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Letting June 14, 2024

Notice to Bidders, Specifications and Proposal



**Contract No. 62N40
DUPAGE-COOK Counties
Section 2020-264-SUR,SW&TS
Route FAP 307
Project CMAQ-NHPP-1DXU(858)
District 1 Construction Funds**

Prepared by

Checked by

F

(Printed by authority of the State of Illinois)



- 1. TIME AND PLACE OF OPENING BIDS.** Electronic bids are to be submitted to the electronic bidding system (iCX-Integrated Contractors Exchange). All bids must be submitted to the iCX system prior to 12:00 p.m. June 14, 2024 at which time the bids will be publicly opened from the iCX SecureVault.
- 2. DESCRIPTION OF WORK.** The proposed improvement is identified and advertised for bids in the Invitation for Bids as:

**Contract No. 62N40
DUPAGE-COOK Counties
Section 2020-264-SUR,SW&TS
Project CMAQ-NHPP-1DXU(858)
Route FAP 307
District 1 Construction Funds**

(10.1-Mile) Changeable Message Signs, Signal Timing/ Progression, Signing (New) Surveillance, Traffic Signal Modernization and ADA Improvements. Located on IL 64 (North Avenue) from York Rd to IL 50 (Cicero Ave) in the Cities of Chicago, Elmhurst, Northlake, the Villages of Elmwood Park, Melrose Park, Oak Park, River Forest, River Grove and Stone Park in DuPage and Cook Co.

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

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

By Order of the
Illinois Department of Transportation

Omer Osman,
Secretary

INDEX
 FOR
 SUPPLEMENTAL SPECIFICATIONS
 AND RECURRING SPECIAL PROVISIONS

Adopted January 1, 2024

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

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

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STATE OF ILLINOIS

SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction," adopted January 1 2022, the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways," and the "Manual of Test Procedures for Materials" in effect on the date of invitation for bids, and the Supplemental Specifications and Recurring Special Provisions indicated on the Check Sheet included herein which apply to and govern the construction of FAP Route 307 (IL 64), Project CMAQ-NHPP-1DXU(858), Section 2020-263-SUR,SW&TS, DuPage and Cook Counties, Contract No. 62N40 and in case of conflict with any part or parts of said Specifications, the said Special Provisions shall take precedence and shall govern.

FAP Route 307 (IL 64)
Project CMAQ-NHPP-1DXU(858)
Section 2020-263-SUR,SW&TS
DuPage and Cook Counties
Contract No. 62N40

LOCATION OF PROJECT

The project extends along IL 64 from York Street in Cook County to IL 50 (Cicero Avenue) within the City of Chicago. Improvements are within nine communities within Cook County and covers 10 miles along IL 64.

DESCRIPTION OF PROJECT

The scope of work generally consists of the implementation of several Intelligent Transportation Systems (ITS) elements to improve local and regional mobility by addressing arterial congestion and supporting transit. ITS improvements include traffic signal interconnection, travel time monitoring, dynamic message signs, closed-circuit television (CCTV) cameras, and emergency vehicle preemption. Additional improvements include sidewalk ramp modifications at signalized intersections for compliance with the Americans with Disabilities ACT (ADA), improved pedestrian access to transit, the addition of high visibility crosswalks, pedestrian push buttons, pedestrian countdown signals, and far side relocation of bus stops at traffic signals where feasible.

ADJUSTMENTS AND RECONSTRUCTIONS (D1)

Effective: March 15, 2011

Revised: October 1, 2021

Revise the first paragraph of Article 602.04 to read:

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

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

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

Revise Article 603.05 to read:

“603.05 Replacement of Existing Flexible Pavement. After the castings have been adjusted, the surrounding space shall be filled with Class PP-2 concrete, unless otherwise noted in the plans, to the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e)(3)b.”

Revise Article 603.06 to read:

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

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

Revise the first sentence of Article 603.07 to read:

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

AGGREGATE FOR CONCRETE BARRIER (D1)

Effective: February 11, 2004

Revised: January 24, 2008

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

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

BUS SHELTER REMOVE AND RELOCATE

Description. This work shall consist of the removal, storage and reinstallation of the existing bus shelter as shown on the plans and shall conform to the applicable portions of Section 501, of the Standard Specifications.

The Contractor shall be responsible for safely removing, storing and reinstalling the shelter. Contractor shall be responsible for all damages incurred from the removal, storing, and installation of the shelter caused by the Contractor. The sidewalk at the removal location shall be restored by removing the existing bolts and grouting the holes flush with the surface of the sidewalk. This work is included in the BUS SHELTER REMOVAL AND RELOCATE pay item.

The contractor shall place the existing bus shelter on the concrete sidewalk level and plumb. The shelter shall shim as necessary with stainless steel shims. The Contractor shall anchor the shelter onto the concrete sidewalk with the appropriately sized concrete anchors and bolts as approved by the Engineer.

CLASS D PATCHES (SPECIAL)

Effective: July 24, 2020

Description. This work shall consist of all labor, materials and equipment necessary to construct Class D Patches at the locations shown on the plans and/ or locations determined by the Resident Engineer in the field. The work shall be performed according to Section 442 of the Standard Specifications, except as modified herein.

Delete Note 2 from Article 442.02 of the Standard Specification and replace with the following:

“Note 2. The mixture composition of the HMA used shall be binder course and surface course as specified in the Hot-Mix Asphalt Mixtures Requirements table in the plans.”

Basis of Payment. This work shall be paid for at the contract unit price per square yard of CLASS D PATCHES, of the type and thickness specified, (SPECIAL).

CLEANING EXISTING DRAINAGE STRUCTURES (D1)

Effective: September 30, 1985

Revised: May 1, 2022

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

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

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

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

CONSTRUCTION LAYOUT SPECIAL FOR RESURFACING WITH ADA AND STAND ALONE ADA (D1)

Effective: January 1, 2017

Revised: April 17, 2017

Description. This work shall consist of furnishing and placing construction layout stakes for the construction of ADA Ramps shown in the plans. The Contractor shall furnish and place stakes marking the locations and elevations of points indicated in the plans for ADA Ramp Construction.

The Contractor shall locate all reference points as shown on the plans and listed herein. Any additional control points required will be identified in the field by the Contractor and all field notes will be kept in the office of the Resident Engineer.

The Contractor shall provide field forces, equipment, and material to set all additional stakes for this project, which are needed to establish offset stakes, reference points, and any other horizontal and vertical controls necessary to secure a correct layout for the work.

Layout stakes shall be set to assure conformance to the ADA Ramp design shown on the plans and shall meet the approval of the Engineer.

