies, LED drivers, integral control devices, surge protection devices, and internal wiring/terminal blocks)	1 year	10 years
S.P.	PAVEMENT MARKINGS	1 year	5 years
INTELLIGENT TRANSPORTATION SYSTEMS			
S.P.	CO-LOCATED SOLAR POWERED GENERATOR ASSEMBLY	1 year	1 year
S.P.	DYNAMIC MESSAGE SIGNS - TYPE 1	1 year	1 year
S.P.	DMS ELECTRICAL WORK - TYPE 1	1 year	1 year
S.P.	ITS POLE MOUNTED ENCLOSURE, ITS ASSEMBLY (CCTV or MVDS)	1 year	1 year
S.P.	CLOSED CIRCUIT TELEVISION (CCTV) CAMERA, ITS ASSEMBLY	1 year	1 year
S.P.	MICROWAVE VEHICLE DETECTION SYSTEM (MVDS), ITS ASSEMBLY	1 year	1 year
S.P.	TOWER MOUNTED CLOSED CIRCUIT TELEVISION (CCTV) CAMERA ASSEMBLY	1 year	1 year

COMMENCEMENT OF WARRANTY PERIOD

The Warranty Period Start Date shall be the Contract Completion date stated in the Chief Engineer's letter to the Contractor confirming that the Contractor has completed all work.

Commencement of warranty does not relieve the Contractor of any remaining or contractual obligations. Approval of the Warranty Period Start Date shall not be construed as final acceptance of the work of the contract not subject to approval.

The Contractor shall submit Tollway form A-27 documenting the warranty items and terms.

WARRANTY REQUIREMENTS

The Illinois Tollway will notify the Contractor of the need for corrective action. The Contractor shall perform corrective action promptly as defined in the notification. The notification will provide for a requested start date for performance of corrective action covered by the notice, and for a number of working days estimated to complete the corrective action. The Illinois Tollway and Contractor may agree upon a start date and reasonable period of performance to define prompt completion.

Illinois Department of Transportation

Check Sheet For Recurring Special Provisions

The Following Recurring Special Provisions Indicated By An "X" Are Applicable To This Contract And Are Included By Reference:

Recurring Special Provisions

Check Sheet #			Page No.
1	☐	Additional State Requirements for Federal-Aid Construction Contracts	64
2	☐	Subletting of Contracts (Federal-Aid Contracts)	67
3	☐	EEO	68
4	☐	Specific EEO Responsibilities Non Federal-Aid Contracts	78
5	☐	Required Provisions - State Contracts	83
6	☐	Asbestos Bearing Pad Removal	89
7	☐	Asbestos Waterproofing Membrane and Asbestos Hot-Mix Asphalt Surface Removal	90
8	☐	Temporary Stream Crossings and In-Stream Work Pads	91
9	☐	Construction Layout Stakes Except for Bridges	92
10	☐	Construction Layout Stakes	95
11	☐	Use of Geotextile Fabric for Railroad Crossing	98
12	☐	Subsealing of Concrete Pavements	100
13	☐	Hot-Mix Asphalt Surface Correction	104
14	☒	Pavement and Shoulder Resurfacing	106
15	☒	Patching with Hot-Mix Asphalt Overlay Removal	107
16	☐	Polymer Concrete	109
17	☐	PVC Pipeliner	111
18	☐	Bicycle Racks	112
19	☐	Temporary Portable Bridge Traffic Signals	114
20	☒	Work Zone Public Information Signs	116
21	☐	Nighttime Inspection of Roadway Lighting	117
22	☐	English Substitution of Metric Bolts	118
23	☐	Calcium Chloride Accelerator for Portland Cement Concrete	119
24	☐	Quality Control of Concrete Mixtures at the Plant	120
25	☒	Quality Control/Quality Assurance of Concrete Mixtures	128
26	☐	Digital Terrain Modeling for Earthwork Calculations	144
27	☐	Reserved	146
28	☐	Preventive Maintenance - Bituminous Surface Treatment	147
29	☐	Reserved	153
30	☐	Reserved	154
31	☐	Reserved	155
32	☐	Temporary Raised Pavement Markers	156
33	☐	Restoring Bridge Approach Pavements Using High-Density Foam	157
34	☐	Portland Cement Concrete Inlay or Overlay	160
35	☐	Portland Cement Concrete Partial Depth Hot-Mix Asphalt Patching	164

The Following Local Roads And Streets Recurring Special Provisions Indicated By An "X" Are Applicable To This Contract And Are Included By Reference:

Local Roads And Streets Recurring Special Provisions

BDE SPECIAL PROVISIONS
For the January 19 and March 9, 2018 Lettings

The following special provisions indicated by an "x" are applicable to this contract and will be included by the Project Development and Implementation Section of the BD&E. An * indicates a new or revised special provision for the letting.

	File Name	#		Special Provision Title	Effective	Revised
	80099	1		Accessible Pedestrian Signals (APS)	April 1, 2003	Jan. 1, 2014
	80382	2		Adjusting Frames and Grates	April 1, 2017	
	80274	3		Aggregate Subgrade Improvement	April 1, 2012	April 1, 2016
	80192	4		Automated Flagger Assistance Device	Jan. 1, 2008	
	80173	5		Bituminous Materials Cost Adjustments	Nov. 2, 2006	Aug. 1, 2017
	80241	6		Bridge Demolition Debris	July 1, 2009	
	5026I	7		Building Removal-Case I (Non-Friable and Friable Asbestos)	Sept. 1, 1990	April 1, 2010
	5048I	8		Building Removal-Case II (Non-Friable Asbestos)	Sept. 1, 1990	April 1, 2010
	5049I	9		Building Removal-Case III (Friable Asbestos)	Sept. 1, 1990	April 1, 2010
	5053I	10		Building Removal-Case IV (No Asbestos)	Sept. 1, 1990	April 1, 2010
	80366	11		Butt Joints	July 1, 2016	
	80386	12		Calcium Aluminate Cement for Class PP-5 Concrete Patching	Nov. 1, 2017	
*	80396	13		Class A and B Patching	Jan. 1, 2018	
	80384	14		Compensable Delay Costs	June 2, 2017	
	80198	15		Completion Date (via calendar days)	April 1, 2008	
	80199	16		Completion Date (via calendar days) Plus Working Days	April 1, 2008	
	80293	17		Concrete Box Culverts with Skews > 30 Degrees and Design Fills ≤ 5 Feet	April 1, 2012	July 1, 2016
	80311	18		Concrete End Sections for Pipe Culverts	Jan. 1, 2013	April 1, 2016
	80277	19		Concrete Mix Design – Department Provided	Jan. 1, 2012	April 1, 2016
	80261	20		Construction Air Quality – Diesel Retrofit	June 1, 2010	Nov. 1, 2014
	80387	21		Contrast Preformed Plastic Pavement Marking	Nov. 1, 2017	
	80029	22		Disadvantaged Business Enterprise Participation	Sept. 1, 2000	July 2, 2016
*	80378	23		Dowel Bar Inserter	Jan. 1, 2017	Jan. 1, 2018
	80388	24		Equipment Parking and Storage	Nov. 1, 2017	
	80229	25		Fuel Cost Adjustment	April 1, 2009	Aug. 1, 2017
	80304	26		Grooving for Recessed Pavement Markings	Nov. 1, 2012	Nov. 1, 2017
	80246	27		Hot-Mix Asphalt – Density Testing of Longitudinal Joints	Jan. 1, 2010	April 1, 2016
*	80347	28		Hot-Mix Asphalt – Pay for Performance Using Percent Within Limits – Jobsite Sampling	Nov. 1, 2014	Jan. 1, 2018
	80383	29		Hot-Mix Asphalt – Quality Control for Performance	April 1, 2017	Nov. 1, 2017
	80376	30		Hot-Mix Asphalt – Tack Coat	Nov. 1, 2016	
*	80392	31		Lights on Barricades	Jan. 1, 2018	
	80336	32		Longitudinal Joint and Crack Patching	April 1, 2014	April 1, 2016
*	80393	33		Manholes, Valve Vaults, and Flat Slab Tops	Jan. 1, 2018	
	80045	34		Material Transfer Device	June 15, 1999	Aug. 1, 2014
*	80394	35		Metal Flared End Section for Pipe Culverts	Jan. 1, 2018	
	80165	36		Moisture Cured Urethane Paint System	Nov. 1, 2006	Jan. 1, 2010
	80349	37		Pavement Marking Blackout Tape	Nov. 1, 2014	April 1, 2016
	80371	38		Pavement Marking Removal	July 1, 2016	
*	80390	39		Payments to Subcontractors	Nov. 2, 2017	
	80377	40		Portable Changeable Message Signs	Nov. 1, 2016	April 1, 2017
	80389	41		Portland Cement Concrete	Nov. 1, 2017	
	80359	42		Portland Cement Concrete Bridge Deck Curing	April 1, 2015	Nov. 1, 2017
	80385	43		Portland Cement Concrete Sidewalk	Aug. 1, 2017	
	80300	44		Preformed Plastic Pavement Marking Type D - Inlaid	April 1, 2012	April 1, 2016
	80328	45		Progress Payments	Nov. 2, 2013	
	3426I	46		Railroad Protective Liability Insurance	Dec. 1, 1986	Jan. 1, 2006

	File Name	#		Special Provision Title	Effective	Revised
	80157	47		Railroad Protective Liability Insurance (5 and 10)	Jan. 1, 2006	
*	80306	48		Reclaimed Asphalt Pavement (RAP) and Reclaimed Asphalt Shingles (RAS)	Nov. 1, 2012	Jan. 1, 2018
*	80395	49		Sloped Metal End Section for Pipe Culverts	Jan. 1, 2018	
	80340	50		Speed Display Trailer	April 2, 2014	Jan. 1, 2017
	80127	51		Steel Cost Adjustment	April 2, 2004	Aug. 1, 2017
*	80391	52		Subcontractor Mobilization Payments	Nov. 2, 2017	
	80317	53		Surface Testing of Hot-Mix Asphalt Overlays	Jan. 1, 2013	April 1, 2016
	80298	54	✓	Temporary Pavement Marking (NOTE: This special provision was previously named *"Pavement Marking Tape Type IV"*.)	April 1, 2012	April 1, 2017
	20338	55		Training Special Provisions	Oct. 15, 1975	
*	80318	56		Traversable Pipe Grate for Concrete End Sections (NOTE: This special provision was previously named "*Traversable Pipe Grate*".)	Jan. 1, 2013	Jan. 1, 2018
	80288	57		Warm Mix Asphalt	Jan. 1, 2012	April 1, 2016
	80302	58		Weekly DBE Trucking Reports	June 2, 2012	April 2, 2015
	80071	59		Working Days	Jan. 1, 2002	

The following special provisions are in the 2018 Supplemental Specifications and Recurring Special Provisions.

File Name	Special Provision Title	New Location	Effective	Revised
80368	Light Tower	Article 1069.08	July 1, 2016	
80369	Mast Arm Assembly and Pole	Article 1077.03(a)(1)	July 1, 2016	
80338	Portland Cement Concrete Partial Depth Hot-Mix Asphalt Patching	Recurring CS #35	April 1, 2014	April 1, 2016
80379	Steel Plate Beam Guardrail	Articles 630.02, 630.05, 630.06, and 630.08	Jan. 1, 2017	
80381	Traffic Barrier Terminal, Type 1 Special	Article 631.04	Jan. 1, 2017	
80380	Tubular Markers	Articles 701.03, 701.15, 701.18, and 1106.02	Jan. 1, 2017	

The following special provisions require additional information from the designer. The additional information needs to be submitted as a separate document. The Project Development and Implementation section will then include the information in the applicable special provision. The Special Provisions are:

- Bridge Demolition Debris
- Building Removal - Case I
- Building Removal – Case II
- Building Removal - Case III
- Building Removal-Case IV
- Completion Date
- Completion Date Plus Working Days
- DBE Participation
- Material Transfer Device
- Railroad Protective Liability Insurance
- Training Special Provisions
- Working Days

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."

80298

CLEANING AND PAINTING EXISTING STEEL STRUCTURES (IDOT GBSP)
Effective: October 2, 2001
Revised: April 22, 2016

Description. This work shall consist of the preparation of all designated metal surfaces by the method(s) specified on the plans. This work also includes the painting of those designated surfaces with the paint system(s) specified on the plans. The Contractor shall furnish all materials, equipment, labor, and other essentials necessary to accomplish this work and all other work described herein and as directed by the Engineer.

Materials. All materials to be used on an individual structure shall be produced by the same manufacturer.

The Bureau of Materials and Physical Research has established a list of all products that have met preliminary requirements. Each batch of material, except for the penetrating sealer, shall be tested and assigned a MISTIC approval number before use. The specified colors shall be produced in the coating manufacturer's facility. Tinting of the coating after it leaves the manufacturer's facility is not allowed.

The paint materials shall meet the following requirements of the Standard Specification and as noted below:

Item	Article
(a) Waterborne Acrylic	1008.04
(b) Aluminum Epoxy Mastic	1008.03
(c) Organic Zinc Rich Primer	1008.05
(d) Epoxy/ Aliphatic Urethane	1008.05
(e) Penetrating Sealer (Note 1)	
(f) Moisture Cured Zinc Rich Urethane Primer (Note 2)	
(g) Moisture Cured Aromatic/Aliphatic Urethane (Note 2)	
(h) Moisture Cured Penetrating Sealer (Note 3)	

Note 1: The Epoxy Penetrating Sealer shall be a cross-linked multi component sealer. The sealer shall have the following properties:

(a) The volume solids shall be 98 percent (plus or minus 2 percent).
(b) Shall be clear or slightly tinted color.

Note 2: These material requirements shall be according to the Special Provision for the Moisture Cured Urethane Paint System.

Note 3: The Moisture Cured Penetrating Sealer manufacturer's certification will be required.

Submittals. The Contractor shall submit for Engineer review and acceptance, the following plans and information for completing the work. The submittals shall be provided within 30 days of execution of the contract unless given written permission by the Engineer to submit them at a later date. Work cannot proceed until the submittals are accepted by the Engineer. Details for each of the plans are presented within the body of this specification.

a) Contractor/Personnel Qualifications. Evidence of Contractor qualifications and the names and qualifications/experience/training of the personnel managing and implementing the Quality Control program and conducting the quality control tests, and certifications for the CAS (Coating Application Specialists) on SSPC-QP1 and QP2 projects.

b) Quality Control (QC) Program. The QC Program shall identify the following; the instrumentation that will be used, a schedule of required measurements and observations, procedures for correcting unacceptable work, and procedures for improving surface preparation and painting quality as a result of quality control findings. The program shall incorporate at a minimum, the IDOT Quality Control Daily Report form, or a Contractor form (paper or electronic) that provides equivalent information.

c) Inspection Access Plan. The inspection access plan for use by Contractor QC personnel for ongoing inspections and by the Engineer during Quality Assurance (QA) observations.

d) Surface Preparation/Painting Plan. The surface preparation/painting plan shall include the methods of surface preparation and type of equipment to be utilized for washing, hand/power tool cleaning, removal of rust, mill scale, paint or foreign matter, abrasive blast or water jetting, and remediation of chloride. If detergents, additives, or inhibitors are incorporated into the water, the Contractor shall include the names of the materials and Safety Data Sheets (SDS). The Contractor shall identify the solvents proposed for solvent cleaning together with SDS.

   If cleaning and painting over existing galvanized surfaces are specified, the plan shall address surface preparation, painting, and touch up/repair of the galvanized surfaces.

   The plan shall also include the methods of coating application and equipment to be utilized.

   If the Contractor proposes to heat or dehumidify the containment, the methods and equipment proposed for use shall be included in the Plan for the Engineer’s consideration.

e) Paint Manufacturer Certifications and Letters. When a sealer is used, the Contractor shall provide the manufacturer’s certification of compliance with IDOT testing requirements listed under “Materials” above. A certification regarding the compatibility of the sealer with the specified paint system shall also be included.

   When rust inhibitors are used, the Contractor shall provide a letter from the coating manufacturer indicating that the inhibitor is compatible with, and will not adversely affect the performance of the coating system.

   If the use of a chemical soluble salt remover is proposed by the Contractor, provide a letter from the coating manufacturer indicating that the material will not adversely effect the performance of the coating system.

   The paint manufacturer's most recent application and thinning instructions, SDS and product data sheets shall be provided, with specific attention drawn to storage temperatures, and the temperatures of the material, surface and ambient air at the time of application.

   A letter or written instructions from the coating manufacturer shall be provided indicating the length of time that each coat must be protected from cold or inclement weather (e.g., exposure to rain) during its drying period, the maximum recoat time for each coat, and the steps necessary to prepare each coat for overcoating if the maximum recoat time is exceeded.

f) Abrasives. Abrasives to be used for abrasive blast cleaning, including SDS. For expendable abrasives, the Contractor shall provide certification from the abrasive supplier that the abrasive meets the requirements of SSPC-AB1. For steel grit abrasives, the certification shall indicate that the abrasive meets the requirements of SSPC-AB3.

g) Protective Coverings. Plan for containing or controlling paint debris (droplets, spills, overspray, etc.). Any tarpaulins or protective coverings proposed for use shall be fire retardant. For submittal requirements involving the containment used to remove lead paint, the Contractor shall refer to Special Provision for Containment and Disposal of Lead Paint Cleaning Residues.

h) Progress Schedule. Progress schedule shall be submitted per Article 108.02 and shall identify all major work items (e.g., installation of rigging/containment, surface preparation, and coating application).

When the Engineer accepts the submittals, the Contractor will receive written notification. The Contractor shall not begin any paint removal work until the Engineer has accepted the submittals. The Contractor shall not construe Engineer acceptance of the submittals to imply approval of any particular method or sequence for conducting the work, or for addressing health and safety concerns. Acceptance of the programs does not relieve the Contractor from the responsibility to conduct the work according to the requirements of Federal, State, or Local regulations and this specification, or to adequately protect the health and safety of all workers involved in the project and any members of the public who may be affected by the project. The Contractor remains solely responsible for the adequacy and completeness of the programs and work practices, and adherence to them.

Contractor Qualifications. Unless indicated otherwise on the contract plans, for non lead abatement projects, the painting Contractor shall possess current SSPC–QP1 certification. Unless indicated otherwise on the plans, for lead abatement projects the Contractor shall also possess current SSPC-QP2 certification. The Contractor shall maintain certified status throughout the duration of the painting work under the contract. The Department reserves the right to accept Contractors documented to be currently enrolled in the SSPC-QP7, Painting Contractor Introductory Program, Category 2, in lieu of the QP certifications noted above.