The Contractor shall be responsible for having the finished work conform to the lines, grades, elevations, and dimensions called for in the plans. Any inspection or checking of the Contractor's layout by the Engineer and the acceptance of all or any part of it shall not relieve the Contractor of his/her responsibility to secure the proper dimensions, grades, and elevations of the work. The Contractor shall exercise care in the preservation of stakes and bench marks and shall have them reset when any are damaged, lost, displaced, removed or otherwise obliterated.

Responsibility of the Department.

The Department will make random checks of the Contractor's staking to determine if the work is in conformance with the plans. When the Contractor's work will tie into work that is being or will be done by others, checks will be made to determine if the work is in conformance with the proposed overall grade and horizontal alignment.

Where the Contractor, in setting construction stakes, discovers discrepancies, the Department will check to determine their nature and make whatever revisions are necessary to the plans. Any additional restaking required by the Engineer will be the responsibility of the Contractor. The additional restaking done by the Contractor will be paid for according to Article 109.04 of the Standard Specifications.

The Department will be responsible for the accuracy of the initial reference points shown in the plans.

It is not the responsibility of the Department, except as provided herein, to check the correctness of the Contractor's stakes. Any apparent errors will be immediately called to the Contractor's attention and the Contractor will be required to make the necessary correction before the stakes are used for construction purposes. The Contractor shall provide the Engineer a copy of any field notes and layout diagrams produced during the course of the project.

Responsibility of the Contractor.

The Contractor shall establish from the given survey points and contract plan information, all the control points or reference points necessary to layout the ADA Ramp elements. The Contractor shall furnish and place the layout stakes. The Contractor shall notify the Engineer when the stakes are complete and available for review and approval by the Engineer at least 3 working days in advance of the actual construction.

Field notes shall be kept in standard survey field notebooks and those books shall become the property of the Department at the completion of the project. All notes shall be neat, orderly, and in accepted form.

Measurement and Payment. This work will be paid for at the contract lump sum price for CONSTRUCTION LAYOUT (SPECIAL).

CURB OR COMBINATION CURB AND GUTTER REMOVAL AND REPLACEMENT (D1)

Effective: November 1, 2020

Revised: September 1, 2022

Description. This work shall consist of the complete removal and replacement of curb or combination curb and gutter. Work shall be according to Sections 440 and 606 of the Standard Specifications, State Standard 606001, District Detail BD-24 and as directed by the Engineer except as modified herein.

Curb or combination curb and gutter removal and replacement shall match the type of the existing curb or combination curb and gutter. Types may be variable and are to meet existing dimensions and field conditions. Locations of removal and replacement shall be determined by the Resident Engineer at the time of construction.

Unsuitable material to be removed, as directed by the Engineer, shall be replaced with subbase granular material, type B or additional thickness of concrete. Suitable backfill material, when required, shall be replaced as directed by the Engineer.

Epoxy coated tie bars, #6 (20) - 24" (610) long at 24" (610) centers, shall be used except when adjacent to flexible pavement. Longitudinal bars, if encountered, are not to be replaced.

Hot-mix asphalt surface removal on the existing gutter flag, if encountered, shall be included in the removal of the curb and gutter.

Saw cuts shall be according to Article 440.03 of the Standard Specifications.

½" (13) preformed expansion joints shall be used at concrete sidewalks, driveways and medians.

Method of Measurement. Concrete curb removal and replacement, or combination concrete curb and gutter removal and replacement will be measured for payment in feet (meters) along the face of concrete curb. A minimum replacement length of 4 feet is required.

Basis of Payment. This item will be paid for at the contract unit price per foot (meter) for CURB REMOVAL AND REPLACEMENT GREATER THAN 10 FEET or COMBINATION CURB AND GUTTER REMOVAL AND REPLACEMENT GREATER THAN 10 FEET for lengths greater than 10 feet.

This item will be paid at the contract unit price per foot (meter) for CURB REMOVAL AND REPLACEMENT LESS THAN OR EQUAL TO 10 FEET or COMBINATION CURB AND GUTTER REMOVAL AND REPLACEMENT LESS THAN OR EQUAL TO 10 FEET for lengths less than or equal to 10 feet.

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.

Sidewalk removal, driveway pavement removal and median surface removal will be paid for according to Article 440.08 of the Standard Specifications.

Portland cement concrete sidewalk will be paid for according to Article 424.13 of the Standard Specifications.

Portland cement concrete driveway pavement will be paid for according to Article 423.11 of the Standard Specifications.

Hot-mix asphalt driveway will be paid for according to Article 355.11 and 406.14 of the Standard Specifications.

Concrete median surface will be paid for according to Article 606.15 of the Standard Specifications.

Topsoil will be paid for according to Article 211.08 of the Standard Specifications.

Sodding will be paid for according to Article 252.13 of the Standard Specifications. Fertilizer for the placement of sod is not required.

DRAINAGE & UTILITY STRUCTURES TO BE ADJUSTED

Description. This work shall include all labor, material, and equipment necessary to adjust drainage and utility structures to proposed finish grade at locations shown on the Engineering plans or as directed by the Engineer in accordance with Section 602 of the Standard Specifications and as specified herein.

All adjustments shall be made with existing frames and grates or lids unless otherwise specified. Prior to making the final grade adjustment, all joint surfaces shall be made free of dirt and debris. Broken concrete or other miscellaneous materials shall not be used to shim the adjusting ring or frame. The maximum total height of the adjusting rings shall not exceed eight (8) inches.

Basis of Payment. This work will be measured in place and paid for at the contract unit price per each for DRAINAGE & UTILITY STRUCTURES TO BE ADJUSTED, which shall include all labor, material, and equipment required to complete the work as specified herein.

FRICITION AGGREGATE (D1)

Effective: January 1, 2011
 Revised: December 1, 2021

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

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

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

Use	Mixture	Aggregates Allowed
Class A	Seal or Cover	<u>Allowed Alone or in Combination</u> ^{5/} : Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete
HMA Low ESAL	Stabilized Subbase or Shoulders	<u>Allowed Alone or in Combination</u> ^{5/} : Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{1/} Crushed Concrete
HMA High ESAL Low ESAL	Binder IL-19.0 or IL-19.0L SMA Binder	<u>Allowed Alone or in Combination</u> ^{5/ 6/} : Crushed Gravel Carbonate Crushed Stone ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Concrete ^{3/}
HMA High ESAL Low ESAL	C Surface and Binder IL-9.5 IL-9.5FG or IL-9.5L	<u>Allowed Alone or in Combination</u> ^{5/} : Crushed Gravel Carbonate Crushed Stone ^{2/} Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag ^{4/} Crushed Concrete ^{3/}

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

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

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

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

Effective: January 1, 2019
 Revised: December 1, 2021

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

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

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

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

- 1/ The compacted gyratory bricks for Hamburg wheel and I-FIT testing shall be 7.5 ± 0.5 percent air voids.
- 2/ If the Contractor does not possess the equipment to prepare the 160 mm tall brick(s), twice as many 115 mm tall compacted gyratory bricks will be acceptable.

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

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

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

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

HOT-MIX ASPHALT BINDER AND SURFACE COURSE (D1)

Effective: November 1, 2019

Revised: December 1, 2021

Revise Article 1004.03(c) to read:

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

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

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

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

3/ The specified coarse aggregate gradations may be blended.

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

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

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

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

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

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

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

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

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

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

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

1/ Based on percent of total aggregate weight.

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

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

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

- 5/ When establishing the Adjusted Job Mix Formula (AJMF) the percent passing the #8 (2.36 mm) sieve shall not be adjusted below 34 percent.
- 6/ When the mixture is used as a binder, the maximum shall be increased by 0.5 percent passing.”

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

(b) Volumetric Requirements. The target value for the air voids of the HMA shall be 4.0 percent, for IL-4.75 and SMA mixtures it shall be 3.5 percent and for Stabilized Subbase it shall be 3.0 percent at the design number of gyrations. The voids in the mineral aggregate (VMA) and voids filled with asphalt binder (VFA) of the HMA design shall be based on the nominal maximum size of the aggregate in the mix and shall conform to the following requirements.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BLUETOOTH POLE

Effective: February 25, 2015

Description. This item shall consist of furnishing and installing a conventional-type round tapered aluminum pole with 11.5" Bolt circles and no mast arm complete with all required hardware including bolt covers as specified herein and applicable portions of Section 1069 of the Standard Specifications. The pole shall also be in accordance with the Solar Powered Bluetooth pole detail.

Materials. Materials shall be according to applicable portions of Section 1069 of the Standard Specification and the following:

- a) The pole shall be designed to AASHTO design criteria for 90 MPH wind loading and a minimum 50-year design life
- b) The pole shall be designed such that the deflection of the pole from the vertical axis does not exceed one degree per 10 feet (3.04M) of nominal pole height, as caused by the dead weight moment of design Bluetooth Detector, at height recommended by Manufacturer of Bluetooth Detector.
- c) The pole shall be coordinated with the Bluetooth Detectors being provided on this project to be free of susceptibility to harmful harmonics with vibration damper. The pole shall incorporate an integral vibration damper. The document submitted for approval shall address this requirement.

- d) The shaft shall be of smooth circular cross section seamless tapered aluminum alloy, type 6063-T6. It shall be free of dents, kinks, ripples, scratches, or other defects. The outer wall shall have a satin ground finish, 50 grit or finer.
- e) The shaft shall have a cast aluminum base plate conforming to ASTM designation B108 and SG70A for aluminum alloy, welded to the pole shaft. All welding shall be performed by the inert gas shielded arc method, and all welds shall be free from cracks and pores. The base plate shall have slots suitable for 1 inch (25.4 mm) diameter anchor bolts and 11.5-inch nominal bolt circles.
- f) The height of the pole shall be 30 feet (9.144m), or as otherwise noted on the plans.
- g) The shaft shall have a nominal wall thickness of not less than 250 mils.
- h) The shaft shall have a 4-inch by 8-inch (101.6 mm x 203.2 mm) handhole with rounded ends.

The handhole shall be reinforced and shall have a cover of the same materials as the pole held in place with 1/8" (3.175 mm)-20 steel core nylon screws. The holes for the screws shall be tapped with the appropriate thread configuration. The handhole shall be located 18-inches (457.2mm) from the bottom of the pole to the centerline of the handhole.
- i) The shaft shall be equipped with a ground lug, welded inside the shaft, suitable for No. 8 and No. 4 wires, located adjacent to and accessible from the handhole.
- j) The Bluetooth Detectors shall be mounted on poles as shown in the plans. The recommended mounting height for the Bluetooth sensor is 12 – 15 feet above the travelled lane (or as recommended by the manufacturer).

Installation. The pole shall be set plumb on the foundation or Breakaway Device without the use of shims, grout or any other leveling devices under the pole base.

Method of Measurement. This work shall be measured by payment by each pole with 11.5" bolt circles installed.

Basis of Payment. This work shall be paid for at the contract unit price for each LIGHT POLE (SPECIAL) installed.

REMOVE EXISTING BRICK PAVERS

This work shall consist of the complete removal of existing brick pavers and subbase material at the locations shown in the plans and as directed by the Engineer.

Description. Removal of the existing brick pavers and subbase material shall be performed in accordance with the applicable portions of Section 440 of the Standard Specifications. The existing subgrade shall be rolled or tamped to the in-kind line and grade. If additional material is required to establish the in-kind grade, the material used shall be satisfactory to the Engineer and placed according to Section 205 of the Standard Specifications.

Basis of Payment. This work shall be measured and paid for at the contract unit price per square foot for REMOVE EXISTING BRICK PAVERS. This price shall include all necessary labor, material and equipment necessary to complete the work.

STAMPED COLORED PCC SIDEWALK 5"

Description. This work shall consist of constructing integrally colored portland cement concrete sidewalk with imprinted pattern as indicated herein and in accordance with Section 424 of the standard specifications at the locations shown on the plans or directed by the Engineer.

Manufacturer's data sheets shall be submitted on each product to be used, including preparation instructions, storage and handling requirements, and installation methods.

The installer shall provide a qualified foreman or supervisor who has a minimum of three years' experience with imprinted and textured concrete, and who has successfully completed at least five imprinted concrete installation of high quality and similar in scope to that required. The concrete shall be cast-in-place on the job site by trained and experienced workers. Obtain materials from the same source for all colored and imprinted work. The Contractor shall provide a technical representative from the color supplier for the first day of concrete placement to assist in concrete batching and job site finishing and curing.

Prior to beginning work, provide field samples of integrally colored Portland cement concrete with imprinted pattern, surface hardener, and cure/sealer. Samples to be 48 inches by 48 inches in size with surface colors and patterns specified. Do not proceed with work until the workmanship, pattern, color, and sheen are approved by the Engineer. Refinish mock-ups or provide additional samples as required to obtain the Engineer's approval.

The thickness of the new stamped colored PCC sidewalk shall be 5". This item will not include the subbase aggregate required for the installation of the sidewalk.

The stamp molds shall be semi-rigid polyurethane mats with projected texture and ridged underside capable of imprinting texture and joint patterns to plastic concrete. The pattern to be used shall be running bond with a textured face. Final pattern selections to be approved by the Engineer.