Quality Control (QC) Inspections. The Contractor shall perform first line, in process QC inspections. The Contractor shall implement the submitted and accepted QC Program to insure that the work accomplished complies with these specifications. The designated Quality Control inspector shall be onsite full time during any operations that affect the quality of the coating system (e.g., surface preparation and chloride remediation, coating mixing and application, and evaluations between coats and upon project completion). The Contractor shall use the IDOT Quality Control Daily Report form to record the results of quality control tests. Alternative forms (paper or electronic) will be allowed provided they furnish equivalent documentation as the IDOT form, and they are accepted as part of the QC Program submittal. The completed reports shall be turned into the Engineer before work resumes the following day. The Engineer or designated representative will sign the report. The signature is an acknowledgment that the report has been received, but should not be construed as an agreement that any of the information documented therein is accurate.

Contractor QC inspections shall include, but not be limited to the following:

- Suitability of protective coverings and the means employed to control project debris and paint spills, overspray, etc.
- Ambient conditions
- Surface preparation (solvent cleaning, pressure washing including chalk tests, hand/power tool or abrasive blast cleaning, etc.)
- Chloride remediation
- Coating application (specified materials, mixing, thinning, and wet/dry film thickness)
- Recoat times and cleanliness between coats
- Coating continuity and coverage (freedom from runs, sags, overspray, dryspray, pinholes, shadow-through, skips, misses, etc.)

The personnel managing the Contractor's QC Program shall possess a minimum classification of Society of Protective Coatings (SSPC) BCI certified, National Association of Corrosion Engineers (NACE) Coating Inspector Level 2 - Certified, and shall provide evidence of successful inspection of 3 bridge projects of similar or greater complexity and scope that have been completed in the last 2 years. Copies of the certification and experience shall be provided. References for experience shall be provided and shall include the name, address, and telephone number of a contact person employed by the bridge owner.

The personnel performing the QC tests shall be trained in coatings inspection and the use of the testing instruments. Documentation of training shall be provided. The QC personnel shall not perform hands on surface preparation or painting activities. Painters shall perform wet film thickness measurements, with QC personnel conducting random spot checks of the wet film. The Contractor shall not replace the QC personnel assigned to the project without advance notice to the Engineer, and acceptance of the replacement(s), by the Engineer.

The Contractor shall supply all necessary equipment with current calibration certifications to perform the QC inspections. Equipment shall include the following at a minimum:

- Sling psychrometer or digital psychrometer for the measurement of dew point and relative humidity, together with all necessary weather bureau tables or psychrometric charts. In the event of a conflict between readings with the sling psychrometer and the digital psychrometer, the readings with the sling psychrometer shall prevail.
- Surface temperature thermometer
- SSPC Visual Standards VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning; SSPC-VIS 3, Visual Standard for Power and Hand-Tool Cleaned Steel; SSPC-VIS 4, Guide and Reference Photographs for Steel Prepared by Water Jetting, and/or SSPC-VIS 5, Guide and Reference Photographs for Steel Prepared by Wet Abrasive Blast Cleaning, as applicable.
- Test equipment for determining abrasive cleanliness (oil content and water-soluble contaminants) according to SSPC abrasive specifications AB1, AB2, and AB3.
- Commercially available putty knife of a minimum thickness of 40 mils (1mm) and a width between 1 and 3 in. (25 and 75 mm). Note that the putty knife is only required for projects in which the existing coating is being feathered and tested with a dull putty knife.
- Testex Press-O-Film Replica Tape and Micrometer compliant with Method C of ASTM D4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel, or digital profile depth micrometer compliant with ASTM D4417, Method B. In the event of a conflict between measurements with the two instruments on abrasive blast cleaned steel, the results with the Testex Tape shall prevail. Note that for measuring the profile of steel power

tool cleaned to SSPC-SP15, Commercial Grade Power Tool Cleaning, the digital profile depth micrometer shall be used.
- Bresle Cell Kits or CHLOR*TEST kits for chloride determinations, or equivalent
- Wet Film Thickness Gage
- Blotter paper for compressed air cleanliness checks
- Type 2 Electronic Dry Film Thickness Gage per SSPC - PA2, Procedure for Determining Conformance to Dry Coating Thickness Requirements
- Standards for verifying the accuracy of the dry film thickness gage
- Light meter for measuring light intensity during paint removal, painting, and inspection activities
- All applicable ASTM and SSPC Standards used for the work (reference list attached)

The accuracy of the instruments shall be verified by the Contractor's personnel according to the equipment manufacturer's recommendations and the Contractor's QC Program. All inspection equipment shall be made available to the Engineer for QA observations on an as needed basis.

Hold Point Notification. Specific inspection items throughout this specification are designated as Hold Points. Unless other arrangements are made at the project site, the Contractor shall provide the Engineer with a minimum 4-hour notification before a Hold Point inspection will be reached. If the 4-hour notification is provided and the Work is ready for inspection at that time, the Engineer will conduct the necessary observations. If the Work is not ready at the appointed time, unless other arrangements are made, an additional 4-hour notification is required. Permission to proceed beyond a Hold Point without a QA inspection will be granted solely at the discretion of the Engineer, and only on a case by case basis.

Quality Assurance (QA) Observations. The Engineer will conduct QA observations of any or all phases of the work. The presence or activity of Engineer observations in no way relieves the Contractor of the responsibility to provide all necessary daily QC inspections of his/her own and to comply with all requirements of this Specification.

The Engineer has the right to reject any work that was performed without adequate provision for QA observations.

Inspection Access and Lighting. The Contractor shall facilitate the Engineer's observations as required, including allowing ample time to view the work. The Contractor shall furnish, erect and move scaffolding or other mechanical equipment to permit close observation of all surfaces to be cleaned and painted. This equipment shall be provided during all phases of the work. Examples of acceptable access structures include:

- Mechanical lifting equipment, such as, scissor trucks, hydraulic booms, etc.
- Platforms suspended from the structure comprised of trusses or other stiff supporting members and including rails and kick boards.
- Simple catenary supports are permitted only if independent life lines for attaching a fall arrest system according to Occupational Safety and Health Administration (OSHA) regulations are provided.

When the surface to be inspected is more than 6 ft. (1.8 m) above the ground or water surface, and fall prevention is not provided (e.g., guardrails are not provided), the Contractor shall provide the Engineer with a safety harness and a lifeline according to OSHA regulations. The lifeline and attachment shall not direct the fall into oncoming traffic. The Contractor shall provide a method of attaching the lifeline to the structure independent of the inspection facility or any support of the

platform. When the inspection facility (e.g., platform) is more than 2 1/2 ft. (800 mm) above the ground, the Contractor shall provide an approved means of access onto the platform.

The Contractor shall provide artificial lighting in areas both inside and outside the containment where natural light is inadequate, as determined by the Engineer, to allow proper cleaning, inspection, and painting. Illumination for inspection shall be at least 30 foot candles (325 LUX). Illumination for cleaning and painting, including the working platforms, access and entryways shall be at least 20 foot candles (215 LUX). General work area illumination outside the containment shall be employed at the discretion of the Engineer and shall be at least 5 foot candles. The exterior lighting system shall be designed and operated so as to avoid glare that interferes with traffic, workers, and inspection personnel.

Surface Preparation and Painting Equipment. All cleaning and painting equipment shall include gages capable of accurately measuring fluid and air pressures and shall have valves capable of regulating the flow of air, water or paint as recommended by the equipment manufacturer. The equipment shall be maintained in proper working order.

Diesel or gasoline powered equipment shall be positioned or vented in a manner to prevent deposition of combustion contaminants on any part of the structure.

Hand tools, power tools, pressure washing, water jetting, abrasive blast cleaning equipment, brushes, rollers, and spray equipment shall be of suitable size and capacity to perform the work required by this specification. All power tools shall be equipped with vacuums and High Efficiency Particulate Air (HEPA) filtration. Appropriate filters, traps and dryers shall be provided for the compressed air used for abrasive blast cleaning and conventional spray application. Paint pots shall be equipped with air operated continuous mixing devices unless prohibited by the coating manufacturer.

Test Sections. Prior to surface preparation, the Contractor shall prepare a test section(s) on each structure to be painted in a location(s) which the Engineer considers to be representative of the existing surface condition and steel type for the structure as a whole. More than one test section may be needed to represent the various design configurations of the structure. The purpose of the test section(s) is to demonstrate the use of the tools and degree of cleaning required (cleanliness and profile) for each method of surface preparation that will be used on the project. Each test section shall be approximately 10 sq. ft. (0.93 sq m). The test section(s) shall be prepared using the same equipment, materials and procedures as the production operations. The Contractor shall prepare the test section(s) to the specified level of cleaning according to the appropriate SSPC visual standards, modified as necessary to comply with the requirements of this specification. The written requirements of the specification prevail in the event of a conflict with the SSPC visual standards. Only after the test section(s) have been approved shall the Contractor proceed with surface preparation operations. Additional compensation will not be allowed the Contractor for preparation of the test section(s).

For the production cleaning operations, the specifications and written definitions, the test section(s), and the SSPC visual standards shall be used in that order for determining compliance with the contractual requirements.

Protective Coverings and Damage. All portions of the structure that could be damaged by the surface preparation and painting operations (e.g., utilities), including any sound paint that is allowed to remain according to the contract documents, shall be protected by covering or shielding. Tarpaulins drop cloths, or other approved materials shall be employed. The Contractor shall comply with the provisions of the Illinois Environmental Protection Act. Paint drips, spills, and overspray are not permitted to escape into the air or onto any other surfaces or surrounding property not intended to be

painted. Containment shall be used to control paint drips, spills, and overspray, and shall be dropped and all equipment secured when sustained wind speeds of 40 mph (64 kph) or greater occur, unless the containment design necessitates action at lower wind speeds. The contractor shall evaluate project-specific conditions to determine the specific type and extent of containment needed to control the paint emissions and shall submit a plan for containing or controlling paint debris (droplets, spills, overspray, etc.) to the Engineer for acceptance prior to starting the work. Acceptance by the Engineer shall not relieve the Contractor of their ultimate responsibility for controlling paint debris from escaping the work zone.

When the protective coverings need to be attached to the structure, they shall be attached by bolting, clamping, or similar means. Welding or drilling into the structure is prohibited unless approved by the Engineer in writing. When removing coatings containing lead the containment and disposal of the residues shall be as specified in the Special Provision for Containment and Disposal of Lead Paint Cleaning Residues contained elsewhere in this Contract. When removing coatings not containing lead the containment and disposal of the residues shall be as specified in the Special Provision for Containment and Disposal of Non-Lead Paint Cleaning Residues contained elsewhere in this Contract.

The Contractor shall be responsible for any damage caused to persons, vehicles, or property, except as indemnified by the Response Action Contractor Indemnification Act. Whenever the intended purposes of the controls or protective devices used by the Contractor are not being accomplished, work shall be immediately suspended until corrections are made. Damage to vehicles or property shall be repaired by the Contractor at the Contractor's expense. Painted surfaces damaged by any Contractor's operation shall be repaired, removed and/or repainted, as directed by the Engineer, at the Contractor's expense.

Weather Conditions. Surfaces to be painted after cleaning shall remain free of moisture and other contaminants. The Contractor shall control his/her operations to insure that dust, dirt, or moisture do not come in contact with surfaces cleaned or painted that day.

a) The surface temperature shall be at least 5°F (3°C) above the dew point during final surface preparation operations. The manufacturers' published literature shall be followed for specific temperature, dew point, and humidity restrictions during the application of each coat.

b) If the Contractor proposes to control the weather conditions inside containment, proposed methods and equipment for heating and/or dehumidification shall be included in the work plans for the Engineer's consideration. Only indirect fired heating equipment shall be used to prevent the introduction of moisture and carbon monoxide into the containment. The heating unit(s) shall be ventilated to the outside of the containment. Any heating/dehumidification proposals accepted by the Engineer shall be implemented at no additional cost to the department.

c) Cleaning and painting shall be done between April 15 and October 31 unless authorized otherwise by the Engineer in writing.

The Contractor shall monitor temperature, dew point, and relative humidity every 4 hours during surface preparation and coating application in the specific areas where the work is being performed. The frequency of monitoring shall increase if weather conditions are changing. If the weather conditions after application and during drying are forecast to be outside the acceptable limits established by the coating manufacturer, coating application shall not proceed. If the weather conditions are forecast to be borderline relative to the limits established by the manufacturer,

monitoring shall continue at a minimum of 4-hour intervals throughout the drying period. The Engineer has the right to reject any work that was performed, or drying that took place, under unfavorable weather conditions. Rejected work shall be removed, recleaned, and repainted at the Contractor's expense.

Compressed Air Cleanliness. Prior to using compressed air for abrasive blast cleaning, blowing down the surfaces, and painting with conventional spray, the Contractor shall verify that the compressed air is free of moisture and oil contamination according to the requirements of ASTM D 4285. The tests shall be conducted at least one time each shift for each compressor system in operation. If air contamination is evident, the Contractor shall change filters, clean traps, add moisture separators or filters, or make other adjustments as necessary to achieve clean, dry air. The Contractor shall also examine the work performed since the last acceptable test for evidence of defects or contamination caused by the compressed air. Effected work shall be repaired at the Contractor's expense.

Low Pressure Water Cleaning and Solvent Cleaning (HOLD POINT). The Contractor shall notify the Engineer 24 hours in advance of beginning surface preparation operations.

a) Water Cleaning of Lead Containing Coatings Prior to Overcoating. Prior to initiating any mechanical cleaning such as hand/power tool cleaning on surfaces that are painted with lead, all surfaces to be prepared and painted, and the tops of pier and abutment caps shall be washed. Washing is not required if the surfaces will be prepared by water jetting.

   Washing shall involve the use of potable water at a minimum of 1000 psi (7 MPa) and less than 5000 psi (34 MPa) according to "Low Pressure Water Cleaning" of SSPC-SP WJ-4. There are no restrictions on the presence of flash rusting of bare steel after cleaning. Paint spray equipment shall not be used to perform the water cleaning. The cleaning shall be performed in such a manner as to remove dust, dirt, chalk, insect and animal nests, bird droppings, loose coating, loose mill scale, loose rust and other corrosion products, and other foreign matter. Water cleaning shall be supplemented with scrubbing as necessary to remove the surface contaminants. . The water, debris, and any loose paint removed by water cleaning shall be collected for proper disposal. The washing shall be completed no more than 2 weeks prior to surface preparation.

   If detergents or other additives are added to the water, the detergents/additives shall be included in the submittals and not used until accepted by the Engineer. When detergents or additives are used, the surface shall be rinsed with potable water before the detergent water dries.

   After washing has been accepted by the Engineer, all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants which remain on the steel surfaces to be painted shall be removed by solvent cleaning according to SSPC – SP1, supplemented with scraping (e.g., to remove large deposits of asphaltic cement) as required. The solvent(s) used for cleaning shall be compatible with the existing coating system. The Contractor shall identify the proposed solvent(s) in the submittals. If the existing coating is softened, wrinkled, or shows other signs of attack from the solvents, the Contractor shall immediately discontinue their use. The name and composition of replacement solvents, together with MSDS, shall be submitted for Engineer acceptance prior to use.

   Under no circumstances shall subsequent hand/power tool cleaning or abrasive blast cleaning be performed in areas containing surface contaminants or in areas where the Engineer has not accepted the washing and solvent cleaning. Surfaces prepared by hand/power tool

cleaning or abrasive blast cleaning without approval of the washing and solvent cleaning may be rejected by the Engineer. Rejected surfaces shall be recleaned with both solvent and the specified mechanical means at the Contractor's expense.

After all washing and mechanical cleaning are completed, representative areas of the existing coating shall be tested to verify that the surface is free of chalk and other loose surface debris or foreign matter. The testing shall be performed according to ASTM D4214. Cleaning shall continue until a chalk rating of 6 or better is achieved in every case.

b) Water Cleaning of Non-Lead Coatings Prior to Overcoating. Thoroughly clean the surfaces according to the steps defined above for "Water Cleaning of Lead Containing Coatings Prior to Overcoating." The wash water does not need to be collected, but paint chips, insect and animal nests, bird droppings and other foreign matter shall be collected for proper disposal. If the shop primer is inorganic zinc, the chalk rating does not apply. All other provisions are applicable.

c) Water Cleaning/Debris Removal Prior to Total Coating Removal. When total coating removal is specified, water cleaning of the surface prior to coating removal is not required by this specification and is at the option of the Contractor. If the Contractor chooses to use water cleaning, the above provisions for water cleaning of lead and non-lead coatings apply as applicable, including collection and disposal of the waste.

Whether or not the surfaces are pre-cleaned using water, the tops of the pier caps and abutments shall be cleaned free of dirt, paint chips, insect and animal nests, bird droppings and other foreign matter and the debris collected for proper disposal. Cleaning can be accomplished by wet or dry methods.

Prior to mechanical cleaning, oil, grease, and other soluble contaminants on bare steel or rusted surfaces shall be removed by solvent cleaning according to SSPC-SP1.

d) Water Cleaning Between Coats. When foreign matter has accumulated on a newly applied coat, washing and scrubbing shall be performed prior to the application of subsequent coats. The water does not need to be collected unless it contacts existing lead containing coatings.

Laminar and Stratified Rust. All laminar and stratified rust that has formed on the existing steel surfaces shall be removed. Pack rust formed along the perimeter of mating surfaces of connected plates or shapes of structural steel shall be removed to the extent feasible without mechanically detaching the mating surface. Any pack rust remaining after cleaning the mating surfaces shall be tight and intact when examined using a dull putty knife. The tools used to remove these corrosion products shall be identified in the submittals and accepted by the Engineer. If the surface preparation or removal of rust results in nicks or gouges in the steel, the work shall be suspended, and the damaged areas repaired to the satisfaction of the Engineer, at the Contractor's expense. The Contractor shall also demonstrate that he/she has made the necessary adjustments to prevent a reoccurrence of the damage prior to resuming work. If surface preparation reveals holes or section loss, or creates holes in the steel, the Contractor shall notify the Engineer. Whenever possible, the Department will require that the primer be applied to preserve the area, and allow work to proceed, with repairs and touch up performed at a later date.

Surface Preparation (HOLD POINT). One or more of the following methods of surface preparation shall be used as specified on the plans. When a method of surface preparation is specified, it applies to the entire surface, including areas that may be concealed by the containment connection points. In

each case, as part of the surface preparation process, soluble salts shall be remediated as specified under “Soluble Salt Remediation.” The Contractor shall also note that the surface of the steel beneath the existing coating system may contain corrosion and/or mill scale. Removal of said corrosion and/or mill scale, when specified, shall be considered included in this work and no extra compensation will be allowed.