A color hardener will be required. Final pattern and color selections to be approved by the Engineer and Municipality. The concrete mix design for all colored sidewalks shall be integrally colored. The pay item's use shall determine the class of concrete in accordance with Section 1020 of the Standard Specifications, with the exception that the minimum cement factor shall be 6.05 cwt. The coarse aggregate to be used shall contain no more than two percent by weight (mass) of deleterious materials. Deleterious materials shall include substances whose disintegration is accompanied by an increase in volume which may cause spalling of the concrete.

Integral coloring admixture shall be a non-fading synthetic oxide pigment meeting ASTM C979. Add integral color according to the manufacturer's instructions.

Color hardener shall be applied to the surface of the concrete according to the manufacturer's instructions and recommended application techniques.

Form release agent shall be a liquid membrane-forming clear curing compound conforming to AASHTO M148, Type 1. Apply a separate curing and sealing compound for integrally colored concrete according to the manufacturer's instructions and recommended application techniques. The compound should include a slip-resistant additive. Apply the curing compound at a uniform interval after each pour to maintain a consistency in finished coloration.

Use admixture designed for use and compatibility with colored concrete pigments. Do not use calcium chloride or admixtures containing chlorides.

The change in any material ingredient in the concrete may require a new mock-up be constructed for the Engineer's approval.

Imprinting tools shall be used for texturing freshly placed concrete in a pattern/texture as approved by the Engineer. Tools are to be used according to the manufacturer's instructions.

Colored concrete mixes for the entire project are to be consistent. If additional water is added to the colored concrete once a truck is on site, this concrete will be rejected. Cover and protect adjacent construction and concrete from discoloration and spillage during placement and curing of colored concrete. Remove and replace discolored concrete as Engineer directs.

Uniformly apply liquid release agent onto the colored, still plastic state concrete to provide clean release of imprinting tools from the concrete surface without lifting imprint or rearing concrete.

Do not cure colored concrete using plastic sheeting unless necessary due to weather conditions. Plastic sheeting shall not be laid directly on top to the concrete as discoloration will occur. Plastic shall be suspended above the concrete.

All completed areas of colored concrete shall be of consistent color and appearance and must meet the approval of the Engineer. Any finished areas that are rejected by Engineer shall be removed and replaced by Contractor at no additional cost to the Department.

Method of Measurement. The work will be measured in square feet for the installed area. No deductions will be made for the area(s) occupied by manholes, inlets, drainage structures, or by any public utility appurtenances within the area.

Basis of Payment. This work will be paid for at the contract unit price per square foot for STAMPED COLORED PCC SIDEWALK 5", which shall include all costs for materials, equipment and labor required to complete the work specified herein.

STATUS OF UTILITIES (D1)

Effective: June 1, 2016

Revised: January 1, 2020

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

UTILITIES TO BE ADJUSTED

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

Stage 1

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	DURATION OF TIME
STA 178+45, 90' LT	Telephone	Proposed fiber crosses existing underground telephone line	AT&T	60 days
STA 188+90, 85' LT	Telephone	Proposed fiber crosses existing underground telephone line	AT&T	60 days
STA 189+40, 90' LT	Electric	Proposed fiber crosses existing underground electric line	ComEd	60 days
STA 307+70, 60' LT	Electric	Proposed fiber crosses existing underground electric line	ComEd	60 days
STA 328+55, 45' RT	Electric	Proposed fiber crosses existing underground electric line	ComEd	60 days
STA 341+40, 65' RT	Electric	Proposed fiber crosses two existing underground electric lines	ComEd	60 days
STA 386+90, 55' LT	Electric	Proposed fiber crosses existing underground electric line	ComEd	60 days
STA 497+10, 45' LT	Telephone	Proposed fiber crosses existing underground telephone line	AT&T	60 days
STA 497+10 TO STA 498+05	Telephone	Existing underground telephone line within 5' of proposed fiber location; intersects vault	AT&T	60 days
STA 497+20, 45' LT	Electric	Proposed fiber crosses existing underground electric line	ComEd	60 days
STA 497+20 TO STA 197+45	Electric	Two existing underground electric lines within 5' of proposed fiber location; intersects vault	ComEd	60 days
STA 497+35, 45' LT	Gas	Proposed fiber crosses existing	Peoples Gas	60 days

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	DURATION OF TIME
		underground gas line; intersects vault		
STA 498+15, 45' LT	Electric	Proposed fiber crosses existing underground electric line	ComEd	60 days
STA 524+70, 50' LT	Telephone	Proposed fiber crosses existing underground telephone line	AT&T	60 days

Stage 1: 390 Days Total Installation

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

Agency/Company Responsible to Resolve Conflict	Name of contact	Phone	E-mail address
AT&T – LNS/Teleport Communications America	Tamara Booker (New Plans) & Tim Lapointe	(614) 208-8689	th3913@att.com tl0695@att.com
City of Chicago Department of Water Management – Sewer Section	Anupam Verma Chuck Mann Brendan Schreiber Pablo Martinez Jason McCubbin Patrick Maloney	(312) 744-5070 (312) 744-0344 312-742-7226	Anupam.Verma@cityofchicago.org Chuck.Mann@cityofchicago.org Brendan.Schreiber@cityofchicago.org Pablo.Martinez@cityofchicago.org Jason.McCubbin@ctrwater.net Patrick.Maloney@cityofchicago.org
ComEd	TBD	TBD	TBD
Lumen (CenturyLink/ Level 3)	Kimberly Singleton Ben Pacocha Ryan Burgeson	(847) 954-8250 (224) 242-4823	Kimberly.Singleton@centurylink.com ben.pacocha@lumen.com relocations@lumen.com ryan.burgeson@centurylink.com NationalRelo@centurylink.com relocations@centurylink.com relocations@brightspeed.com
MCI/Verizon	Charles Schero Sandra B. Cisneros Joe Chaney John Buher Jason Jarvis	(732) 335-5588 (219) 314-6926	investigations@verizon.com john.buher@verizon.com
Peoples Gas	Eric Stall Aaron Meyer William Charvat Tad Easton	(312) 240-7394 (312) 240-4016 (866) 556-6002	erstell@integrysgroup.com aaron.meyer@peoplesgasdelivery.com william.charvat@peoplesgasdelivery.com tad.eaton@peoplesgasdelivery.com