When a particular cleaning method is specified for use in distinct zones on the bridge, the cleaning shall extend into the existing surrounding paint until a sound border is achieved. The edge of the existing paint is considered to be sound and intact after cleaning if it cannot be lifted by probing the edge with a dull putty knife. The sound paint shall be feathered for a minimum of 1 1/2 in. (40 mm) to achieve a smooth transition between the prepared steel and the existing coatings. Sanders with vacuum attachments, which have been approved by the Engineer, shall be used as necessary to accomplish the feathering.

a) Limited Access Areas: A best effort with the specified methods of cleaning shall be performed in limited access areas such as the backsides of rivets inside built up box members. The equipment being used for the majority of the cleaning may need to be supplemented with other commercially available equipment, such as angle nozzles, to properly clean the limited access areas. The acceptability of the best effort cleaning in these areas is at the sole discretion of the Engineer.

b) Near-White Metal Blast Cleaning: This surface preparation shall be accomplished according to the requirements of Near-White Metal Blast Cleaning SSPC-SP 10. Unless otherwise specified in the contract, the designated surfaces shall be prepared by dry abrasive blast cleaning, wet abrasive blast cleaning, or water jetting with abrasive injection. A Near-White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining.

   Random staining shall be limited to no more than 5 percent of each 9 sq. in. (58 sq. cm) of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. With the exception of crevices as defined below, surface discoloration is considered to be a residue that must be removed, rather than a stain, if it possesses enough mass or thickness that it can be removed as a powder or in chips when scraped with a pocketknife.

   A surface profile shall be created on the steel as defined later under “Surface Profile.”

   At the discretion of the Engineer, after a best effort cleaning, slight traces of existing coating may be permitted to remain within crevices such as those created between the steel and rivets orbolts/washers/nuts, and between plates.. When traces of coating are permitted to remain, the coating shall be tightly bonded when examined by probing with a dull putty knife. The traces of coating shall be confined to the bottom portion of the crevices only, and shall not extend onto the surrounding steel or plate or onto the outer surface of the rivets or bolts. Pitted steel is excluded from exemption considerations and shall be cleaned according to SSPC-SP10.

   If hackles or slivers are visible on the steel surface after cleaning, the Contractor shall remove them by grinding followed by reblast cleaning. At the discretion of the Engineer, the use of power tools to clean the localized areas after grinding, and to establish a surface profile acceptable to the coating manufacturer, can be used in lieu of blast cleaning.

If the surfaces are prepared using wet abrasive methods, attention shall be paid to tightly configured areas to assure that the preparation is thorough. After surface preparation is completed, the surfaces, surrounding steel, and containment materials/scaffolding shall be rinsed to remove abrasive dust and debris. Potable water shall be used for all operations. An inhibitor shall be added to the supply water and/or rinse water to prevent flash rusting. With the submittals, the Contractor shall provide a sample of the proposed inhibitor together with a letter from the coating manufacturer indicating that the inhibitor is suitable for use with their products and that the life of the coating system will not be reduced due to the use of the inhibitor. The surfaces shall be allowed to completely dry before the application of any coating.

c) Commercial Grade Power Tool Cleaning: This surface preparation shall be accomplished according to the requirements of SSPC-SP15. The designated surfaces shall be completely cleaned with power tools. A Commercial Grade Power Tool Cleaned surface, when viewed without magnification, is free of all visible oil, grease, dirt, rust, coating, oxides, mill scale, corrosion products, and other foreign matter, except for staining. In previously pitted areas, slight residues of rust and paint may also be left in the bottoms of pits.

Random staining shall be limited to no more than 33 percent of each 9 sq. in. (58 sq. cm) of surface area. Allowable staining may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Surface discoloration is considered to be a residue that must be removed, rather than a stain, if it possesses enough mass or thickness that it can be removed as a powder or in chips when scraped with a pocketknife.

A surface profile shall be created on the steel as defined later under “Surface Profile.”

At the Contractor’s option, Near-White Metal Blast Cleaning may be substituted for Power Tool Cleaning – Commercial Grade, as long as containment systems appropriate for abrasive blast cleaning are utilized and there is no additional cost to the Department.

d) Power Tool Cleaning – Modified SP3: This surface preparation shall be accomplished according to the requirements of SSPC-SP3, Power Tool Cleaning except as modified as follows. The designated surfaces shall be cleaned with power tools. A power tool cleaned surface shall be free of all loose rust, loose mill scale, loose and peeling paint, and loose rust that is bleeding through and/or penetrating the coating. All locations of visible corrosion and rust bleed, exposed or lifting mill scale, and lifting or loose paint shall be prepared using the power tools, even if the material is tight.

Upon completion of the cleaning, rust, rust bleed, mill scale and surrounding paint are permitted to remain if they can not be lifted using a dull putty knife.

e) Power Tool Cleaning of Shop Coated Steel. When shop-coated steel requires one or more coats to be applied in the field, the surface of the shop coating shall be cleaned as specified under “Water Cleaning of Non-Lead Coatings Prior to Overcoating.” If the damage is to a fully applied shop system, water cleaning is not required unless stipulated in the contract. Damaged areas of shop coating shall be spot cleaned according to Power Tool Cleaning - Modified SSPC-SP3. If the damage extends to the substrate, spot cleaning shall be according to SSPC-SP15. The edges of the coating surrounding all spot repairs shall be feathered.

f) Galvanized Surfaces: If galvanized surfaces are specified to be painted, they shall be prepared by brush-off blast cleaning in accordance with SSPC-SP 16 or by using proprietary solutions that are specifically designed to clean and etch (superficially roughen) the galvanized steel for painting. If cleaning and etching solutions are selected, the Contractor shall submit the manufacturer's technical product literature and SDS for Engineer's review and written acceptance prior to use.

Abrasives. Unless otherwise specified in the contract, when abrasive blast cleaning is specified, it shall be performed using either expendable abrasives (other than silica sand) or recyclable steel grit abrasives. Expendable abrasives shall be used one time and disposed of. Abrasive suppliers shall certify that the expendable abrasives meet the requirements of SSPC-AB1 and that recyclable steel grit abrasives meet SSPC-AB3. Tests to confirm the cleanliness of new abrasives (oil and water-soluble contamination) shall be performed by the Contractor according to the requirements and frequencies of SSPC-AB1 and SSPC-AB3, as applicable. On a daily basis, the Contractor shall verify that recycled abrasives are free of oil and water-soluble contamination by conducting the tests specified in SSPC-AB2.

All surfaces prepared with abrasives not meeting the SSPC-AB1, AB2, or AB3 requirements, as applicable, shall be solvent cleaned or low pressure water cleaned as directed by the Engineer, and reblast cleaned at the Contractor's expense.

Surface Profile (HOLD POINT). The abrasives used for blast cleaning shall have a gradation such that the abrasive will produce a uniform surface profile of 1.5 to 4.5 mils (38 to 114 microns). If the profile requirements of the coating manufacturer are more restrictive, advise the Engineer and comply with the more restrictive requirements. For recycled abrasives, an appropriate operating mix shall be maintained in order to control the profile within these limits.

The surface profile for SSPC-SP15 power tool cleaned surfaces shall be within the range specified by the coating manufacturer, but not less than 2.0 mils (50 microns).

The surface profile produced by abrasive blast cleaning shall be determined by replica tape or digital profile depth micrometer according to SSPC-PA 17 at the beginning of the work, and each day that surface preparation is performed. Areas having unacceptable profile measurements shall be further tested to determine the limits of the deficient area. When replica tape is used, it shall be attached to the daily report. In the event of a conflict between measurements taken with the replica tape and digital profile depth micrometer, the measurements with the replica tape shall prevail.

The surface profile produced by power tools to SSPC-SP15, shall be measured using the digital profile depth micrometer only. Replica tape shall not be used.

When unacceptable profiles are produced, work shall be suspended. The Contractor shall submit a plan for the necessary adjustments to insure that the correct surface profile is achieved on all surfaces. The Contractor shall not resume work until the new profile is verified by the QA observations, and the Engineer confirms, in writing, that the profile is acceptable.

Soluble Salt Remediation (HOLD POINT). The Contractor shall implement surface preparation procedures and processes that will remove chloride from the surfaces. Surfaces that may be contaminated with chloride include, but are not limited to, expansion joints and all areas that are subject to roadway splash or run off such as fascia beams and stringers.

Methods of chloride removal may include, but are not limited to, steam cleaning or pressure washing with or without the addition of a chemical soluble salt remover as approved by the coating manufacturer, and scrubbing before or after initial paint removal. The Contractor may also elect to clean the steel and allow it to rust overnight followed by recleaning, or by utilizing blends of fine and coarse abrasives during blast cleaning, wet abrasive/water jetting methods of preparation, or combinations of the above. If steam or water cleaning methods of chloride removal are utilized over surfaces where the coating has been completely removed, and the water does not contact any lead containing coatings, the water does not have to be collected. The Contractor shall provide the proposed procedures for chloride remediation in the Surface Preparation/Painting Plan.

Upon completion of the chloride remediation steps, the Contractor shall use cell methods of field chloride extraction and test procedures (e.g., silver dichromate) accepted by the Engineer, to test representative surfaces that were previously rusted (e.g., pitted steel) for the presence of remaining chlorides. Remaining chloride levels shall be no greater than 7µg/sq cm as read directly from the surface without any multiplier applied to the results. The testing must be performed, and the results must be acceptable, prior to painting each day.

A minimum of 5 tests per 1000 sq. ft. (93 sq m) or fraction thereof completed in a given day, shall be conducted at project start up. If results greater than 7 µg/sq cm are detected, the surfaces shall be recleaned and retested at the same frequency. If acceptable results are achieved on three consecutive days in which testing is conducted, the test frequency may be reduced to 1 test per 1000 sq. ft. (93 sq. m) prepared each day provided the chloride remediation process remains unchanged. If unacceptable results are encountered, or the methods of chloride remediation are changed, the Contractor shall resume testing at a frequency of 5 tests per 1000 sq. ft. (93 sq. m).

Following successful chloride testing the chloride test areas shall be cleaned. SSPC-SP15, Commercial Grade Power Tool Cleaning can be used to clean the test locations when the specified degree of cleaning is SSPC-SP10.

Surface Condition Prior to Painting (HOLD POINT). Prepared surfaces, shall meet the requirements of the respective degrees of cleaning immediately prior to painting, and shall be painted before rusting appears on the surface. If rust appears or bare steel remains unpainted for more than 12 hours, the affected area shall be prepared again at the expense of the Contractor.

All loose paint and surface preparation cleaning residue on bridge steel surfaces, scaffolding and platforms, containment materials, and tops of abutments and pier caps shall be removed prior to painting. When lead paint is being disturbed, cleaning shall be accomplished by HEPA vacuuming unless it is conducted within a containment that is designed with a ventilation system capable of collecting the airborne dust and debris created by sweeping and blowing with compressed air.

The quality of surface preparation and cleaning of surface dust and debris must be accepted by the Engineer prior to painting. The Engineer has the right to reject any work that was performed without adequate provision for QA observations to accept the degree of cleaning. Rejected coating work shall be removed and replaced at the Contractor's expense.

General Paint Requirements. Paint storage, mixing, and application shall be accomplished according to these specifications and as specified in the paint manufacturer's written instructions and product data sheets for the paint system used. In the event of a conflict between these specifications and the coating manufacturers' instructions and data sheets, the Contractor shall advise the Engineer and comply with the Engineer's written resolution. Until a resolution is provided, the most restrictive conditions shall apply.

Unless noted otherwise, If a new concrete deck or repair to an existing deck is required, painting shall be done after the deck is placed and the forms have been removed.

a) Paint Storage and Mixing. All Paint shall be stored according to the manufacturer's published instructions, including handling, temperatures, and warming as required prior to mixing. All coatings shall be supplied in sealed containers bearing the manufacturers name, product designation, batch number and mixing/thinning instructions. Leaking containers shall not be used.

   The Contractor shall only use batches of material that have an IDOT MISTIC approval number. For multi-component materials, the batch number from one component is tested with specific batch numbers from the other component(s). Only the same batch number combinations that were tested and approved shall be mixed together for use.

   Mixing shall be according to the manufacturer's instructions. Thinning shall be performed using thinner provided by the manufacturer, and only to the extent allowed by the manufacturer's written instructions. In no case shall thinning be permitted that would cause the coating to exceed the local Volatile Organic Compound (VOC) emission restrictions. For multiple component paints, only complete kits shall be mixed and used. Partial mixing is not allowed.

   The ingredients in the containers of paint shall be thoroughly mixed by mechanical power mixers according to the manufacturer's instructions, in the original containers before use or mixing with other containers of paint. The paint shall be mixed in a manner that will break up all lumps, completely disperse pigment and result in a uniform composition. Paint shall be carefully examined after mixing for uniformity and to verify that no unmixed pigment remains on the bottom of the container. Excessive skinning or partial hardening due to improper or prolonged storage will be cause for rejection of the paint, even though it may have been previously inspected and accepted.

   Multiple component coatings shall be discarded after the expiration of the pot life. Single component paint shall not remain in spray pots, paint buckets, etc. overnight. It shall be stored in a covered container and remixed before use.

   The Engineer reserves the right to sample field paint (individual components and/or the mixed material) and have it analyzed. If the paint does not meet the product requirements due to excessive thinning or because of other field problems, the coating shall be removed from that section of the structure and replaced as directed by the Engineer.

b) Application Methods. Unless prohibited by the coating manufacturer's written instructions, paint may be applied by spray methods, rollers, or brushes. If applied with conventional or airless spray methods, paint shall be applied in a uniform layer with overlapping at the edges of the spray pattern.

   The painters shall monitor the wet film thickness of each coat during application. The wet film thickness shall be calculated based on the solids by volume of the material and the amount of thinner added. When the new coating is applied over an existing system, routine QC inspections of the wet film thickness shall be performed in addition to the painter's checks in order to establish that a proper film build is being applied.

When brushes or rollers are used to apply the coating, additional applications may be required to achieve the specified thickness per layer.

c) Field Touch Up of Shop-Coated Steel. After cleaning, rusted and damaged areas of shop-primed inorganic zinc shall be touched up using epoxy mastic. Damaged areas of shop-applied intermediate shall be touched-up using the same intermediate specified for painting the existing structure. Following touch up, the remaining coats (intermediate and finish, or finish only, depending on the number of coats applied in the shop) shall be the same materials specified for painting the existing structure. When inorganic zinc has been used as the shop primer, a mist coat of the intermediate coat shall be applied before the application of the full intermediate coat in order to prevent pinholing and bubbling.

d) Recoating and Film Continuity (HOLD POINT for each coat). Paint shall be considered dry for recoating according to the time/temperature/humidity criteria provided in the manufacturer's instructions and when an additional coat can be applied without the development of film irregularities; such as lifting, wrinkling, or loss of adhesion of the under coat. The coating shall be considered to be too cured for recoating based on the maximum recoat times stipulated by the coating manufacturer. If the maximum recoat times are exceeded, written instructions from the manufacturer for preparing the surface to receive the next coat shall be provided to the Engineer. Surface preparation and application shall not proceed until the recommendations are accepted by the Engineer in writing. If surfaces are contaminated, washing shall be accomplished prior to intermediate and final coats. Wash water does not have to be collected unless the water contacts existing lead containing coatings.

Painting shall be done in a neat and workmanlike manner. Each coat of paint shall be applied as a continuous film of uniform thickness free of defects including, but not limited to, runs, sags, overspray, dryspray, pinholes, voids, skips, misses, and shadow-through. Defects such as runs and sags shall be brushed out immediately during application. Dry spray on the surface of previous coats shall be removed prior to the application of the next coat.

Paint Systems. The paint system(s) from the list below shall be applied as specified.

The paint manufacturer's relative humidity, dew point, and material, surface, and ambient temperature restrictions shall be provided with the submittals and shall be strictly followed. Written recommendations from the paint manufacturer for the length of time each coat must be protected from cold or inclement weather (e.g., exposure to rain), during the drying period shall be included in the submittals. Upon acceptance by the Engineer, these times shall be used to govern the duration that protection must be maintained during drying.

Where stripe coats are indicated, the Contractor shall apply an additional coat to edges, rivets, bolts, crevices, welds, and similar surface irregularities. The stripe coat shall be applied by brush or spray, but if applied by spray, it shall be followed immediately by brushing to thoroughly work the coating into or on the irregular surfaces, and shall extend onto the surrounding steel a minimum of 1 in. (25 mm) in all directions. The purpose of the stripe coat is to assure complete coverage of crevices and to build additional thickness on edges and surface irregularities. If the use of the brush on edges pulls the coating away, brushing of edges can be eliminated, provided the additional coverage is achieved by spray. Measurement of stripe coat thickness is not required, but the Contractor shall visually confirm that the stripe coats are providing the required coverage.
The stripe coat may be applied as part of the application of the full coat unless prohibited by the coating manufacturer. If applied as part of the application process of the full coat, the stripe coat shall be allowed to dry for a minimum of 10 minutes in order to allow Contractor QC personnel to verify that

the coat was applied. If a wet-on-wet stripe coat is prohibited by the coating manufacturer or brush or roller application of the full coat pulls the underlying stripe coat, the stripe coat shall dry according to the manufacturers' recommended drying times prior to the application of the full coat. In the case of the prime coat, the full coat can also be applied first to protect the steel, followed by the stripe coat after the full coat has dried.

The thicknesses of each coat as specified below shall be measured according to SSPC-PA2, using Coating Thickness Restriction Level 3 (spot measurements 80% of the minimum and 120% of the maximum, provided the entire area complies with the specified ranges).

a) System 1 – OZ/E/U – for Bare Steel: System 1 shall consist of the application of a full coat of organic (epoxy) zinc-rich primer, a full intermediate coat of epoxy, and a full finish coat of aliphatic urethane. Stripe coats of the prime and finish coats shall be applied. The film thicknesses of the full coats shall be as follows:

   - One full coat of organic zinc-rich primer between 3.5 and 5.0 mils (90 and 125 microns) dry film thickness. The prime coat shall be tinted to a color that contrasts with the steel surface.

   - One full intermediate coat of epoxy between 3.0 and 6.0 mils (75 and 150 microns) dry film thickness. The intermediate coat shall be a contrasting color to both the first coat and finish coat.

   - One full finish coat of aliphatic urethane between 2.5 and 4.0 mils (65 and 100 microns) dry film thickness. Finish coat color shall be according to contract plans.

   The total dry film thickness for this system, exclusive of areas receiving the stripe coats, shall be between 9.0 and 15.0 mils (225 and 375 microns).

b) System 2 – PS/EM/U – for Overcoating an Existing System: System 2 shall consist of the application of a full coat of epoxy penetrating sealer, a spot intermediate coat of aluminum epoxy mastic and a stripe and full finish coat of aliphatic urethane.