UTILITIES TO BE WATCHED AND PROTECTED

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

Stage 1

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
STA 176+15 TO STA 181+90	Telephone	Existing underground telephone line within 5' of proposed fiber location	AT&T
STA 187+60 TO STA 188+85	Telephone	Existing underground telephone line within 5' of proposed fiber location	AT&T
STA 188+35 TO STA 190+20	Sanitary Sewer	Sewer line within 10' of proposed fiber location	City of Northlake
STA 188+70, 105' LT	Telephone	Existing underground telephone line within 5' of proposed mast arm pole location	AT&T
STA 189+30, 90' LT	Electric	Existing underground electric line within 10' of proposed traffic signal post location	ComEd
STA 189+40, 85' LT	Electric	Existing underground electric line within 5' of proposed mast arm pole location	ComEd
STA 189+40, 80' LT	Electric	Existing underground electric line within 5' of proposed traffic signal post location	ComEd
STA 189+60, 65' RT	Electric	Existing underground electric line within 5' of proposed pedestrian signal post location	ComEd
STA 274+65 TO STA 277+85	Sanitary Sewer	Sewer line within 25' of proposed fiber location	Village of Melrose Park
STA 275+55 TO STA 275+90	Telephone	Existing underground telephone line within 15' of proposed fiber location	AT&T
STA 275+60 TO STA 275+95	Telephone	Existing underground telephone line within 15' of proposed fiber location	AT&T
STA 275+65 TO STA 279+65	Telephone	Existing underground telephone line within 5' of proposed fiber location	AT&T
STA 276+45	Sanitary Sewer	Sewer line within 10' of proposed fiber location	Village of Melrose Park

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
STA 286+05 TO STA 292+70	Telephone	Existing underground telephone line within 5' of proposed fiber location	AT&T
STA 288+90	Telephone	Existing underground telephone line within 10' of proposed fiber location	AT&T
STA 292+45, 80' LT	Telephone	Existing underground telephone line within 5' of proposed pedestrian signal post location	AT&T
STA 292+70 TO STA 294+05	Sanitary Sewer	Sewer line within 20' of proposed fiber location	Village of Melrose Park
STA 306+75 TO STA 307+50	Telephone	Existing underground telephone line within 25' of proposed fiber location	AT&T
STA 307+35 TO STA 309+75	Gas	Existing underground gas line within 10' of proposed fiber location	Peoples Gas
STA 307+50 TO STA 309+85	Water	Water line within 15' of proposed fiber location	Village of Melrose Park
STA 307+60, 85' RT	Electric	Existing underground electric line within 10' of proposed mast arm pole location	ComEd
STA 308+60, 95' LT	Electric	Existing underground electric line within 5' of proposed mast arm pole location	ComEd
STA 308+65, 75' LT	Gas	Existing underground gas line within 10' of proposed pedestrian signal post location	Peoples Gas
STA 309+10, 60' LT	Water	Proposed fiber crosses water line	Village of Melrose Park
STA 308+85 TO STA 309+55	Telephone	Existing underground telephone line within 25' of proposed fiber location	AT&T
STA 328+50, 50' RT	Electric	Existing underground electric line within 10' of proposed mast arm pole location	ComEd
STA 340+55 TO STA 341+60	Telephone	Existing underground telephone line within 10' of proposed fiber location	AT&T
STA 341+45, 50' RT	Telephone	Existing underground telephone line within 5' of proposed mast arm pole location	AT&T
STA 341+60 TO STA 342+40	Electric	Two existing underground electric lines within 10' of proposed fiber location	ComEd

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
STA 386+30 TO STA 386+90	Electric	Existing underground electric line within 10' of proposed fiber location	ComEd
STA 387+40 TO STA 389+80	Electric	Existing underground electric line within 20' of proposed fiber location	ComEd
STA 387+45, 55' LT	Electric	Existing underground electric line within 5' of proposed pedestrian signal post location	ComEd
STA 387+60, 60' LT	Electric	Existing underground electric line within 5' of proposed pedestrian signal post location	ComEd
STA 466+05 TO STA 467+05	Water	Water line within 15' of proposed fiber location	Village of River Forest
STA 467+05, 50' RT	Water	Proposed fiber crosses water line	Village of River Forest
STA 467+10, 0' RT	Water	Proposed fiber crosses water line	Village of River Forest
STA 467+15, 25' LT	Sanitary Sewer	Proposed fiber crosses sewer line	Village of Elmwood Park
STA 467+15 TO STA 469+55	Sanitary Sewer	Sewer line within 20' of proposed fiber location	CDWM
STA 467+60, 40' LT	Water	Proposed fiber crosses water line	Village of Elmwood Park
STA 467+60, 75' RT	Water	Water line within 5' of proposed pedestrian signal post location	Village of Elmwood Park
STA 467+90, 40' LT	Sanitary Sewer	Proposed fiber crosses sewer line	CDWM
STA 497+10, 45' LT	Telephone	Existing underground telephone line within 5' of proposed mast arm pole location	AT&T
STA 497+40 TO STA 498+75	Gas	Existing underground gas line within 5' of proposed fiber location	Peoples Gas
STA 497+75 TO STA 498+20	Electric	Existing underground electric line within 20' of proposed fiber location	ComEd
STA 498+20, 40' LT	Gas	Existing underground gas line within 5' of proposed traffic signal post location	Peoples Gas

STAGE / LOCATION	TYPE	DESCRIPTION	OWNER
STA 498+20, 40' LT	Electric	Existing underground electric line within 5' of proposed traffic signal post location	ComEd
STA 523+00 TO STA 525+55	Sanitary Sewer	Sewer line within 15' of proposed fiber location	CDWM
STA 524+20, 45' LT	Sanitary Sewer	Proposed fiber crosses sewer line	CDWM
STA 524+30, 45' LT	Water	Proposed fiber crosses water line	CDWM
STA 524+60, 35' RT	Telephone	Existing underground telephone line within 10' of proposed mast arm pole location	AT&T
STA 524+65, 50' LT	Telephone	Existing underground telephone line within 5' of proposed pedestrian signal post location	AT&T
STA 549+40 TO STA 550+80	Telephone	Existing underground telephone line within 5' of proposed fiber location	AT&T
STA 549+80, 45' LT	Electric	Existing underground electric line within 5' of proposed mast arm pole location	ComEd
STA 549+90, 45' LT	Electric	Existing underground electric line within 5' of proposed pedestrian signal post location	ComEd
STA 550+70, 45' LT	Electric	Existing underground electric line within 5' of proposed pedestrian signal post location	ComEd
STA 550+75, 50' LT	Electric	Existing underground electric line within 5' of proposed mast arm pole location	ComEd
STA 564+20, 45' LT	Electric	Existing underground electric line within 5' of proposed mast arm pole location	ComEd
STA 590+65, 45' LT	Sanitary sewer	Sewer line within 5' of proposed mast arm pole location	CDWM
STA 590+65, 45' LT	Electric	Existing underground electric line within 5' of proposed mast arm pole location	ComEd

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

Agency/Company Responsible to Resolve Conflict	Name of contact	Phone	E-mail address
AT&T – LNS/Teleport Communications America	Tamara Booker (New Plans) & Tim Lapointe	(614) 208-8689	th3913@att.com tl0695@att.com
City of Chicago Department of Water Management – Sewer Section	Anupam Verma Chuck Mann Brendan Schreiber Pablo Martinez Jason McCubbin Patrick Maloney	(312) 744-5070 (312) 744-0344 312-742-7226	Anupam.Verma@cityofchicago.org Chuck.Mann@cityofchicago.org Brendan.Schreiber@cityofchicago.org Pablo.Martinez@cityofchicago.org Jason.McCubbin@ctrwater.net Patrick.Maloney@cityofchicago.org
City of Elmhurst Public Works Department	Kent Johnson	(630) 530-3024	Kent.Johnson@elmhurst.org
ComEd	TBD	TBD	TBD
Comcast	Reena Thomas Bob Schullter Robert Stoll Martha Gieras	(224) 229-5861 (224) 229-5849	Reena.Thomas@comcast.com Bob_Schullter@comcast.com Robert_Stoll@comcast.com Martha_Gieras@comcast.com htinspector@comcast.net
Lumen (CenturyLink/ Level 3)	Kimberly Singleton Ben Pacocha Ryan Burgeson	(847) 954-8250 (224) 242-4823	Kimberly.Singleton@centurylink.com ben.pacocha@lumen.com relocations@lumen.com ryan.burgeson@centurylink.com NationalRelo@centurylink.com relocations@centurylink.com relocations@brightspeed.com
MCI/Verizon	Charles Schero Sandra B. Cisneros Joe Chaney John Buher Jason Jarvis	(732) 335-5588 (219) 314-6926	investigations@verizon.com john.buher@verizon.com
Metropolitan Water Reclamation District of Greater Chicago	Paul Sobanski Cedric Robertson Margarita Johnson Joseph Schuessler Hanif Munshi Catherine O'Connor	(708) 588-4080 (708) 588-3896 (847) 568-8380	JohnsonM1@mwr.org SchuesslerJ@mwr.org MunshiM@mwr.org PatinoM@mwr.org
Nicor Gas	Saki Forah Michal Ann Beyke Charles Parrott	(630) 388-3319	sforah@southernco.com MBeyke@southernco.com cparrot@southernco.com
Peoples Gas	Eric Stall Aaron Meyer William Charvat Tad Easton	(312) 240-7394 (312) 240-4016 (866) 556-6002	erstall@integrysgroup.com aaron.meyer@peoplesgasdelivery.com william.charvat@peoplesgasdelivery.com tad.eaton@peoplesgasdelivery.com

The above represents the best information available to the Department and is included for the convenience of the bidder. The days required for conflict resolution should be considered in the bid as this information has also been factored into the timeline identified for the project when setting the completion date. The applicable portions of the Standard Specifications for Road and Bridge Construction shall apply.

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

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

KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (LANE CLOSURES ONLY)

Effective: January 22, 2003

Revised: August 10, 2017

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

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

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

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

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

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

One lane or ramp blocked = \$1,000

Two lanes blocked = \$2,500

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

KEEPING ARTERIAL ROADWAYS OPEN TO TRAFFIC (WITH 15 MIN FULL STOPS)

Effective: January 22, 2003

Revised: August 10, 2017

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

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

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

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

Full closure of all arterial lanes in one or both directions will only be permitted for a maximum of 15 minutes at a time **during the off-peak traffic volume hours**. During full roadway closures, the Contractor will be required to reduce the roadway to only one open traffic lane in the affected direction(s) of travel using the appropriate State Standard(s) and District Detail(s). Police forces shall be notified and requested to close the remaining lane to facilitate the necessary work activities, except that a flagger may be substituted for daytime closures with the approval of the Engineer. The Contractor shall notify the District One Arterial Traffic Control Supervisor at 847-705-4470 at least three (3) working days (weekends and holidays DO NOT count into this notification time) in advance of the proposed road closures.

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

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

One lane or ramp blocked = \$1,000

Two lanes blocked = \$2,500

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

MAINTENANCE OF ROADWAYS (D1)

Effective: September 30, 1985

Revised: November 1, 1996

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

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

TEMPORARY INFORMATION SIGNING

Effective: November 13, 1996

Revised: January 29, 2020

Description.

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

Materials.

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

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

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

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

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

GENERAL CONSTRUCTION REQUIREMENTS

Installation.

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

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

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

Method of Measurement.

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

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

Basis Of Payment.

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

TRAFFIC CONTROL AND PROTECTION (ARTERIALS) (D1)

Effective: February 1, 1996

Revised: March 1, 2011

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

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

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

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

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

TRAFFIC CONTROL PLAN (D1)

Effective: September 30, 1985

Revised: January 1, 2007

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

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

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

STANDARDS:

701001	Off-Road Operations 2L, 2W, More Than 15' Away
701006	Off-Road Operations 2L, 2W, 15' To 24" from Pavement Edge
701101	Off-Road Operations Multilane, 15' To 24" from Pavement Edge
701106	Off-Road Operations Multilane, More Than 15' Away
701301	Lane Closure, 2L, 2W, Short Time Operations
701311	Lane Closure 2L, 2W Moving Operations - Day Only
701427	Lane Closure, Multilane, Intermittent or Moving Operation for Speeds Less 40 Mph
701501	Urban Lane Closure, 2L, 2W, Undivided
701601	Urban Lane Closure Multilane, 1W or 2W With Nontraversable Median
701606	Urban Single Lane Closure, Multilane, 2W With Mountable Median
701701	Urban Lane Closure Multilane Intersection
701801	Sidewalk, Corner or Crosswalk Closure
701901	Traffic Control Devices
704001	Temporary Concrete Barrier

DETAILS:

TC-10	Traffic Control and Protection for Side Roads, Intersections and Driveways
TC-11	Raised Reflective Pavement Markers (Snow Plow Resistant)
TC-13	District 1 Typical Pavement Markings
TC-14	Traffic Control and Protection at Turn Bays (To Remain Open to Traffic)
TC-22	Arterial Road Information Sign
TC-24	City Of Chicago Typical Pavement Markings
TC-26	Driveway Entrance Signing

SPECIAL PROVISIONS:

Maintenance of Roadways (D1)
Public Convenience and Safety (D1)
Keeping Arterial Roadways Open to Traffic (Lane Closures Only)
Work Zone Traffic Control Devices (BDE)
Contractor Cooperation
Keeping Arterial Roadways Open to Traffic (With 15 Min Full Stops)
Work Restrictions
Short Term and Temporary Pavement Markings (BDE)
Temporary Information Signing
Traffic Control 3 Protection (Arterials) (D1)
Vehicle And Equipment Warning Lights (BDE)
ACCESSIBLE PEDESTRIAN SIGNALS
Effective: April 1, 2003
Revised: November 1, 2023
888.02TS

Description. This work shall consist of furnishing and installing accessible pedestrian signals (APS). Each APS shall consist of an interactive vibrotactile pedestrian pushbutton with speaker, an informational sign, a light emitting diode (LED) indicator light, a solid-state electronic control

board, a power supply, wiring, and mounting hardware. The APS shall meet the requirements of the MUTCD and Sections 801 and 888 of the Standard Specifications, except as modified herein.