   A full coat of epoxy penetrating sealer shall be applied to all surfaces following surface preparation. A spot intermediate coat shall consist of the application of one coat of the aluminum epoxy mastic on all areas where rust is evident and areas where the old paint has been removed, feathered and/or damaged prior to, during or after the cleaning and surface preparation operations. After the spot intermediate, a stripe coat and full finish coat of aliphatic urethane shall be applied. The film thicknesses shall be as follows:

   - One full coat of epoxy penetrating sealer between 1.0 and 2.0 mils (25 and 50 microns) dry film thickness.

   - One spot coat of aluminum epoxy mastic between 5.0 and 7.0 mils (125 and 175 microns) dry film thickness. The color shall contrast with the finish coat.

   - One full finish coat of aliphatic urethane between 2.5 and 4.0 mils (65 and 100 microns) dry film thickness. Finish coat color shall be according to contract plans.

   The total dry film thickness for this system, exclusive of the stripe coat, shall be between 8.5 and 13.0 mils (215 and 325 microns). The existing coating thickness to remain under the overcoat must be verified in order to obtain accurate total dry film thickness measurements.

c) System 3 – EM/EM/AC – for Bare Steel: System 3 shall consist of the application of two full coats of aluminum epoxy mastic and a full finish coat of waterborne acrylic. Stripe coats for first coat of epoxy mastic and the finish coat shall be applied. The film thicknesses of the full coats shall be as follows:

- One full coat of aluminum epoxy mastic between 5.0 and 7.0 mils (125 and 175 microns) dry film thickness. The first coat of aluminum epoxy mastic shall be tinted a contrasting color with the blast cleaned surface and the second coat.

- One full intermediate coat of aluminum epoxy mastic between 5.0 and 7.0 mils (125 and 175 microns) dry film thickness. The intermediate coat shall be a contrasting color to the first coat and the finish coat.

- A full finish coat of waterborne acrylic between 2.0 and 4.0 mils (50 and 100 microns) dry film thickness. Finish coat color shall be according to contract plans.

The total dry film thickness for this system, exclusive of areas receiving the stripe coats, shall be between 12.0 and 18.0 mils (360 and 450 microns).

d) System 4 – PS/EM/AC – for Overcoating an Existing System: System 4 shall consist of the application of a full coat of epoxy penetrating sealer, a spot intermediate coat of aluminum epoxy mastic and a stripe and full finish coat of waterborne acrylic.

A full coat of epoxy penetrating sealer shall be applied to all surfaces following surface preparation. A spot intermediate coat shall consist of the application of one coat of the aluminum epoxy mastic on all areas where rust is evident and areas where the old paint has been removed, feathered and/or damaged prior to, during or after the cleaning and surface preparation operations. After the spot intermediate, a stripe coat and full finish coat of waterborne acrylic shall be applied. The film thicknesses shall be as follows:

- One full coat of epoxy penetrating sealer between 1.0 and 2.0 mils (25 and 50 microns) dry film thickness.

- One spot coat of aluminum epoxy mastic between 5.0 and 7.0 mils (125 and 175 microns) dry film thickness. The color shall contrast with the finish coat.

- One full finish coat of waterborne acrylic between 2.0 and 4.0 mils (50 and 100 microns) dry film thickness. Finish coat color shall be according to contract plans.

The total dry film thickness for this system, exclusive of the stripe coat, shall be between 8.0 and 13.0 mils (200 and 325 microns). The existing coating thickness to remain under the overcoat must be verified in order to obtain accurate total dry film thickness measurements.

e) System 5 – MCU – for Bare Steel: System 5 shall consist of the application of a full coat of moisture cure urethane (MCU) zinc primer, a full coat of MCU intermediate, and a full coat of MCU finish. Stripe coats of the prime and finish coats shall be applied. The Contractor shall comply with the manufacturer's requirements for drying times between the application of the stripe coats and the full coats. The film thicknesses of the full coats shall be as follows:

- One full coat of MCU zinc primer between 3.0 and 5.0 mils (75 and 125 microns) dry film thickness. The prime coat shall be tinted to a color that contrasts with the steel surface.

- One full MCU intermediate coat between 3.0 and 4.0 mils (75 and 100 microns) dry film thickness. The intermediate coat shall be a contrasting color to both the first coat and finish coat.

- One full MCU finish coat between 2.0 and 4.0 mils (50 and 100 microns) dry film thickness. Finish coat color shall be according to contract plans.

The total dry film thickness for this system, exclusive of areas receiving the stripe coats, shall be between 8.0 and 13.0 mils (200 and 325 microns).

f) System 6 – MCU – for Overcoating an Existing System: System 6 shall consist of the application of a full coat of moisture cure urethane (MCU) penetrating sealer, a spot coat of MCU intermediate, and a stripe and full coat of MCU finish.

A full coat of MCU penetrating sealer shall be applied to all surfaces following surface preparation. A spot intermediate coat shall consist of the application of one coat of MCU intermediate on all areas where rust is evident and areas where the old paint has been removed, feathered and/or damaged prior to, during or after the cleaning and surface preparation operations. After the spot intermediate, a stripe coat and full coat of MCU finish shall be applied. The Contractor shall comply with the manufacturer's requirements for drying time between the application of the stripe coat and the full finish coat. The film thicknesses shall be as follows:

- One full coat of MCU sealer between 1.0 and 2.0 mils (25 and 50 microns) dry film thickness.

- One full MCU intermediate coat between 3.0 and 4.0 mils (75 and 100 microns) dry film thickness. The color shall contrast with the finish coat.

- One full MCU finish coat 2.0 and 4.0 mils (50 and 100 microns) dry film thickness. Finish coat color shall be according to contract plans.

The total dry film thickness for this system, exclusive of areas receiving the stripe coats, shall be between 6.0 and 10.0 mils (150 and 250 microns). The existing coating thickness to remain under the overcoat must be verified in order to obtain accurate total dry film thickness measurements.

Application of Paint System over Galvanizing: If galvanized surfaces are present and specified to be painted, the Contractor shall apply one of the following as designated on the plans:

- A 2-coat system consisting of a full aluminum epoxy mastic coat and a full waterborne acrylic finish coat from System 3. If red rust is visible, rusted areas shall be spot primed with aluminum epoxy mastic prior to the application of the full coat of aluminum epoxy mastic.
- A 2-coat system consisting of a full epoxy coat and a full urethane coat from System 1. If red rust is visible, rusted areas shall be spot primed with organic zinc prior to the application of the full coat of epoxy.

Surface Preparation and Painting of Galvanized Fasteners: The Contractor shall prepare all fasteners (i.e., galvanized nuts, bolts, etc.) by power tool cleaning in accordance with SSPC-SP 2 or SSPC-SP3 to remove loose material. Following hand/power tool cleaning and prior to painting, the

surfaces shall be solvent cleaned according to SSPC-SP 1. Slight stains of torqueing compound dye may remain after cleaning provided the dye is not transferred to a cloth after vigorous rubbing is acceptable. If any dye is transferred to a cloth after vigorous rubbing, additional cleaning is required.

The fasteners shall be coated with one coat of an aluminum epoxy mastic meeting the requirements of Article1008.03 and the same acrylic or urethane topcoat specified above for use on galvanized members.

Repair of Damage to New Coating System and Areas Concealed by Containment. The Contractor shall repair all damage to the newly installed coating system and areas concealed by the containment/protective covering attachment points, at no cost to the Department. The process for completing the repairs shall be included in the submittals. If the damage extends to the substrate and the original preparation involved abrasive blast cleaning, the damaged areas shall be prepared to SSPC-SP15 Power Tool Cleaning - Commercial Grade. If the original preparation was other than blast cleaning or the damage does not extend to the substrate, the loose, fractured paint shall be cleaned to Power Tool Cleaning – Modified SP3.

The surrounding coating at each repair location shall be feathered for a minimum distance of 1 1/2 in. (40 mm) to achieve a smooth transition between the prepared areas and the existing coating.

If the bare steel is exposed, all coats shall be applied to the prepared area. For damaged galvanizing, the first coat shall be aluminum epoxy mastic. If only the intermediate and finish coats are damaged, the intermediate and finish shall be applied. If only the finish coat is damaged, the finish shall be applied.

Special Instructions.

a) At the completion of the work, the Contractor shall stencil the painting date and the paint code on the bridge. The letters shall be capitals, not less than 2 in. (50 mm) and not more than 3 in. (75 mm) in height.

   The stencil shall contain the following wording "PAINTED BY (insert the name of the Contractor)" and shall show the month and year in which the painting was completed, followed by the appropriate code for the coating material applied, all stenciled on successive lines:

   CODE U (for field applied System 3 or System 4).

   CODE Z (for field applied System 1 or System 2).

   CODE AA (for field applied System 5 or System 6).

   This information shall be stenciled on the cover plate of a truss end post near the top of the railing, or on the outside face of an outside stringer near one end of the bridge, or at some equally visible surface near the end of the bridge, as designated by the Engineer.

b) All surfaces painted inadvertently shall be cleaned immediately.

It is understood and agreed that the cost of all work outlined above, unless otherwise specified, has been included in the bid, and no extra compensation will be allowed.

Basis of Payment. This work shall be paid for at the contract Lump Sum price for CLEANING AND PAINTING STEEL BRIDGE, at the designated location, or for CLEANING AND PAINTING the structure or portions thereof described. Payment will not be authorized until all requirements for surface preparation and painting have been fulfilled as described in this specification, including the preparation and submittal of all QC documentation. Payment will also not be authorized for non-conforming work until the discrepancy is resolved in writing.

Appendix 1 – Reference List

The Contractor shall maintain the following regulations and references on site for the duration of the project:

- Illinois Environmental Protection Act
- ASTM D 4214, Standard Test Method for Evaluating Degree of Chalking of Exterior Paint Films
- ASTM D 4285, Standard Test Method for Indicating Oil or Water in Compressed Air
- ASTM D4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
- SSPC-AB 1, Mineral and Slag Abrasives
- SSPC-AB 2, Cleanliness of Recycled Ferrous Metallic Abrasives
- SSPC-AB 3, Ferrous Metallic Abrasive
- SSPC-PA 2, Procedure for Determining Conformance to Dry Coating Thickness Requirements
- SSPC-PA 17, Procedure for Determining Conformance to Steel Profile/Surface Roughness/Peak Count Requirements
- SSPC-QP 1, Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Structures)
- SSPC-QP 2, Standard Procedure for Evaluating the Qualifications of Painting Contractors to Remove Hazardous Paint
- SSPC-SP 1, Solvent Cleaning
- SSPC-SP 2, Hand Tool Cleaning
- SSPC-SP 3, Power Tool Cleaning
- SSPC-SP 10/NACE No. 2, Near White Metal Blast Cleaning
- SSPC-SP WJ-4, Waterjet Cleaning of Metals – Light Cleaning
- SSPC-SP 15, Commercial Grade Power Tool Cleaning
- SSPC-SP 16, Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals
- SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
- SSPC-VIS 3, Visual Standard for Power- and Hand-Tool Cleaned Steel
- SSPC-VIS 4, Guide and Reference Photographs for Steel Cleaned by Water Jetting
- SSPC-VIS 5, Guide and Reference Photographs for Steel Prepared by Wet Abrasive Blast Cleaning
- The paint manufacturer's application instructions, MSDS and product data sheets

Pay Item Number	Designation	Unit of Measure
JI506001	CLEANING AND PAINTING BEARINGS, BRIDGE 1	L SUM

DECK SLAB AND APPROACH SLAB REPAIR (Illinois Tollway GBSP)

Effective: December 16, 2014
Revised: July 19, 2016

DESCRIPTION
This work shall consist of the removal and disposal of all loose and deteriorated concrete from the bridge deck or approach slab and the replacement with new concrete to the top of the slab surface. The work shall be done according to the applicable requirements of Sections 501, 503 and 1020 of the Standard Specifications, and this Special Provision.

Bridge deck and approach slab repairs will be classified as follows:

(a) Partial-Depth. Partial-depth repairs shall consist of removing the loose and unsound deck or approach slab concrete, disposing of the concrete removed and replacing with new concrete to the top of existing slab surface or remaining slab surface if the slab overlay has been scarified under separate work item. The removal may be performed by chipping with power driven hand tools or by hydro-demolition equipment. The depth shall be measured from the top of the concrete slab surface to at least 1" below the top reinforcement, but not past the bottom reinforcement.

(b) Full-Depth. Full-depth repairs shall consist of removing concrete full-depth of the bridge deck or approach slab, disposing of the concrete removed, and replacing with new concrete to the top of existing slab surface or remaining slab surface if the slab overlay has been scarified under separate work item. The removal may be performed with power driven hand tools or by hydro-demolition equipment. Full-depth repairs shall be classified for payment as Full-Depth, Type I and Full-Depth, Type II according to the following:

Type I Full-depth patches less than or equal to 5 sq ft in area. The minimum dimensions for a patch shall be 1 ft X 1 ft.

Type II Full-depth patches greater than 5 sq ft in area.

MATERIALS
Materials shall be according to Article 1020.02 of the Standard Specifications.

Portland cement concrete for partial depth repairs shall be Class DS concrete. Portland cement concrete for full-depth repairs shall be Class DS or Class BS concrete.

EQUIPMENT
The equipment used shall be subject to the approval of the Engineer and shall meet the following requirements:

(a) Surface Preparation Equipment. Surface preparation and concrete removal equipment shall be according to the applicable portions of Section 1101 of the Standard Specifications and the following:

(1) Sawing Equipment. Sawing equipment shall be a concrete saw capable of sawing concrete to the specified depth.

(2) Blast Cleaning Equipment. The blast cleaning may be performed by wet sandblasting, high-pressure waterblasting, shotblasting or abrasive blasting. Blast cleaning equipment shall be capable of removing rust and old concrete from exposed reinforcement bars, and shall have oil traps.

(3) Power-Driven Hand Tools. Power-driven hand tools will be permitted including jackhammers lighter than the nominal 45 lb class. Chipping hammers heavier than a nominal 15 lb class shall not be used for removing concrete from below any reinforcing bar for partial depth repairs or final removal at the boundary of full-depth repairs. Jackhammers or chipping hammers shall not be operated at an angle in excess of 45 degrees measured from the surface of the slab.

(4) Hydraulic Impact Equipment. Hydraulic impact equipment with a maximum rated striking energy of 360 ft-lbs may be permitted only in areas of full depth removal more than 1 ft away from existing beams, girders or other supporting structural members that are to remain in service or more than 1 ft from the boundaries of full-depth repairs.

(5) Hydro-Demolition Equipment. The hydro-demolition equipment shall consist of filtering and pumping units operating with a remote-controlled robotic device. The equipment shall use water according to Section 1002 of the Standard Specifications. The equipment shall be capable of being controlled to remove only unsound concrete.

(b) Concrete Equipment: Equipment for proportioning and mixing the concrete shall be according to Article 1020.03 of the Standard Specifications.

(c) Finishing Equipment: Finishing equipment shall be according to Article 1103.17 of the Standard Specifications. Adequate hand tools will be permitted for placing and consolidating concrete in the patch areas and for finishing small patches.

CONSTRUCTION REQUIREMENTS

Sidewalks, curbs, drains, reinforcement and/or existing transverse and longitudinal joints which are to remain in place shall be protected from damage during removal and cleaning operations. All damage caused by the Contractor shall be corrected, at the Contractor's expense, to the satisfaction of the Engineer.

The Contractor shall control the runoff water generated by the various construction activities in such a manner as to minimize, to the maximum extent practicable, the discharge of construction debris into adjacent waters, and shall properly dispose of the solids generated according to Article 202.03 of the Standard Specifications. Runoff water will not be allowed to constitute a hazard on adjacent or underlying roadways, waterways, drainage areas or railroads nor be allowed to erode existing slopes.

(a) Hot-Mix Asphalt Surface Removal.

The hot-mix asphalt concrete surface course and all waterproofing membrane shall be removed and disposed of according to applicable portions of Articles 440.04 and 440.06 of the Standard Specifications, except milling equipment will not be allowed if the bridge deck or approach slab is to receive a waterproofing membrane system. If the overlay or waterproofing membrane contains asbestos fibers, removal shall be in accordance with the Special Provision for "Asbestos Waterproofing Membrane or Asbestos hot-mix asphalt Concrete Surface Removal". Removal of the hot-mix asphalt surface by the use of radiant or direct heat will not be permitted.

(b) Surface Preparation:

All loose, disintegrated and unsound concrete shall be removed from portions of the bridge deck or approach slab shown on the plans or as designated by the Engineer. The Engineer will determine the limits of removal as the work progresses.

The Contractor shall take care not to damage reinforcement bars or expansion joints which are to remain in place. Any damage to reinforcement bars or expansion joints shall be corrected at the Contractor's expense. All loose reinforcement bars, as determined by the Engineer, shall be retied at the Contractor's expense.

(1) Partial-Depth. Areas to be repaired will be determined and marked by the Engineer. A concrete saw shall be used to provide vertical edges approximately 3/4 in. deep around the perimeter of the area to be patched when an overlay is not specified. Where high steel is present, the depth may be reduced as directed by the Engineer. A saw cut will not be required on those boundaries along the face of the curb, parapet or joint or when sharp vertical edges are provided by hydro-demolition.

The loose and unsound concrete shall be removed by chipping, with power driven hand tools or by hydro-demolition equipment. The minimum depth of removal shall be to 1 in. below the top reinforcement. The maximum depth of removal for any partial-depth repair shall not be below the bottom layer of reinforcement. Any removal below the bottom layer of reinforcement as directed by the engineer shall require the patch location to be designated as a full depth repair and full removal is then required. All exposed reinforcing bars and newly exposed concrete shall be thoroughly blast cleaned. Concrete adjacent to the reinforcement bars shall be removed to a depth that will permit new concrete to bond to the entire periphery of the exposed bar. The Engineer may require enlarging a designated removal area should inspection indicate deterioration beyond the limits previously designated. In this event, a new saw cut shall be made around the extended area before additional removal is begun. The removal area shall not be enlarged solely to correct debonded reinforcement or deficient lap lengths.

(2) Full-Depth. Concrete shall be removed as determined by the Engineer within all areas designated for full-depth repair and in all designated areas of partial depth repair in which unsound concrete is found to extend below the bottom reinforcement. Full depth removal shall be performed according to Article 501.05. Saw cuts shall be made on the top of the bridge deck or approach slab, except those boundaries along the face of curbs, parapets and joints or where hydro-demolition provided sharp vertical edges. The top saw cut may be omitted if the bridge deck or approach slab is to receive an overlay.

Restoration of the subbase material under approach slabs shall be according to the Special Provision “Aggregate for Base Course Restoration” if required by the Engineer.

Forms for full-depth repair of bridge decks may be supported by hangers with adjustable bolts or by blocking from the beams below. When approved by the Engineer, forms for Type 1 patches may be supported by No. 9 wires or other devices attached to the reinforcement bars.

All form work shall be removed after the curing sequence is complete and prior to opening to traffic.

(3) Reinforcement Treatment. Care shall be exercised during concrete removal to protect the reinforcement bars and structural steel from damage. Any damage to the reinforcement bars or structural steel to remain in place shall be repaired or replaced to the satisfaction of the Engineer at the Contractor's expense. All existing reinforcement bars shall remain in place except as herein provided for corroded bars. Tying of loose bars will be required. Reinforcing bars which 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. An approved mechanical bar splice capable of developing in tension at least 125 percent of the yield strength of the existing bar shall be used when it is not feasible to provide the minimum bar lap. No welding of bars will be permitted.

(4) Cleaning. Immediately after completion of the concrete removal and reinforcement repairs, the repair areas shall be cleaned of dust and debris. Once the initial cleaning is completed, the repair areas shall be thoroughly blast cleaned to a roughened appearance free from all foreign matter. Particular attention shall be given to removal of concrete fines. Any method of cleaning which does not consistently produce satisfactory results shall be discontinued and replaced by an acceptable method. All debris, including water, resulting from the blast cleaning shall be confined and shall be immediately and thoroughly removed from all areas of accumulation. If concrete placement does not follow immediately after the final cleaning, the area shall be carefully protected with well-anchored polyethylene sheeting.

Exposed reinforcement bars shall be free of dirt, detrimental scale, paint, oil, or other foreign substances which may reduce bond with the concrete. A tight non-scaling coating of rust is not considered objectionable. Loose, scaling rust shall be removed by rubbing with burlap, wire brushing, blast cleaning or other methods approved by the Engineer.

(c) Placement & Finishing of Concrete Repair:

(1) Bonding Method. The patch area shall be cleaned to the satisfaction of the Engineer and shall be thoroughly wetted and maintained in a dampened condition with water for at least 12 hours before placement of the concrete. Any excess water shall be removed by compressed air or by vacuuming prior to the beginning of concrete placement. Water shall not be applied to the patch surface within one hour before or at any time during placement of the concrete.

(2) Concrete Placement.

The concrete shall be placed and consolidated according to Article 503.07 and as herein specified. Article 1020.14 (b) of the Standard Specifications shall apply.

When an overlay system is not specified, the patches shall be finished according to Article 503.16 (a)(1) of the Standard Specifications, followed by a light brooming.

(d) Curing and Protection.

Concrete patches shall be cured by the Wetted Burlap or Wetted Cotton Mat Method according to Article 1020.13 (a)(3) or Article 1020.13 (a)(5) of the Standard Specifications. The curing period shall be from the time of final setting of the mix until the patch is exposed to

traffic, which shall be no less than 36 hours. In addition to Article 1020.13 of the Standard Specifications, when the air temperature is less than 55º F, the Contractor shall cover the patch with minimum R12 insulation. Insulation is optional when the air temperature is 55º F. - 90º F. Insulation shall not be placed when the air temperature is greater than 90° F. A 72-hour minimum drying period shall be required before placing waterproofing or hot-mix asphalt surfacing.

(e) Opening to Traffic.

No traffic will be permitted on a patch until after the minimum cure period of 36 hours, and the concrete has obtained a minimum compressive strength of 4000 psi or flexural strength of 675 psi.

Construction equipment will be permitted on a patch during the cure period if the concrete has obtained the minimum required strength. In this instance, the strength specimens shall be cured with the patch.

METHOD of MEASUREMENT
Full or partial depth repairs will be measured for payment and computed in square yards.

BASIS of PAYMENT
Partial depth deck areas removed and replaced will be paid for at the contract unit price per square yard for DECK SLAB REPAIR (PARTIAL). Areas requiring removal below the bottom reinforcement shall be removed and replaced full depth and will be paid for at the contract unit price per square yard for DECK SLAB REPAIR (FULL DEPTH, TYPE I) and/or DECK SLAB REPAIR (FULL DEPTH, TYPE II).

Partial depth approach areas removed and replaced will be paid for at the contract unit price per square yard for APPROACH SLAB REPAIR (PARTIAL). Areas requiring removal below the bottom reinforcement shall be removed and replaced full depth and will be paid for at the contract unit price per square yard for APPROACH SLAB REPAIR (FULL DEPTH, TYPE I) and/or APPROACH SLAB REPAIR (FULL DEPTH, TYPE II).

When corroded reinforcement bars are encountered in the performance of this work and replacement is required, the Contractor will be paid according to Article 109.04 of the Tollway Supplemental Specifications.

No payment will be allowed for removal and replacement of reinforcement bars damaged by the Contractor in the performance of his/her work or for any increases in dimensions needed to provide splices for these replacement bars.

Removal and disposal of asbestos waterproofing and/or asbestos hot-mix asphalt concrete will be paid for as specified in the Special Provision for “Asbestos Waterproofing Membrane or Asbestos hot-mix asphalt Concrete Surface Removal”.

Pay Item Number	Designation	Unit of Measure
JT503010	DECK SLAB REPAIR (PARTIAL)	SQ YD

STRUCTURAL REPAIR OF CONCRETE (Illinois Tollway GBSP)

Effective: May 29, 2007
Revised: April 1, 2016

Description. This work shall consist of structurally repairing concrete.

Materials. Materials shall be according to the following provisions of the Standard Specifications.

Item	Article/Section
(a) Portland Cement Concrete (Note 1)	1020
(b) R1 or R2 Mortar (Note2)	
(c) Normal Weight Concrete (Note 3)	
(d) Shotcrete (High Performance) (Note 4)	
(e) Reinforcement Bars	1006.10
(f) Anchor Bolts	1006.09
(g) Water	1002
(h) Curing Compound (Type I)	1022.01
(i) Cotton Mats	1022.02
(j) Protective Coat	1023.01
(k) Epoxy (Note 5)	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., the coarse aggregate shall be a CA 16, and the strength shall be a minimum 4000 psi compressive or 675 psi flexural at 14 days. A high range water-reducing admixture shall be used to obtain a 5-7 in. slump, but the cement factor shall not be reduced. This cement factor restriction shall also apply if a water-reducing admixture is used.

Note 2. The R1 or R2 Mortar shall be from the IDOT's approved list of Packaged, Dry,Rapid Hardening, Cementitious Materials for Concrete Repairs with coarse aggregate added. The amount of coarse aggregate added to the R1 or R2 Mortar shall be per the manufacturer's recommendations. The coarse aggregate gradation shall be CA 16 from an Aggregate Gradation Control System source or a packaged aggregate meeting Article 1004.02 of the Standard Specifications with a maximum size of 1/2 in.. The R1 or R2 Mortar and coarse aggregate 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. slump.

Note 3. The packaged concrete mixture shall be from the IDOT's approved list of Packaged, Dry, Formed, Concrete Repair Mixtures. The materials and preparation of aggregate shall be according to ASTM C 387. Proportioning shall be according to ASTM C 387, except the minimum cement factor shall be 6.65 cwt/cu.yd.. Cement replacement with fly ash or ground granulated blast-furnace slag shall be according to Section 1020 of the Standard Specifications. The coarse aggregate shall be a maximum size of 1/2 in. 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. slump.

Note 4. A packaged, pre-blended, and dry combination of materials, for the wet-mix shotcrete method shall be provided according to ASTM C 1480. An accelerator is prohibited, except the shotcrete may be modified at the nozzle with a non-chloride accelerator for overhead applications. 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 maximum water soluble chloride ion content of 0.06 % by weight (mass) of cement. 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 test shall be performed a minimum of once every two years.

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 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. to 8.50 cwt/cu. yd for Type FA and 6.05 cwt/cu. yd. to 7.50 cwt/cu. yd. for Type CA. The portland cement shall not be below 4.70 cwt/cu. yd. 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 of cement.

Class C fly ash is optional and the maximum shall be 25 percent by weight of cement.

Ground granulated blast-furnace slag is optional and the maximum shall be 30 percent by weight of cement.

Microsilica is required and shall be a minimum of 5 percent by weight 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 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 of the Standard Specifications shall be a maximum of 0.42.

The air content as shot shall be 4.0 – 8.0 percent.

Note 5. 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 of the Standard Specifications and the following.

Chipping Hammer – The chipping hammer for removing concrete shall be a light-duty pneumatic or electric tool with a 15 lb. 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 of the Standard Specifications.

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. Shotcrete shall not be used for column repairs greater than 4 in. in depth, or any repair location greater than 8 in. in depth. The only exception to this rule would be for a horizontal application, where the shotcrete may be placed from above in one lift.

(d) Rule 4. If formed concrete repair is used for locations that have reinforcement with less than 0.75 in. of concrete cover, the concrete mixture shall contain fly ash or ground granulated blast-furnace slag at the maximum cement replacement allowed.

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 Engineer for review and approval. Whenever 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 shall be kept simple, and squared corners will be preferred. The repair perimeter shall be sawed a depth of 1/2 in. or less, as required to avoid cutting the reinforcement. Any cut reinforcement shall be repaired or replaced at no additional cost to the Illinois Tollway. 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. The outermost layer of reinforcement bar within the repair area shall be undercut to a depth of 3/4 in. (19 mm) or the diameter of the reinforcement bar, whichever value is larger. The underlying transverse reinforcement bar shall also be undercut as previously described, unless the reinforcement is not corroded, and the reinforcement bar is encased and well bonded to the surrounding concrete.

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. The substrate profile shall be ± 1/16 in. 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. 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. 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.

All removed materials shall be disposed of according to Article 202.03 of the Standard Specifications.

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 (Where applied on overhead surfaces only), 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 perimeter sawcut 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 0.06 in. 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. of cover, protective coat shall be applied to the completed repair. The application of the protective coat shall be according to the second paragraph of Article 503.19 of the Standard Specifications, except blast cleaning shall be performed to remove curing compound (where applied on overhead surfaces) on the finished surface.

The Contractor shall anchor the new concrete to the existing concrete with 3/4 in. diameter hook bolts for all repair areas where the depth of concrete removal is greater than 8 in. and there is no existing reinforcement extending into the repair area. The hook bolts shall be spaced at 15- inch maximum centers both vertically and horizontally, and shall be a minimum of 12 inches away from the perimeter of the repair. The hook bolts shall be installed according to Section 584 of the Standard Specifications.

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 of the Standard Specifications. Forms shall be according to Article 503.06 of the Standard Specifications. 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 R1or R2 Mortar 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 of the Standard Specifications. 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. All repaired members shall be restored as close as practicable to their original dimensions.

Curing shall be done according to Article 1020.13 of the Standard Specifications.

If temperatures below 45°F are forecast during the curing period, protection method I or protection method II shall be used during the curing period in according to Article 1020.13(d)(1), or Article 1020.13(d)(2) of the Standard Specifications respectively.

The surfaces of the completed repair shall be finished according to Article 503.15 of the Standard Specifications.

(b) Shotcrete. Shotcrete shall be tested by the Engineer for air content according to Illinois Modified AASHTO T 152. Obtain the sample in a damp, non-absorbent container from the discharge end of the nozzle, or 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. 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. for the bottom and sides. A wood form test panel shall have a minimum 3/4 in. thick bottom, and a minimum 1.5 in. thickness for the sides. The test panel shall be cured according to Article 1020.13 (a) (3) or (5) of the Standard Specifications 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. 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) of the Standard Specifications shall apply. For hot weather, shotcrete shall not be applied when the air temperature is greater than 90°F. The applied shotcrete shall have a minimum temperature of 50°F and a maximum temperature of 90°F. 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. 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. 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 4 in. unless the shotcrete is applied from above on a horizontal surface, or a thicker application is approved by the Engineer. When two or more layers of exposed vertical reinforcement exist, multiple layers of shotcrete shall be applied. The first layer of reinforcement shall be encased before shooting begins to encase the next layer. 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. 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. The Engineer may require modification of operations to ensure satisfactory results are obtained. Cotton mats shall be applied according to Article 1020.13(a)(5) of the Standard Specifications except the exposed layer of shotcrete shall be covered within 10 minutes after finishing, and continuous wet curing shall begin immediately. As an alternative to this method, Type I curing compound shall be applied according to Article 1020.13(a)(4) of the Standard Specifications within 10 minutes and moist curing with cotton mats shall begin within 3 hours. For overhead applications where the final shotcrete layer has been applied, the Contractor has the option to use Type I curing compound in lieu of the cotton mats. Note 5 of the Index Table in Article 1020.13 of the Standard Specifications 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 continuous 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, continuous 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 are forecast during the curing period, protection method I or protection method II shall be used during the curing period in according to Article 1020.13(d)(1), or Article 1020.13(d)(2) of the Standard Specifications respectively.

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 shall be done with a hammer or by other methods determined by the Engineer.

The repaired area shall be removed and replaced, as determined by the Engineer, for nonconformance with original dimensions, surface cracks greater than 0.01 in. in width, map cracking with a crack spacing in any direction of 18 in. or less, voids, or delaminations.

If a nonconforming repair is allowed to remain in place, cracks 0.01 in. or less shall be repaired with epoxy according to Section 590 of the Standard Specifications. For cracks less than 0.007 in., the epoxy may be applied to the surface of the crack. Voids shall be repaired according to Article 503.15 of the Standard Specifications.

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. 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 for STRUCTURAL REPAIR OF CONCRETE (DEPTH GREATER THAN 5 IN.), STRUCTURAL REPAIR OF CONCRETE (DEPTH EQUAL TO OR LESS THAN 5 IN.).

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 of the Illinois Tollway Supplemental specifications.

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 of the Illinois Tollway Supplemental specifications.

Pay Item Number	Designation	Unit of Measure
JT503040	STRUCTURAL REPAIR OF CONCRETE (DEPTH EQUAL TO OR LESS THAN 5 IN)	SQ FT

FIBER WRAP REPAIR (Illinois Tollway GBSP)

Effective: October 20, 2011
Revised: April 1, 2016

Description. This work shall consist of furnishing all materials, labor, equipment and supervision necessary for the installation of externally bonded Fiber Reinforced Polymer (FRP) reinforcement, field applied at the locations shown in the plans and as directed by the Engineer.

Materials. The FRP composite system shall be a proprietary system consisting of all associated fiber reinforcement and polymer adhesives/resins. FRP composites consisting of fiber reinforcement and polymers provided by more than one Manufacturer are not allowed. The system shall be from one of the following companies:

BASF Corporation	SIKA Corporation	Fyfe Company, LLC
889 Valley Park Drive	201 Polito Ave.	8380 Miralani Drive
Shakopee, MN 55379	Lyndhurst NJ 07071	San Diego, CA 92126

The fabric for the FRP composite system shall be continuous filament woven fabric. Primary fibers for the fabric shall be electrical (E) glass fibers or Carbon. Acceptable fabrics are:

BASF Corporation.	SIKA Corporation	Fyfe Company, LLC
CF 130	HEX 103C	SCH-41
EG 900	HEX 100G	SEH-51A

The epoxy shall be supplied by the manufacturer as a part of the system designed for use with the selected fabric. Polyester resin shall not be allowed as a substitute for epoxy resin.

Submittals. The Contractor shall submit to the Illinois Tollway at least three weeks prior to beginning installation the following information for approval:

Manufacturer's product data sheets indicating physical, mechanical and chemical characteristics of all materials used in the FRP system. Information should include manufacturer's name and product number for all materials. Information shall include dry fabric thickness and minimum effective composite thickness per layer. For epoxy resins it shall include mix ratio by weight and volume, pot life, shelf life, resin gel time at proposed cure temperatures, mixing and application instructions & temperature ranges, and storage requirements. For paint it shall include mixing instructions, application method, application temperature ranges and storage requirements.

Tensile properties of the composite material as determined by tensile testing in accordance with ASTM D 3039. Ultimate tensile strength and rupture strain values shall be determined by subtracting three standard deviations from the average values of twenty or more tensile tests.

Manufacturer's installation instructions, maintenance instructions and general recommendations regarding each material to be used. Installation instructions shall include curing procedures for the composite system if required.

Manufacturer's Material Safety Data Sheets (MSDS) for all materials to be used.

The material supplier's name, address, and phone number, and the name, telephone and fax number of a contact person employed by that company.

Complete, step-by-step procedures and specifications for repairs of any defects. Procedure shall specify that if a defective composite area is greater than 50 square inches, the defective area shall be repaired by removing and reapplying.

Complete, step-by-step procedures for repairs of any future defects or damage. Including recommendations for any periodic maintenance or inspections, if required. Also include recommended materials and procedures for future repainting including surface preparation.

Qualifications. The Manufacturer/Supplier must approve the Applicator. A field representative who has completed the course of instruction (supported by the Manufacturer / Supplier) in the installation of the products specified in this section must be present on site during installation of the FRP system.

Delivery, Storage, and Handling. The products shall be delivered and stored in original, unopened containers. Containers must be clearly marked with legible and intact labels listing the Manufacturer's name, brand name, product identification and batch number.

Storage of fiber reinforcement and epoxies must be in areas protected from dust, moisture, and chemical exposure. Epoxies must be stored in areas with an ambient temperature between 50 and 75 degrees F and away from direct sunlight, flame sources or other hazards. Epoxy resins must be stored separately from hardeners.

The fiber reinforcement must not be handled roughly. For specific hazards of resin components consult the Manufacturer's MSDS.

CONSTRUCTION DETAILS

Surface Preparation

The surface shall be free from fins, sharp edges, and protrusions that will cause voids behind the casing or that, in the opinion of the Engineer, will damage the fiber.

The surfaces to receive the composite wrap shall be smooth and free of voids or undulations that would prevent full contact between the concrete and the wrap.

The contact surfaces shall be clean, free from oil, dirt, salt, etc., completely dry at the time of application of the composite. High pressure cleaning that would damage the surface will not be allowed. Newly repaired or patched surfaces that have set, and cured a minimum of 7 days, shall be coated with water-based epoxy paint or other approved sealer.