Add the following to Article 888.03 of the Standard Specifications:

A mounting bracket and/or extension shall be used to assure proper orientation and accessibility where needed. The price of the bracket and/or extension shall be included in the cost of the pedestrian push button. The contractor is not allowed to install a push-button assembly with the sign below the push-button to meet mounting requirements.

Add the following to Article 1074.02(e) of the Standard Specifications:

Stations shall be designed to be mounted to a post, mast arm pole or wood pole. The station shall be aluminum and shall accept a 3 inch round push-button assembly and a regulatory pedestrian instruction sign according to MUTCD, sign series R10-3e 9" x 15" sign with arrow(s) for a count-down pedestrian signal. Stations shall be powder coated yellow with a black pushbutton and stainless steel arrow on pushbutton.

Electrical Requirements. The APS shall operate with systems providing 95 to 130 VAC, 60 Hz and throughout an ambient air temperature range of -29 to +160 °F (-34 to +70 °C).

The APS shall contain a power protection circuit consisting of both fuse and transient protection.

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

If two accessible pedestrian pushbuttons are placed less than 10 ft apart or placed on the same pole, the audible walk and don't walk indication shall be a speech message. This speech message shall sound throughout the WALK interval only. Common street name shall be used and not the route number of the street unless there is no common street name. The street name used in programming shall reflect the street name mast arm mounted sign panel. Locations without street name (ex. private benefit driveways, shopping plaza entrance, etc.) shall use a general term "Commercial Driveway" as a street name for that leg. The speech message shall be modeled after: "Street Name. Walk Sign is on to cross "Street Name." For signalized intersections utilizing exclusive pedestrian phasing, the verbal message shall be "Walk sign is on for all crossings". In addition, a speech pushbutton information message shall be provided by actuating the APS pushbutton during DON'T WALK interval. This verbal message shall be modeled after: "Wait". The extended press option verbal message shall be: "Wait to cross 'Street Name' at 'Street Name'".

Railroad Preemption.

At locations with railroad interconnection APS pushbutton shall be capable of receiving a railroad preemption similar to a traffic signal controller and shall be hard wired to the railroad preemption relay inside the traffic signal cabinet. A shelf mount control unit shall be provided and installed inside the cabinet capable of receiving and transmitting the railroad preemption to all the push buttons.

At railroad intersections all APS pushbuttons shall use the speech message and shall follow the below speech models.

During Don't Walk: "Wait to cross 'Street Name' at 'Street Name', Caution, Walk time shortened when train approaches" – this does not repeat, plays only once with every push button press.

During Walk: "Walk sign is on to cross 'Street Name', – this repeats as many times as possible during Walk interval only.

During Railroad preemption: All push buttons at same time "Train Approaching" – this message shall be repeated two times.

At locations with emergency vehicle preemption, NO additional speech message shall be provided.

At locations with Equestrian Pushbuttons style installation the APS push buttons shall use speech message only and shall emit the audible message from the bottom mounted push button only.

Locations with Corner Islands or Center Medians

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

Crossing of the right turn lane from or to Corner Island: “Wait to cross right turn lane for ‘Street Name’ at ‘Street Name’ crosswalks” and “Walk sign is on to cross right turn lane for ‘Street Name’ at ‘Street Name’ crosswalks”

Crossing from Corner Island to Corner Island where second pushbutton actuation is required: “Wait to cross ‘Street Name’ at ‘Street Name’ to median with second pushbutton” and “Walk sign is on to cross ‘Street Name’ to median with second pushbutton”

Center Medians on a divided highways with push buttons will require pushbutton to have a dual arrow on the pushbutton.

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

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

Pedestrian Pushbutton. Pedestrian pushbuttons shall be at least 2 in. (50 mm) in diameter or width. The force required to activate the pushbutton shall be no greater than 3.5 lb (15.5 N).

A red LED shall be located on or near the pushbutton which, when activated, acknowledges the pedestrians request to cross the street.

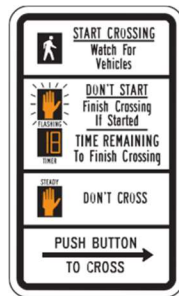
APS pushbutton systems that utilize any wireless technology including Bluetooth technology to place calls or communicate with controller will not be allow. A central master control unit shall be provided and installed in the traffic signal cabinet. Push button shall be connected directly to the master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

APS push buttons shall be compatible with one another and easily replaceable on future replacements or maintenance repairs no multiple model variations will be allowed.

All APS pushbuttons shall come with the messages pre-programmed for each particular intersection regardless of the location or the 10 ft separation. Final field adjustments including percussive tone vs speech message use shall be completed once push buttons are installed in the final location. All push buttons shall be programmed with the appropriate parameters and settings as directed by the Engineer. These settings shall be standard for all pushbuttons and will vary based on the manufacturer. Access to pushbutton settings shall be provided through an app either through wired, wireless, or Bluetooth connection. Pushbutton information, settings, and access instructions shall all be provided in a weatherproof pouch and safely stored inside each traffic signal cabinet.

Contractor shall remove any existing pedestrian isolation boards, field wire terminals, and any wires to the board when easily accessible. If the pedestrian isolation board has been installed from the factory on the back panel of the cabinet, contractor is to disconnect the power to the isolation board and any wires while leaving the board mounted. This work shall be included in the cost of Accessible Pedestrian Signals and will not be paid for separately.

Signage. A sign shall be located immediately above the pedestrian pushbutton and parallel to the crosswalk controlled by the pushbutton. The sign shall conform to the following standard MUTCD design: R10-3e.



R10-3E

Tactile Arrow. A tactile arrow, pointing in the direction of travel controlled by a pushbutton, shall be provided on the pushbutton.

Vibrotactile Feature. The pushbutton shall pulse when depressed and shall vibrate continuously throughout the WALK interval.

Basis of Payment. This work will be paid for at the contract unit price per each for ACCESSIBLE PEDESTRIAN SIGNALS and shall include furnishing, installation, mounting hardware including extension brackets if required, and programming of the push button.