Application

a. The ambient temperature and the temperature of the epoxy resin components shall be between 55° F and 95° F, or as recommended by the manufacturer, at the time of mixing. Care shall be taken to ensure that the surface temperature of the concrete that the FRP system is being applied to is within the appropriate range for the epoxy resins. The composite shall be applied when the relative humidity is less than 85% and the surface temperature is more than 5° F above the dew point. Applications shall begin within one hour after the batch has been mixed.

b. The components of the epoxy resin shall be mixed with a mechanical mixer for a minimum of 5 minutes and applied uniformly to the fiber at a rate that shall insure complete saturation of the fabric.

c. A primer of epoxy shall be applied to the surface to be wrapped.

d. The FRP composite shall be applied to the prepared surface by wrapping using methods that produce a uniform force that is distributed across the entire width of the fabric. The primary fibers of the fabric shall not deviate from a vertical line more than 1/2 inch per foot, and the transverse fibers shall be perpendicular to the primary. Entrapped air shall be released or rolled over before the epoxy sets.

e. Beam repairs called for in this project shall consist of a single layer of fabric with any necessary splice overlap installed with the primary fibers oriented at a right angle to the longitudinal axis of the beam, providing shear reinforcement. If additional layers are required by the Engineer or recommended by the Manufacturer, successive layers of composite materials shall be placed before polymerization of the previous layer of epoxy is too complete to achieve complete bond between layers. If polymerization does occur between layers the surface must be roughened using a light abrasive that will not damage the fiber.

f. After the last layer of fabric is installed a final layer of epoxy shall be applied with care to insure coating of all edges and seams.

g. The individual supervising the installation of the fiber wrap shall be the same individual noted in the approved Information and Installation Manual. This individual shall be on site full time when fiber wrap is being installed. This individual shall not be removed or reassigned from the project without the written permission of the Engineer.

h. The Contractor shall maintain a Wrapping Log. The Wrapping Log shall be available for review by the Engineer at all times, and upon completion of all wrapping the Engineer shall be given a copy. The log shall provide material traceability and records for the wrapping of each beam. As a minimum the Wrapping Log shall contain:

    1. Project name, contract number and bridge number.

    2. Material information including product description, date of manufacturer and lot or batch numbers and location that products are installed.

    3. Daily fabrication, inspection and verification data for the days construction. Include as a minimum the locations, composite thickness measurements, ambient temperature and humidity readings at the beginning, middle and end of each shift (or at the beginning and end of installation), documentation of any required curing process, thickness of any paint or protective coating applied, location of any damaged areas that are repaired.

Coating System Application

A final coating is required to protect the fibers from the elements, specifically UV radiation and to give the final aesthetic effect.

After 96 hours from final application of epoxy, if the final epoxy coat is completely polymerized, the exterior surface of the composite wrap shall be cleaned and roughened by a light abrasive. Care should be taken during the roughening process so that the fibers are not damaged. All cleaned and roughened surfaces shall be dry before painting.

The area to be painted shall receive a total dry film thickness of not less than 4 mils.

Laboratory Testing. The Contractor shall prepare and furnish to the Authority one 12" x 12" sample of the cured composite system for each separate repair.

The Authority will randomly test the samples at their discretion and will furnish the Contractor results of all tests made. The Authority will precondition the samples at 140°F for 48 hours. Five 3/4" x 9" coupons will be cut from each sample and tested in accordance with ASTM D3039. Test results will include ultimate tensile strength, tensile modules, and percent elongation.

If the average of the five coupons fails to meet the specified requirements, two additional coupons will be taken from the same sample. If the average of the seven samples also fails, the Authority will test the sample made prior to the failed sample and the sample made after the failed sample. This process will continue until the limits of the defective work are identified.

After the defective area is identified the Contractor shall reapply the entire composite system to the defective area.

Field Inspection. The Engineer will inspect the cured composite system for defects consisting of external abrasions or blemishes, delaminations, voids, external cracks, chips, cuts, loose fibers, foreign inclusions, depressible raised areas or fabric wrinkles. The following repair criteria shall apply.

1. All defects greater than 1" long or a defective area greater than one square inch shall be repaired in accordance with the approved Information and Installation Manual.

2. If the number of defects of any size within an individual repair exceeds 10, the repair shall either be repaired or replaced as directed by the Engineer.

Method of Measurement. This work will be measured for payment in place and the area computed in square feet.

Basis of Payment. This work will be paid for at the contract unit price per square foot for FIBER WRAP REPAIR.

Work to repair the surface prior to wrapping shall be paid for under pay items for STRUCTURAL REPAIR OF CONCRETE (DEPTH GREATER THAN 5 IN.), STRUCTURAL REPAIR OF CONCRETE (DEPTH EQUAL TO OR LESS THAN 5 IN.); or POLYMER MODIFIED PORTLAND CEMENT MORTAR.

Pay Item Number	Designation	Unit of Measure
X0322194	POLYMER MODIFIED PORTLAND CEMENT MORTAR	SQ FT
JT503040	STRUCTURAL REPAIR OF CONCRETE (DEPTH EQUAL TO OR LESS THAN 5 IN.)	SQ FT
JT503100	FIBER WRAP REPAIR	SQ FT

APPLY CONCRETE SEALANT (Illinois Tollway GBSP)
Effective: October 25, 2016

Description. This work shall consist of furnishing and applying the specified concrete sealant to the surfaces of abutments, piers and walls as shown in the Plans and as directed by the Engineer.

Materials. Materials for sealing concrete surfaces to prevent scaling and freeze-thaw spalling shall be according to the following Section of the Standard Specifications:

Item	Section
(a) Concrete Sealer (Note 1.)	1026

Note 1. Concrete sealers shall be solvent based silane/siloxane or silane penetrating sealers from the latest IDOT Bureau of Materials and Physical Research list of approved/qualified concrete sealers.

CONSTRUCTION REQUIREMENTS

General. Traffic adjacent to operations shall be protected from overspray and debris from cleaning and sealing.

Surface Preparation.

(1) Existing Concrete. Prior to application of the sealant, all surfaces to be sealed shall be blast-cleaned. Blast-cleaning may be performed by either wet sand blasting, high pressure water blasting, shot blasting, shrouded dry sand blasting, dry sand blasting with dust collectors. or other methods approved by the Engineer. The method used shall be performed so as to conform with air and water pollution regulation applicable to the jurisdiction where the work site is located and to also conform to applicable safety and health regulations. Any method which does not consistently produce satisfactory work shall be discontinued and replaced by an acceptable method. All debris of every type, including dirty water, resulting from the blast-cleaning operation shall be reasonably confined during the performance of the blast-cleaning work and shall be immediately and thoroughly removed from the blast-cleaned surfaces and all other areas where debris may have accumulated. Prior to applying the sealant, the Engineer will inspect the blast- cleaned surfaces and any and all contaminated areas shall be blast-cleaned again at no additional cost to the Illinois Tollway and without cause for the Contractor claiming delay.

(2) New Concrete. Surfaces of new concrete that are to receive sealant are to be free of all loose concrete, grease, foreign matter and debris. Blast-cleaning may be required, if so directed by the Engineer to obtain a clean surface. In addition, prior to application of the sealant, the concrete surface shall be in strict accordance with manufacturer's recommendations.

Application. The sealant shall be applied at the rate of 175 square feet or less per gallon. Two applications may be required to obtain the application rate of 175 square feet per gallon.

When applying sealant to piers adjacent to waterways, lower nozzle velocity and brush or roller apply on vertical surfaces so that excess sealant does not drain into the waterways.

On new concrete or repaired concrete, any curing compounds used must be removed by blast cleaning before the silane type sealant can be applied to the surface to be sealed. Concrete shall be a minimum of 28 days old prior to applying sealant.

Method of Measurement. This work will be measured for payment in place and the area computed in square feet.

Basis of Payment. This work will be paid for at the contract unit price per square foot for APPLY CONCRETE SEALANT.

Pay Item Number	Designation	Unit of Measure
JT524010	APPLY CONCRETE SEALANT	SQ FT

BRIDGE DECK CONCRETE SEALER (Illinois Tollway GBSP)
Effective: October 25, 2016

Description. This work shall consist of the surface preparation, furnishing, and application of a concrete sealer upon the entire top surface of the deck, approach slabs and the tops and inside vertical faces of the parapets of the structure(s), as outlined in the plans.

Materials. Materials shall be according to the following Section of the Standard Specifications:

Item	Section
Concrete Sealer (Note 1.)	1026

Note 1. Concrete sealers shall be solvent based silane/siloxane or silane penetrating sealers from the latest IDOT Bureau of Materials and Physical Research list of approved/qualified concrete sealers for products requiring only one application.

CONSTRUCTION REQUIREMENTS

General. This work, including satisfactory curing of the sealer, shall be completed within the permitted lane closure periods.

Surfaces which are to be sealed shall be thoroughly cleaned by brooming and blowing off with high pressure air. Mechanical scraping may also be required to assist in the removal of mud and other foreign material. The use of chemicals and other cleaning compounds to facilitate the removal of foreign materials shall be approved by the manufacturer of the concrete sealer or its representative before use. Traffic shall not be allowed on the cleaned surface prior to treatment or application of sealer. Cleaning and application equipment shall be fitted with suitable traps, filters, drip pans, and other devices in order to prevent oil and other foreign material from being deposited on the surface.

Deck drains shall be temporarily plugged at the start of each daily operation before the bridge deck concrete sealer is applied, to control run off. The material used to plug the drains shall be removed and disposed of immediately upon the completion of the sealing treatment.

Traffic shall not be permitted to drive over plugged deck drains.

Existing pavement markings shall be temporarily covered prior to the application of the bridge deck concrete sealer. The temporary covering material used shall be such that it will not affect the marking's retroreflectivity when removed. After application of the bridge deck concrete sealer and prior to opening to traffic, all temporary coverings shall be removed.

For new concrete, sealing shall be performed after all grinding and/or saw cut grooving is completed and before the deck is marked and open to traffic.

The concrete surface moisture condition state shall be dry. Pavement moisture shall be checked by the following procedure. Tape the edges of a square foot of plastic to the pavement surface. Allow the plastic to stand for 15 minutes. After 15 minutes, observe the plastic for drops of moisture. If moisture is present and the drop sizes are larger than approximately ¼" diameter, the pavement moisture is too high and bridge deck concrete sealer shall not be applied. Do not apply when inclement weather is anticipated within 12 hours.

Bridge deck surfaces shall be flooded using a distribution sprayer, roller, brush or broom. Distribution sprayers shall include a skirting system to control overspray. Material shall be brushed or squeegeed for even distribution. Redistribute any puddles or free standing material. The bridge deck concrete sealer shall be applied according to the manufacturer's instructions, and information provided on the approved list of concrete sealers. The final total coverage rate shall not exceed the manufacturer's recommendations.

Traffic will be allowed on the deck only after a treated area does not track. The Contractor shall allow sufficient time for curing within the Maintenance of Traffic.

Method of Measurement. This work will be measured in square feet of surfaces treated.

Basis of Payment. This work will be paid at the contract unit price per square foot for BRIDGE DECK CONCRETE SEALER.

Pay Item Number	Designation	Unit of Measure
JT524015	BRIDGE DECK CONCRETE SEALER	SQ FT

BRIDGE EXPANSION JOINTS, REPLACEMENT AND RECONSTRUCTION, WITH BONDED PREFORMED SEALS AND ELASTOMERIC CONCRETE (Illinois Tollway GBSP)

Effective: June 12, 2007
Revised: April 1, 2016

Description. The work under this specification shall consist of the replacement and reconstruction of closure devices in the expansion openings of bridge decks as shown in the Plans. This work shall include the preparation of all shop drawings, provide materials, testing, labor and equipment necessary to fabricate, furnish and install the Elastomeric Concrete Blockouts and the bonded pre-formed neoprene seals as described in these special provisions.

Materials. Materials shall be according to the following.

(a) Elastomeric Concrete Headings shall be according to the following.

(1) ALTERNATE "A": The Watson, Bowman, Acme Heading. The elastomeric concrete material shall be the Wabo®Crete II product as produced by Watson Bowman Acme or an approved equivalent. The Contractor shall furnish a manufacturer's certification that the materials proposed have been pre-tested and will meet the requirements as set forth in the special provision.

The elastomeric concrete material shall be an ambient cure, 100% solids, two component polyurethane with pre-graded aggregate mix exhibiting the physical properties listed in the tables below. When properly mixed and poured, the elastomeric concrete cures rapidly, flows and fills any voids, spalls or irregularities forming a monolithic unit.

Elastomeric cured binder shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D638	750 min., psi
Elongation @ break	ASTM D638	200%
Hardness, Durometer D	ASTM D2240	30 – 49
Compression Set, 22hr @ 158ºF	ASTM D395 Method B	50% max.
Tear Resistance, min, lb/in	ASTM D624	80
Water Absorption	ASTM D570	3% max.
Heat shrinkage, %	ASTM D1299	1.6 max.
Oven Aging @ 158ºF For 72 hr – tensile	ASTM D638	750
Elongation	ASTM D638	150% min.

Elastomeric cured binder and aggregate shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENT
Compressive Strength	ASTM D695	2200 psi min.
Resilience @ 5% deflection Slant Shear Bond Strength To Concrete	ASTM D695	90% min. 250 psi min.
Impact Resistance @ 32ºF @ -20ºF @ 158ºF	ASTM D3029	 No cracks No cracks No cracks

The bonding agent shall be the elastomeric concrete producer's two component, 100% solids bonding agent. The product compatible with Wabo®Crete II elastomeric concrete is the Wabo®Epoxing Bonding Agent. The bonding agent shall be applied to the sides and base of the constructed concrete blockout prior to placement of the elastomeric concrete. The bonding agent shall be stored, mixed, and applied in accordance with the manufacturer's recommendations.

(2) Alternate "B": The D. S. Brown Heading. The elastomeric concrete material shall be the Delpatch™ product as produced by D. S. Brown. The Contractor shall furnish a manufacturer's certification that the materials proposed have been pre-tested and will meet the requirements as set forth in the special provision.

The elastomeric concrete material shall be an ambient cure, 100% solids, and two component binder with pre-graded aggregate and fiberglass mix exhibiting the physical properties listed in the tables below. When properly mixed and poured, the elastomeric concrete cures rapidly, flows and fills any voids, spalls or irregularities forming a monolithic unit.

Elastomeric cured binder shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D412(mod.)	600 psi, min.
Elongation @ break	ASTM D412(mod.)	25% min.
Hardness, Durometer D	ASTM D2240	50

Elastomeric cured binder and aggregate shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENT
Compression Strength	ASTM D695	800 psi min. / 1400 psi max.
Resilience @ 5% deflection Adhesion to Concrete -dry -wet	ASTM D695	95% min. 400 psi min. 250 psi min.
Impact Ball Drop @ -20°F, no cracking	ASTM D3029(mod.)	>10 ft.

(b) Bonded Joint Seal Systems shall be according to the following.

Joint seals used for the replacement and reconstruction of the existing seals shall consist of the pre-formed neoprene pressurized seals of the JEENE Joint Seal System as manufactured by Watson, Bowman, Acme, Corp., and/or of the pre-formed neoprene compression seals of the J-Series Joint Seal System as manufactured by D. S. Brown Company. Only the following materials supplied by Watson, Bowman, Acme or D. S. Brown shall be used to install the joint seal systems.

(1) Alternate "A": JEENE Joint System. A polychloroprene (neoprene) elastomer seal, preformed by extrusion and vulcanized into its definitive shape, which is supplied in several configurations and dimensions, ranging from ¼" to 5" shall be required for use. The preformed seal shall have the following properties:

PROPERTY	ASTM METHOD	REQUIREMENT
Tensile Strength, min.	D-412	2000 psi (13.8 Mpa)
Elongation at Break, min.	D-412	250%
Hardness, Shore A	D-2240	65 ± 5
Oven Aging, 70 hrs. at 212ºF Tensile Strength, max. loss Elongation at Break, max. loss Change in Hardness	D-573	 20% 20% 0 – 10 points
Oil Swell, 70 hrs. at 212ºF Weight Change, max.	D-471	 45%
Ozone Resistance, 70 hrs. at 104ºF	D-1149	No Cracks
Low Temperature Stiffing, 7 days at 14ºF Change in Hardness	D-2240	 0 – 15 points

A two-component, thixotropic, epoxy-based adhesive, which is mixed at the job site and supplied by the joint seal manufacturer, shall be required for use with the JEENE Joint Seal System. The adhesive shall have the following properties:

PROPERTY	ASTM METHOD	REQUIREMENT
Tensile Strength	D-638	4,000 psi
Axial Compression	D-638	8,000 psi
Pot Life at 68ºF	N/A	40 minutes
Flash Point	N/A	> 200ºF
Initial Cure at 68ºF	N/A	24 hours
Full Cure at 68ºF	N/A	7 days

Note: If the ambient air temperature is between 40ºF and 60ºF, an alternate cold weather epoxy shall be utilized.

(2) Alternate "B": J-Series Joint Seal System. A polychloroprene (neoprene) elastomeric seal preformed by extrusion and vulcanized into its definitive shape, ranging from 1" to 4" shall be required for use. The preformed seal shall have the following properties:

PROPERTY	ASTM METHOD	REQUIREMENT
Tensile Strength, min.	D-412	2000 psi
Elongation at Break, min.	D-412	250%
Hardness, Shore A	D-2240	55 ± 5
Oven Aging, 70 hrs. @ 212°F Tensile Strength, max. loss Elongation at Break, max. loss Change in Hardness, Shore A		 20% 20% 0 – 10 points
Oil Swell, 70 hrs at 212°F Weight Change, max.	 D-471	 45%
Ozone Resistance, 20% strain, 70 hrs aging, D573, 3 ppm in air	D-1149	No Cracks

A two-component modified epoxy-based adhesive, which is mixed at the job site and supplied by the joint seal manufacturer, shall be required for use with the J-Series Joint Seal System. The adhesive shall have the following properties:

PROPERTY	ASTM METHOD	REQUIREMENT
Tensile Strength, min.	D-638	4,500psi, min.
Axial Compression	D-638	8,775 psi, min.
Pot Life at 68°F	N/A	45 minutes
Flash Point	N/A	>200°F
Non-Volatile content		100% reactive
Initial cure @ 70°F	N/A	24 hours

General. The Contractor shall furnish and install the specified joint seal system at the locations shown on the plans in accordance with the manufacturer's instructions and as directed by the Engineer.

Modifications to the existing expansion joints will consist of the removal of the existing expansion joint's neoprene or silicone seals. The horizontal limits of these replacement areas will be to sound concrete as determined by the Engineer. Any concrete removal and replacement will be done in accordance with the applicable sections of the Special Provision Accelerated Concrete Deck Slab and Approach Slab Repair. All exposed reinforcing steel shall be sand blasted clean. Any supplemental reinforcement bars shall be included and paid for in the item for REINFORCEMENT BARS, Section 508 of the Standard Specifications.

Before the installation of the elastomeric concrete within the blockout areas of the expansion joints, the existing anchor block or in-place elastomeric concrete shall be removed. Any new Portland cement based concrete placed adjacent to the joint as a horizontal repair shall be cured in accordance with the Special Provision for Accelerated Concrete Deck Slab and Approach Slab Repair and shall have been cured for a minimum of one to three days before material removal is performed to create an elastomeric concrete blockout or heading. The blockout shall be constructed to the

dimensions shown on the drawings, with the exception for any unsound concrete identified by the Engineer to exist immediately below or horizontally adjacent to the designed blockout area. Any unsound concrete that is identified during the removal operations is required to be removed and to be repaired. Unsound concrete less than or equal to 2-½ inches wide by 4 inches deep shall be repaired with elastomeric concrete. When unsound concrete is greater than 4 inches but less than 7 inches deep, remove unsound and sound concrete to a uniform 7 inch depth and construct a partial depth repair in accordance with the Special Provision "Accelerated Concrete Deck Slab and Approach Slab Repair" with the blockout included. When the unsound concrete depth exceeds 7 inches, the repair shall be a full depth repair in accordance with the Special Provision "Accelerated Concrete Deck Slab and Approach Slab Repair" with the blockout included. The full depth repair may be at isolated locations or along the full length of the joint, as determined by the Engineer. Before installation of the elastomeric concrete, the concrete substrate must be clean, (free of dirt, coatings, rust, grease, oil and other contaminants), sound and durable. Surface preparation methods include saw cutting, chipping, scarification, and sand blasting.

Installation of the joint seal system and elastomeric concrete shall be performed under the supervision and responsibility of the manufacturer's representative or authorized contractor. No delay in completion of the contract or claims for additional compensation will be allowed due to unavailability of the manufacturer's representative.

The manufacturer's representative shall meet with the Contractor and the Engineer prior to installing the joint seal system and the elastomeric concrete to ensure that the installation procedures are in accordance with the manufacturer's written instructions.

The manufacturer's representative shall, if deemed necessary, assist the Engineer in performing a general inspection of the completed joint seal systems to determine their acceptability. Any joint seals along with the elastomeric concrete which, in the judgement of the Engineer, are not furnished and installed in total accordance with the plans, the Standard Specifications, and the manufacturer's instructions shall be subject to rejection. Any such joint seal system which is rejected shall be removed and replaced in a manner acceptable to the Engineer at no additional cost to the Authority.

Shop Drawings. The Contractor shall submit shop drawings in accordance with the provisions of Article 105.04 of the Illinois Tollway Supplemental Specifications for all expansion joint closure devices.

No materials detailed in the Plans and/or described in the Special Provisions, or covered by the shop drawings shall be delivered to the site of the work until the shop drawings have been approved.

Construction Procedures. All construction and installation methods and procedures for expansion joint closure devices and the replacement and repair of bridge expansion joints shall be in strict accordance with the Plans, the manufacturer's recommendations, the approved shop drawings and as directed by the Engineer.

Prior to the start of any installation work, the Contractor shall submit the following documents to the Construction Manager:

(a) 10 copies of the manufacturer's certification, certifying that all materials and components to be furnished are in compliance with the Plans and accepted shop drawings.
(b) 10 copies of the manufacturer's recommendations for installation of the materials and components to be furnished, certified by the manufacturer to be current, accurate, and directly applicable to the materials and components to be delivered to the site of the work.

Any expansion joint closure device or joint seal system which, in the judgement of the Engineer, is not furnished and installed in total accordance with the Plans, the Special Provisions, the approved shop drawings, or the manufacturer's specifications shall be subject to rejection. Any such installation which is rejected shall be removed and replaced with material and in a manner acceptable to the Engineer. The costs for any such adjustments shall be the responsibility of the Contractor.

Installation Procedures. Installation of elastomeric headings and joint seal systems shall be as follows.

(a) Elastomeric Concrete Installation. The Elastomeric Concrete and Epoxy Bonding Agent Manufacturer's instructions shall be followed.

The Elastomeric Concrete and Epoxy Bonding Agent Manufacturer's instructions for the proper installation of the JEENE joint system and the J-Series joint system shall be entered on the shop drawings. Shop drawings which lack installation instructions may be returned without approval.

The Wabo®Epoxing Bonding agent must be used as a primer on the properly prepared concrete before beginning the installation of the Wabo®Crete II elastomeric concrete within the blockout areas. Application of the primer to the concrete surface shall be in accordance with the manufacturer's recommended procedure. The primer shall not be allowed to cure before installation of the elastomeric concrete.

D. S. Brown Company's proprietary primer must be used on the properly prepared concrete before beginning the installation of the Delpatch™ elastomeric concrete within the blockout areas. Application of the primer to the concrete surface shall be in accordance with the manufacturer's recommended procedure. The primer shall be allowed to cure 30 minutes before pouring the Delpatch™ elastomeric concrete.

Mixing of the elastomeric concrete components shall be in accordance with the manufacturer's recommended procedure. Following proper mixing procedures, the final blend of elastomeric concrete is poured out of the mixing container and into the blockout area adjacent to the joint opening.

Wabo®Crete II is an ambient cure material. Cure times are, therefore, temperature dependent. Suggested cure times are listed below:

Cure Time (Open to Traffic)	70-90ºF	1 - 1½ hours
	50-70ºF	1½ - 2 hours
	40-50ºF	2 – 3 hours

Delpatch™ is also an ambient cure material and can be placed when any moisture is not present or when pavement temperatures are between 45-110°F. Delpatch™ elastomeric concrete can accept traffic in one to two hours after the final pour when installed in normal working temperatures.

(b) Joint Seal System Installations. Joint seal installations shall be as follows.

(1) JEENE Joint Seal System Installation. After the elastomeric concrete is cured and the joint opening form has been removed, (and after the Engineer verifies that work done under other subsections meets requirements,) the pre-formed neoprene pressurized seal shall be installed.

Before installation of the seal, the entire formed joint opening shall be cleaned with all foreign materials totally removed from the gap. The environment should be free of dust, oil, grease, wax, moisture, and frost. The elastomeric concrete heads must first be cleaned out by disc grinding or sandblasting using black beauty sand and then vacuumed or blown with dry, oil free, compressed air before the two component epoxy adhesive is mixed and applied. No installation may be performed in rainy weather, or when rain is expected within one hour before installation. All surfaces must be completely dry prior to applying adhesive.

The pre-formed neoprene pressurized seals shall be of the size and shape shown on the Plans. Ambient temperature shall not be lower than 40ºF during installation. Note that gap size will change with cold and hot temperature extremes. Gap measurement should optimally be carried out at the mid-point of the average temperature range for the area of installation. The pre-formed seal shall be cut to the correct length of the appropriate gap for installation, without pulling or exerting excess tension. After the seal length is determined and required cut-outs are completed, both ends of the seal shall be plugged (air tight) and the air valves installed. All end plugs in the seal shall be tested for air tightness and integrity by careful inspection and water submergence prior to seal installation in the joint opening. Deflate and dry off the pre-formed seal before installation.

Clean and abrade the sides of the pre-formed seal per the manufacturer's instructions before the epoxy adhesive is applied. Mix adhesive according to manufacturer's directions only after all preparation of the joint openings in all lanes and for the pre-formed seal are complete. The adhesive shall be applied to the inner faces of the joint opening in an even manner, without leaving blank spots. In the same even manner, the adhesive shall be applied to the outer rigid side walls of the pre-formed seal. As the adhesive is applied to the seal walls (on both sides), the seal should be gradually inserted into the gap, without stress or compression. The contractor should maintain the profile at the depth desired, by hand or by any convenient means. The seals shall be installed at all times with the top of the seal placed below the top of the seal placed below the top of the adjoining pavement slabs as shown on the Plans. Any excess adhesive shall be removed.

Pressurization should be done through the air valve with a heavy pump. Pressurization should be applied slowly so as not to cause the joint to squeeze adhesive out of the flanges on the sides of the joint. Following pressurization, immediately clean all excess adhesive around the edges and top of the joint with a trowel or scraping tool, allow the epoxy adhesive to cure approximately 24 hours, and then remove the air valve to bleed off air pressure.

(2) J-Series Joint Seal System Installation. After the elastomeric concrete is cured and the joint opening form has been removed (and after the Engineer verifies that work done under other subsections meets requirements), the pre-formed neoprene compression seal shall be installed. Before installation of the seal, the entire formed joint opening shall be cleaned with all foreign materials totally removed from the gap. The environment should be free of dust, oil, grease, wax, moisture, and frost. The elastomeric concrete heads must first be cleaned using a stiff bristled brush or sandblasting using black beauty sand and then vacuumed or blown with dry, oil free, compressed air before the two component epoxy adhesive is mixed and applied. No installation may be performed in rainy weather, or when rain is expected within one hour before installation. Clean the concrete surfaces with alcohol cleaner and all surfaces must be completely dry prior to applying adhesive.

The pre-formed neoprene compression seals shall be of the size and shape shown on the Plans. Uncoil the seal and allow it to relax. Apply seal conditioner, scrubbing vigorously into

the ribs of the seal using a wire brush or wire wheel on the sidewalls. The surface must be abraded and tacky to the touch. This roughened, dull finish is needed for an aggressive bond. Continued scrubbing with a stiff nylon brush and new conditioner will clean the surface. Do this in two separate passes, and then rinse the profile with cleaner.

Apply the adhesive to the joint surfaces and into the ribs of the profile using a margin trowel. The ribs must be completely filled. Using a vacuum hooked up to one end of the seal length, draw down the seal enough to insert into the opening. One placed and leveled, turn off vacuum pump and allow the seal to expand and push against the concrete. A small amount of adhesive should be visible above the ribbed area. Remove any additional adhesive using organic solvents. Allow the adhesive to cure for 24 hours.

WARRANTY

Upon the completion of this work, the Contractor shall provide the Illinois Tollway with a written, three-year warranty signed by the Contractor in the form of a 3-year guarantee bond for the expansion joint system as specified herein. The bond shall be on the form furnished by the Illinois Tollway and with a surety satisfactory to the Illinois Tollway in the amount of 200 percent of the cost of the respective expansion joints per the Final Contract Amount. The bond must cover all material, labor, equipment and traffic control costs needed to repair or replace the installed expansion joint system. The bond shall remain in full force and effect for a period of 3 years, which period shall commence on the date traffic is moving over the respective bridge in its final lane configuration.

The Contractor shall furnish a guarantee bond for the specified time period for each bridge structure where expansion joints were installed/replaced. Any warranty work will be at the Contractor's expense, which shall include all labor, material, maintenance of traffic, and any incidental cost to repair the joint system in a manner acceptable to the Engineer at no additional cost to the Illinois Tollway. Any traffic control measures needed to repair the expansion joint under the specified time period will be performed in accordance with Standard Specifications.

At its option, the Illinois Tollway may accept the Warranty for this item from the installing Contractor, if different than the named Contractor.

Method of Measurement. BRIDGE EXPANSION JOINTS, REPLACEMENT AND RECONSTRUCTION for existing structures shall be measured for payment in feet for each type and size of closure specified. Measurement shall be along the centerline of each expansion closure, in place and accepted, from end to end, including curb, median or parapet sections.

ELASTOMERIC CONCRETE HEADINGS will be measured for payment in cubic feet. The volume measured for payment will be calculated from the lines and dimensions shown in the Plans and include any supplemental elastomeric concrete required to replace unsound concrete immediately adjacent to the heading locations.

Horizontal concrete removal and reconstruction outside the blockout areas for BRIDGE EXPANSION JOINTS, REPLACEMENT AND RECONSTRUCTION will be measured for payment in square yards as ACCELERATED DECK SLAB REPAIR and/or ACCELERATED APPROACH SLAB REPAIR, in accordance with the Special Provision for Accelerated Concrete Deck Slab and Approach Slab Repair. Supplemental REINFORCEMENT BARS and/or REINFORCEMENT BARS, EPOXY COATED will be measured for payment in pounds furnished and placed as authorized by the Engineer.

Basis of Payment. Payment for BRIDGE EXPANSION JOINTS, REPLACEMENT AND RECONSTRUCTION for the joint seal system with elastomeric concrete headings completed, in place, accepted and measured as specified herein will be made at the Contract unit price per foot. This payment shall be full compensation for removing and disposing of all expansion joint material, existing anchor blocks including embedded studs and elastomeric concrete, and any unsound concrete; for saw cutting and blast cleaning; for furnishing certifications, shop drawings, instructions and warranties.

ACCELERATED DECK SLAB REPAIR and ACCELERATED APPROACH SLAB REPAIR shall be paid in square yards in accordance with the Illinois Tollway special srovision for Accelerated Concrete Deck Slab and Approach Slab Repair. Supplemental reinforcement bars shall be paid for as REINFORCEMENT BARS and/or REINFORCEMENT BARS, EPOXY COATED in pounds in accordance with Section 508.11 of the Standard Specifications.

Payment for ELASTOMERIC CONCRETE HEADINGS completed, in place, accepted and measured as specified herein will be made at the Contract unit price per cubic foot. This payment shall be full compensation for furnishing certifications, shop drawings, testing, instructions and warranties.

Pay Item Number	Designation	Unit of Measure
JT525010	BRIDGE EXPANSION JOINTS, REPLACEMENT AND RECONSTRUCTION, 1”	FOOT
JT525018	BRIDGE EXPANSION JOINTS, REPLACEMENT AND RECONSTRUCTION, 2 3/4"	FOOT
JT525022	BRIDGE EXPANSION JOINTS, REPLACEMENT AND RECONSTRUCTION, 4”	FOOT
JT525025	ELASTOMERIC CONCRETE HEADINGS	CU FT

NEOPRENE EXPANSION JOINT RECONSTRUCTION (Illinois Tollway GBSP)

Effective: April 9, 2008
Revised: April 1, 2016

Description. This work shall consist of the repair and reconstruction of the existing blockout concrete or elastomeric concrete under and adjacent to the deck expansion joints, and the replacement of the continuous neoprene expansion joint seal at the expansion joints as shown in the Plans. This work shall include preparation of all shop drawings, and the materials, testing, labor and equipment necessary to remove the existing joint materials, repair or reconstruct the neoprene expansion joint blockouts including the concrete deck, reconstructing headings and replacing broken steel angles, anchor bolts and studs, as needed, and all other cleaning and preparatory work necessary that is required prior to fabricating and replacing the neoprene expansion joint seals and anchor blocks as described in these special provisions and at the locations indicated in the Plans.

Materials. Materials shall be according to the following.

(a) Elastomeric Concrete shall be according to the following.

(1) Alternate "A", Wabo®Crete II. The elastomeric concrete material shall be the Wabo®Crete II product as produced by Watson Bowman Acme or an approved equivalent. The Contractor shall furnish a manufacturer's certification that the materials proposed have been pre-tested and will meet the requirements as set forth in the special provision.

The elastomeric concrete material shall be an ambient cure, 100% solids, two component polyurethane with pre-graded aggregate mix exhibiting the physical properties listed in the tables below. When properly mixed and poured, the elastomeric concrete cures rapidly, flows and fills any voids, spalls or irregularities forming a monolithic unit.

Elastomeric cured binder shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D638	750 min., psi
Elongation @ break	ASTM D638	200%
Hardness, Durometer D	ASTM D2240	30 – 49
Compression Set, 22hr @ 158ºF	ASTM D395 Method B	50% max.
Tear Resistance, min, lb/in	ASTM D624	80
Water Absorption	ASTM D570	3% max.
Heat shrinkage, %	ASTM D1299	1.6 max.
Oven Aging @ 158ºF For 72 hr – tensile	ASTM D638	750
Elongation	ASTM D638	150% min.

Elastomeric cured binder and aggregate shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENT
Compressive Strength	ASTM D695	2200 psi min.
Resilience @ 5% deflection Slant Shear Bond Strength To Concrete	ASTM D695	90% min. 250 psi min.
Impact Resistance @ 32ºF (0ºC) @ -20ºF (-29ºC) @ 158ºF (70ºC)	ASTM D3029	 No cracks No cracks No cracks

The bonding agent shall be the elastomeric concrete producer's two component, 100% solids bonding agent. The product compatible with Wabo®Crete II elastomeric concrete is the Wabo®Epoxing Bonding Agent. The bonding agent shall be applied to the sides and base of the constructed concrete blockout prior to placement of the elastomeric concrete. The bonding agent shall be stored, mixed, and applied in accordance with the manufacturer's recommendations.

(2) Alternate "B", Delpatch™: The elastomeric concrete material shall be the Delpatch™ product as produced by D. S. Brown. The Contractor shall furnish a manufacturer's certification that the materials proposed have been pre-tested and will meet the requirements as set forth in the special provision.

The elastomeric concrete material shall be an ambient cure, 100% solids, and two component binder with pre-graded aggregate and fiberglass mix exhibiting the physical properties listed in the tables below. When properly mixed and poured, the elastomeric concrete cures rapidly, flows and fills any voids, spalls or irregularities forming a monolithic unit.

Elastomeric cured binder shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENT
Tensile strength	ASTM D412(mod.)	600 psi, min.
Elongation @ break	ASTM D412(mod.)	25% min.
Hardness, Durometer D	ASTM D2240	50

Elastomeric cured binder and aggregate shall meet the following physical properties:

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENT
Compression Strength	ASTM D695	800 psi min. / 1400 psi max.
Resilience @ 5% deflection Adhesion to Concrete -dry -wet	ASTM D695	95% min. 400 psi min. 250 psi min.
Impact Ball Drop @ -20°F, no cracking	ASTM D3029(mod.)	>10 ft.

(b) Anchor bolts, Threaded rods, Washers and Nuts. Anchor bolts, threaded rods, washers and nuts shall either be stainless steel meeting the requirements of ASTM A 193 or they shall conform to the requirements of ASTM A 307, zinc-coated by the mechanical plating method conforming to ASTM B 695 (AASHTO M298), Class 50. Zinc-coated nuts shall be tapped oversize in accordance with the requirements of AASHTO M291 (ASTM A 563) and shall meet the supplementary requirements of S1.1 through S1.2.1 of the same specifications for lubricant and testing.

(c) Automatically End Welded Threaded Studs, Washers and Nuts. Automatically end welded threaded study; washers and nuts, when required shall be stainless steel meeting the requirements of ASTM A 193. Welding and inspection of the threaded studs shall conform to Article 505.08(m) of the Standard Specifications.

(d) Continuous Membrane Joint Seal System shall be according to the following:

The continuous membrane joint seal system shall be a Wabo®ElastoFlex continuous membrane seal product, EFL Series, as produced by Watson Bowman Acme or an approved equivalent. The Contractor shall furnish a manufacturer's certification that the materials proposed have been pre-tested and will meet the requirements as set forth in the special provision.

The continuous membrane joint seal system shall consist of a continuous gland of fabric reinforced EPDM rubber mechanically locked by modular steel reinforced EPDM anchor blocks. Ends of each anchor block shall be tongue and groove jointed together to ensure a positive connection and to prevent uplift and separation. The membrane gland shall be installed continuously curb to curb.

The rubber anchor blocks shall be produced from EPDM rubber. The elastomeric seal shall be produced from neoprene rubber.

The materials shall meet the following properties:

(1) EPDM RUBBER (molded rubber anchor blocks)

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENTS
Tensile strength, min.	ASTM D412	1500 psi
Elongation @ break, min.	ASTM D412	350%
Hardness, Shore A	ASTM D2240	60 ± 5
Compression Set, 22hr @ 212ºF, max.	ASTM D395	50%
Heat Resistance, (70hrs.@212ºF) Tensile Strength, max Elongation, max Hardness, max	ASTM D573	 25% 25% 10 pts.
Oil Resistance (70hrs.@212ºF) Volume, max	ASTM D471	120%
Ozone Resistance 50 pphm for 72 hrs@104ºF	ASTM D518	100 Rating

(2) Neoprene Rubber (continuous membrane “elastomeric” seal)

PHYSICAL PROPERTIES	TEST METHOD	REQUIREMENTS
Tensile strength, min.	ASTM D412	2000 psi
Elongation @ break, min	ASTM D412	250%
Hardness, Shore A	ASTM D2240	55 ± 5
Oven Aging, (70hrs.@xxxºF) Tensile max loss Elongation, max loss Change in Hardness	ASTM D573	 20% 20% 0 to 10 pts.
Oil Swell, 70hrs.@212ºF(100ºC) Weight Change, max	ASTM D471	45%
Ozone Resistance 70hrs.@104ºF (40°C)	ASTM D518	100 Rating

(3) Steel Reinforcement in Anchor Blocks. The steel reinforcement in anchor blocks shall be bonded to eslastomer during vulcanization process and shall conform to ASTM A 570 Grade 36, AASHTO M 183, SAE 1020, or equal.

(e) Adhesive and Sealant. The adhesive/sealant bedding compound for bonding the expansion joint seals to the concrete or steel seats shall be a polysulfide grout meeting the requirements of Federal Specification MMM-G-650B, Grade C with 50 percent filler material allowed.

The sealant for sealing between the ends of the elastomeric anchor blocks, between edges of concrete block-out and anchor blocks, and for filling bolt hole cavities shall be a one or two part, non-sagging polysulfide or polyurethane black sealing compound meeting the requirements of the Federal Specification TT-S-00230C, Type II.

General. The Contractor shall repair the elastomeric concrete and the adjacent concrete outside the blockout areas as indicated by the Engineer as well as furnish and replace the specified joint seal system at the locations shown on the plans in accordance with the manufacturer’s instructions and as specified herein.

Modifications to the existing neoprene expansion joints will consist of the removal of the existing neoprene seals, anchor blocks, broken or defective anchor bolts and studs in the curb, parapets and deck as shown on the plan as well as the removal and replacement of any spalled, cracked or otherwise damaged concrete adjacent to the neoprene expansion joint. The horizontal limits of these replacement areas will be to sound concrete as determined by the Engineer. The removal and replacement of additional miscellaneous structural steel shall also be as determined by the Engineer. All exposed reinforcing steel shall be sand blasted clean. Any supplemental reinforcement bars shall be included and paid for in the item for REINFORCEMENT BARS, EPOXY COATED, Section 508 of the Standard Specifications.

Before the installation of the elastomeric concrete within the blockout areas and the horizontal limits of the expansion joints, the existing anchor block or in-place elastomeric concrete shall be removed. The blockout shall be constructed to the dimensions indicated by the engineer. Any unsound concrete that is identified during the removal operations is required to be removed and to be repaired with supplemental elastomeric concrete to the elastomeric material quantity designed for the blockout replacement forming a monolithic unit. Before installation of the elastomeric concrete, the concrete

substrate shall be clean, (free of dirt, coatings, rust, grease, oil and other contaminants), sound and durable. Surface preparation methods include saw cutting, chipping, scarification, and sand blasting.

Any elastomeric concrete which, in the judgment of the Engineer, is not furnished and installed in total accordance with the plans, the Supplemental Specifications, and these Special Provisions, as well as the manufacturer's instructions shall be subject to rejection. Any such elastomeric concrete and joint repairs which are rejected shall be removed and replaced in a manner acceptable to the Engineer at no additional cost to the Illinois Tollway.

Installation of the joint seal system shall be performed under the supervision and responsibility of the manufacturer's representative or authorized contractor. No delay in completion of the contract or claims for additional compensation will be allowed due to unavailability of the manufacturer's representative.

The manufacturer's representative shall meet with the Contractor and the Engineer prior to installing the joint seal system to ensure that the installation procedures are in accordance with the manufacturer's written instructions.

The manufacturer's representative shall, if deemed necessary, assist the Engineer in performing a general inspection of the completed joint seal systems to determine their acceptability. Any neoprene joint seals which, in the judgment of the Engineer, are not furnished and installed in total accordance with the Plans, the Supplemental Specifications, and these Special Provisions, as well as the manufacturer's instructions shall be subject to rejection. Any such joint seal system which is rejected shall be removed and replaced in a manner acceptable to the Engineer at no additional cost to the Illinois Tollway.

Shop Drawings. The Contractor shall submit shop drawings in accordance with the provisions of Article 105.04 of the Illinois Tollway's Supplemental Specifications for all elastomeric concrete repairs and neoprene expansion joint closure devices.

The shop drawings, along with joint details shall include details of the concrete blockout, if required for the installation, a layout plan of the joint units to be used and the spacing and locations of the anchor bolts or studs.

No materials detailed in the Plans and/or described in the Special Provisions, or covered by the shop drawings shall be delivered to the site of the work until the shop drawings have been approved.

CONSTRUCTION PROCEDURES

All construction and installation methods and procedures for expansion joint closure devices and the replacement and repair of bridge expansion joint blockouts, seals, and elastomeric concrete repairs shall be in strict accordance with the Plans, the manufacturer's recommendations, the approved shop drawings and as directed by the Engineer.

Prior to the start of any installation work, the Contractor shall submit the following documents to the Engineer:

(c) 10 copies of the manufacturer's certification, certifying that all materials and components to be furnished are in compliance with the Plans and accepted shop drawings.

(d) 10 copies of the manufacturer's recommendations for installation of the materials and

components to be furnished, certified by the manufacturer to be current, accurate, and directly applicable to the materials and components to be delivered to the site of the work.

Installation of elastomeric headings and joint seal systems shall be as follows.

(a) Elastomeric Concrete Installation. The Elastomeric Concrete and Epoxy Bonding Agent Manufacturer's instructions shall be followed.

The Elastomeric Concrete and Epoxy Bonding Agent Manufacturer's instructions for the proper installation of the Neoprene Expansion Joint Seal system shall be entered on the shop drawings. Shop drawings which lack installation instructions may be returned without approval.

The Wabo®Epoxing Bonding agent shall be used as a primer on the properly prepared concrete before beginning the installation of the Wabo®Crete II elastomeric concrete within the blockout areas. Application of the primer to the concrete surface shall be in accordance with the manufacturer's recommended procedure. The primer shall not be allowed to cure before installation of the elastomeric concrete.

D. S. Brown Company's proprietary primer shall be used on the properly prepared concrete before beginning the installation of the Delpatch™ elastomeric concrete within the blockout areas. Application of the primer to the concrete surface shall be in accordance with the manufacturer's recommended procedure. The primer shall be allowed to cure 30 minutes before pouring the Delpatch™ elastomeric concrete.

Mixing of the elastomeric concrete components shall be in accordance with the manufacturer's recommended procedure. Following proper mixing procedures, the final blend of elastomeric concrete is poured out of the mixing container and into the blockout area adjacent to the joint opening.

Wabo®Crete II is an ambient cure material. Cure times are, therefore, temperature dependent. Suggested cure times are listed below:

Cure Time (Open to Traffic)	70-90ºF (21-32ºC)	1 - 1½ hours
	50-70ºF (10-21ºC)	1½ - 2 hours
	40-50ºF (4-10ºC)	2 – 3 hours

Delpatch™ is also an ambient cure material and can be placed when any moisture is not present or when pavement temperatures are between 45-110°F (8-43°C). Delpatch™ elastomeric concrete can accept traffic in one to two hours after the final pour when installed in normal working temperatures.

(b) Neoprene Expansion Joint Seal System installations.

Prior to installing the neoprene expansion seals, the expansion joint openings shall be prepared accordingly. Anchors shall be properly positioned by the use of a suitable template and shall be cast-in-place bolts or by drilling and setting anchor rods according to Article 509.06 of the Standard Specifications. Concrete or metal surfaces on which the neoprene expansion joints are to be set shall be dry, clean, level and sound with no broken or spalled concrete. Adjacent joint seats shall be on a common plane with each other. Joint seals shall not be placed until the Engineer has approved the blockout. Errors shall be corrected by grinding or other approved procedures, including, if necessary, concrete removal and replacement to obtain proper alignment.

The neoprene molded sealing element shall be furnished and installed in one continuous, unbroken length for the entire joint length including parapets, curbs and walls. The seal shall be installed in an adhesive/sealant bedding compound in the blockout as shown on the plans. Neoprene surfaces to be in contact with adhesive shall be cleaned with a solvent as recommended by the manufacturer, prior to installation. The adhesive/sealant shall be liberally applied over the entire blockout our metal seat areas as sealing element is set into it. The anchor blocks shall then be set in position over the seal with the nuts torqued to at least 65 ft lb (90 N m). A minimum of 24 hours after initial installation, the nuts shall be retorqued to the initial 65 ft lb.

Prior to filling the space in the bolt wells, the Engineer's inspection of the anchor fasteners and tightening of the units will be required. All joints between units, around connecting bolts and cavity plugs shall be sealed in a neat manner. Neoprene surfaces to be in contact with sealant shall be cleaned with a solvent as recommended by the manufacturer prior to sealing.

The finished joint shall present a smooth, neat appearance with no protruding bolts or rough joints. Excess sealant shall be wiped or scraped away before it becomes hard. Upon completion of an entire joint, the Contractor shall grind any uneven end butt connections flush. Any openings between butt ends not showing sealant to the top shall be cleaned and filled with sealant. Where the joint pads are inset into the concrete blockouts, the edges between the concrete and the pads shall be sealed with sealant. When the bridge deck is to be waterproofed and surfaced, the installation of the joint shall be completed prior to placement of the deck waterproofing and hot-mix asphalt (HMA) surfacing.

The end treatment for curbs, parapets and sidewalks shall be as detailed on the plans and as recommended by the manufacturer of the joint system.

Warranty. The Contractor shall furnish a guarantee bond for the specified time period for each bridge structure where the neoprene expansion membrane joint seal are installed/replaced. Any warranty work will be at no additional cost to the Illinois Tollway, which shall include all labor, material, maintenance of traffic, and any incidental cost to repair the joint system in a manner acceptable to the Engineer at no additional cost to the Illinois Tollway. Any traffic control measures needed to repair the expansion joint under the specified time period will be performed in accordance with Standard Specifications.

At its option, the Illinois Tollway may accept the Warranty for this item from the installing Contractor, if different than the named Contractor.

Method of Measurement. NEOPRENE EXPANSION JOINTS, REPAIRS AND RECONSTRUCTION for existing structures shall be measured for payment in feet. Measurement shall be along the centerline of each expansion closure, in place and accepted, from end to end, including curb, median or parapet sections.

ELASTOMERIC CONCRETE REPAIR will be measured for payment in cubic feet. The volume measured for payment will be calculated from the limits specified in the field by the Engineer and includes any supplemental elastomeric concrete required to replace unsound concrete immediately adjacent to the deck expansion joint blockout locations.

Horizontal concrete removal and reconstruction with elastomeric concrete outside the blockout areas will also be measured for payment in cubic feet as ELASTOMERIC CONCRETE REPAIR.

NEOPRENE EXPANSION SOINT SEAL REPLACEMENT will be measured for payment in feet along the centerline of each expansion closure, in place and accepted, from end to end, including curb, median or parapet sections.

Supplemental REINFORCEMENT BARS or REINFORCEMENT BARS, EPOXY COATED will be measured for payment in pounds furnished and placed as authorized by the Engineer.

Basis of Payment. Payment for NEOPRENE EXPANSION JOINTS, REPAIRS AND RECONSTRUCTION for the prepared expansion joint closure, accepted and measured as specified herein will be made at the Contract unit price per foot. This payment shall be full compensation for removing and disposing of all expansion joint material, existing anchor blocks including embedded studs and elastomeric concrete, and any unsound concrete; for saw cutting and blast cleaning; for furnishing certifications, shop drawings, instructions and warranties as shown on the plans and specified herein.

Payment for ELASTOMERIC CONCRETE REPAIR completed, in place, accepted and measured as specified herein will be made at the Contract unit price per cubic foot. This payment shall be full compensation for furnishing certifications, shop drawings, instructions and warranties, and for furnishing all materials, testing, and incidentals necessary to complete the work as shown on the plans and specified herein.

Payment for NEOPRENE EXPANSION JOINT SEAL AND REPLACEMENT of the design movement specified along the centerline of the joint will be made at the Contract unit price per foot.

Supplemental reinforcement bars shall be paid for as REINFORCEMENT BARS and/or REINFORCEMENT BARS, EPOXY COATED per pound in accordance with Article 508.11 of the Standard Specifications.

Pay Item Number	Designation	Unit of Measure
JT525040	NEOPRENE EXPANSION JOINT SEAL AND REPLACEMENT	FOOT

POLYMER MODIFIED PORTLAND CEMENT MORTAR (IDOT GBSP)

Effective: June 7, 1994
Revised: April 1, 2016

Description. This work shall consist of furnishing all materials and labor required to remove and dispose of deteriorated concrete, and replace it with a polymer modified portland cement mortar at those locations shown on the plans or designated by the Engineer. The use of this mortar is intended to repair spalls between 3/8 in. (10 mm) and 2 in. (50 mm) deep on horizontal, vertical, and overhead surfaces.

Materials. Materials shall be according to the following.

Item	Article/Section
(a) Polymer Modified Portland Cement Concrete (Note 1)	
(b) Reinforcement Bars	1006.10
(c) Water	1002
(d) Cotton Mats	1022.02
(e) Protective Coat	1023
(f) Epoxy (Note2)	1025
(g) Mechanical Bar Splicers	508.08(c)

Note 1. Polymer modified portland cement mortar shall be a packaged product consisting of portland cement, fine aggregate, and a polymer modifier.

(1) The portland cement shall be according to Article 1001.01

(2) The fine aggregate shall be an FA 1 or FA 2, according to Articles 1003.01 and 1003.02.

(3) The polymer modified portland cement mortar shall meet the following physical requirements:

a. The mortar shall be a workable mix capable of bonding and holding its own plastic weight, when mixed and placed according to manufacturer instructions, on vertical and overhead surfaces. The testing shall be according to Illinois Laboratory Test Procedure “Evaluation of Vertical and Overhead Adhesion for Polymer Modified Portland Cement Mortar”.

b. The mortar shall have a minimum compressive strength of 1,500 psi (10,300 kPa) at 24 hours, 3,000 psi (20,700 kPa) at 3 days, and 5,000 psi (34,500 kPa) at 28 days; according to ASTM C 109.

c. The mortar shall have a minimum bond strength of 2,000 psi (13,800 kPa) at 28 days, according to the Illinois Laboratory Test Procedure “Evaluation of Bond Strength by Slant Shear”.

d. The mortar shall have a water soluble chloride ion content of less than 0.40 lb/cu yd (0.24 kg/cu m). The test shall be performed according to ASTM C 1218, and the mortar shall have an age of 28 to 42 days at the time of test. The ASTM C 1218 test shall be performed by an independent lab a minimum of once every two years, and the test results shall be provided to the Department.

The Department will maintain an Approved List of Polymer Modified Portland Cement Mortar.

Note 2. 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:

(a) Chipping Hammer – The chipping hammer for removing concrete shall be a light-duty pneumatic or electric tool with a 15 lb (7 kg) class or less.

(b) Blast Cleaning Equipment – Blast Cleaning equipment for concrete surface preparation shall be the abrasive type, and the equipment shall have oil traps.

(c) Hydrodemolition Equipment – Hydrodemolition equipment for removing concrete shall be calibrated, and shall use water according to Section 1002.

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 3/8 in. (10 mm) or less, as required to avoid cutting the reinforcement. 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. The outermost layer of reinforcement bar within the repair area shall be undercut to a depth of 3/4 in. (19 mm) or the diameter of the reinforcement bar, whichever value is larger. The underlying transverse reinforcement bar shall also be undercut as previously described, unless the reinforcement is not corroded, and the reinforcement bar is encased and well bonded to the surrounding concrete.

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 3/8 in. (10 mm) and a maximum of 2 in. (50 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 mortar, once concrete removal has started for the repair.

Surface Preparation. Prior to placing the mortar, 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.

The repair area and perimeter vertical face shall have a rough surface. Care shall be taken to ensure the perimeter sawcut is roughened. Just prior to mortar placement, saturate the repair area with water to a saturated surface-dry condition. Any standing water shall be removed.

Mortar 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 mortar placement.

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.

Placement. Mix and place the polymer modified portland cement mortar according to the manufacturer's instructions. The mortar shall be placed and finished to the contours of the member, as originally constructed.

The mortar shall not be placed when the air temperature is below 45 °F (7 °C) and falling or below 40 °F (4 °C). Mortar shall not be placed when the air temperature is greater than 90 °F (32 °C). The mortar shall have a minimum temperature of 50 °F (10 °C) and a maximum temperature of 90 °F (32 °C). The mortar shall not be applied during periods of rain unless protective covers or enclosures are installed. The mortar 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).

Curing. Cotton mats shall be applied, according to Article 1020.13(a)(5), to the exposed layer of mortar within 10 minutes after finishing, and wet curing shall begin immediately. Curing shall be for a minimum of 3 days.

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 the mortar, the repair shall be examined for conformance with original dimensions, cracks, and delaminations. Sounding for delaminations will be done with a hammer or by other methods determined by the Engineer.

The repaired area shall be removed and replaced, as determined by the Engineer, for nonconformance with original dimensions, surface cracks greater than 0.01 in. (0.25 mm) in width, map cracking with a crack spacing in any direction of 18 in. (450 mm) or less, or delaminations.

If the repair is allowed to remain in place, cracks 0.01 in. (0.25 mm) or less shall be repaired with epoxy according to Section 590. For cracks less than 0.007 in. (2 mm), the epoxy may be applied to the surface of the crack.

Method of Measurement. Polymer modified portland cement mortar shall be measured for payment in place, and the area computed in square feet (square meters).

Basis of Payment. This work will be paid for at the contract unit price, per square foot (square meter) for POLYMER MODIFIED PORTLAND CEMENT MORTAR.

The furnishing and installation of supplemental reinforcement bars, mechanical bar splicers, and protective coat will be paid according to Article 109.04.

Pay Item Number	Designation	Unit of Measure
X0322194	POLYMER MODIFIED PORTLAND CEMENT MORTAR	SQ FT