ADVANCED TRANSPORTATION CONTROLLER AND CABINET

Effective: March 1, 2024
857.05TS

Description.

This work shall consist of furnishing and installing a traffic actuated solid state digital controller in an Advanced Transportation Controller (ATC) cabinet of the type specified, meeting the requirements of Section 857 of the Standard Specifications, and as modified herein, including Output Assembly, Input Assembly, Service Assembly, DC Power/Communications Bus, AC Clean Power Bus, Field Output Panel (FOP), and all necessary connections for proper operation. This specification describes the shelf mount versions of the ATC cabinet, which uses a NEMA-style cabinet with ATC subassemblies mounted either on a shelf or on the cabinet side walls.

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

Materials.

Add the following to Article 857.02 of the Standard Specifications:

“Controllers shall be Econolite Cobalt or Eagle/Yunex M60 unless specified otherwise on the plans or elsewhere on these specifications. Only controllers supplied by one of the District One approved Vendors will be allowed. The controller shall be of the most recent approved model and software version supplied by the Vendor at the time of the traffic signal TURN-ON unless specified otherwise on the plans or these specifications. A removable controller data key shall also be provided. The controller shall be equipped with a 2070 series controller module for proper operation in an ATC cabinet. The controller shall prevent phases from being omitted during program changes and after all preemption events and shall inhibit simultaneous display of circular yellow and yellow arrow indications.

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

Add the following to Article 1074.03 of the Standard Specifications:

(a) The cabinet shall be designed and manufactured with materials that will allow rigid mounting. The cabinet shall be base mounted only. The cabinet shall not flex on its mount. The subassemblies in the cabinet shall be removable with simple hand tools, such as a screwdriver, and without removing any other equipment. Any components over 50 V with exposed terminals shall be protected from incidental contact per NEC requirements. All equipment in the cabinet shall be clearly and permanently labeled. All marker strips shall be made of material that can be easily written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item they are to identify and must be clearly visible with the items installed. Card guides (top and bottom) shall be provided for the plug-ins. All circuit boards shall be conformal coated to protect the boards from moisture. All switches shall be guarded.

Each cabinet assembly shall be tested as a complete entity under signal load. The cabinet shall be assembled and tested by the Manufacturer or Vendor to ensure proper component integration operation.

Revise the table in Article 1074.03 (a) (1) to read:

Type	Approx. Volume cu ft (cu m)	Police Door	Mounting	Ventilation	Remark
I	Reserved				
II	5.0 (0.14)	Yes	Post Top	Filtered Air Intake and One Thermo-Statically Controlled Fan	
III	11.5 (0.33)	Yes	Ground Mount	Filtered Air Intake and One Thermo-Statically Controlled Fan	For Traffic Actuated Controller.
IV	29.0 (0.82)	Yes	Ground Mount	Filtered Air Intake and Two Thermo-Statically Controlled Fan	For Traffic Actuated Controller. Back Panel with Minimum 12 Load Switch Positions or ATC Cabinet.
V	44.0 (1.25)	Yes	Ground Mount	Filtered Air Intake and Two Thermo-Statically Controlled Fan	For Traffic Actuated Controller. Back Panel with Minimum 12 Load Switch Positions or ATC Cabinet.

Add the following to Article 1074.03 of the Standard Specifications:

(a) (1) Optionally, a “Type 4.5/Type IV Stretched” or “Super P Stretched” cabinet shall be provided. This cabinet has the same dimensions as a Type IV or Super P cabinet with an additional 10 in. height. Additionally, it shall include a front and rear door with double, vented overhangs for protection from water intrusion.

(a) (2) a. The gaskets shall be permanently bonded to the cabinet. The gaskets shall include a polyester film to prevent the gaskets from sticking to the cabinet surface.

(a) (2) e. A rain channel shall be incorporated into the design of the main door opening to prevent liquids from entering the enclosure. The cabinet door opening shall be a minimum of 80 percent of the front surface of the cabinet. A stiffener plate shall be welded across the inside of the main door to prevent flexing.

(a) (2) f. The top of the cabinet shall incorporate a 1 in. slope towards the rear to prevent rain accumulation.

Revise Article 1074.03 (a) (3) paragraph "a" to read:

"Multiple Door-Stop. The main door on the cabinet shall be equipped with a three-point latching mechanism with nylon rollers. It shall include an automatic door stop mechanism capable of holding the door open at approximately 90°, 120°, and 180° under windy conditions. Manual placement of the mechanism shall not be required by field personnel."

Add the following to Article 1074.03 of the Standard Specifications:

(a) (3) b. The main door shall utilize stainless steel hardware. The handle shall include a vertically-mounted hasp for the attachment of an optional padlock. The handle shall not extend beyond the perimeter of the main door at any time.

(a) (3) c. The lock assembly shall be positioned so that the handle does not cause any interference with the key when opening the cabinet door. All external fasteners shall be tamper-proof. The police door assembly shall be flush-mounted to the main door.

(a) (3) d. The cabinet shall be supplied with a natural aluminum mill finish. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be free from weld flash. Welds shall be smooth, neatly formed, and free from cracks, blowholes, and other irregularities. All sharp edges shall be ground smooth.

(a) (3) e. The cabinet seams shall be sealed with a tack weld on the interior of the cabinet and a double flange at the top only. Optionally, the cabinet can be supplied as a UL listed version with double flanges all the way around, and continuous welding of all seams.

(a) (3) f. All cabinets shall be supplied with a minimum of two removable shelves manufactured from 5052-H32 aluminum. Shelves shall be a minimum of 10 in. deep. The shelves shall include two (2) 1U mounting positions to install 1U rack-mounted equipment. The rack mounting holes shall be tapped for #10-32 screws.

(a) (3) g. Cabinets shall include a set of three vertical "C" channels mounted on each interior side wall of the cabinet for the purpose of mounting the cabinet components. The channels shall accommodate spring mounted nuts. All mounting rails shall extend 3-1/8 in. from the bottom of the cabinet. The sidewalls shall be supplied three channels, with the rear channel located at 8 in. from the back of the cabinet. Measured from center to center, the middle channel shall be 8-1/2 in. from the rear channel, and the front rail shall be 6 in. from the middle channel. The rear walls shall be supplied with three saw tooth rails, with the left-most rail located at 8 in. from the left side of the cabinet. Measured from center to center, the middle rail shall be located 9 in. from the left-most rail, and the right-most rail shall be 19-1/2 in. from the middle rail. The saw tooth rails on back wall shall allow shelf adjustments in 1/2 in. increments.

(a) (3) h. The lower section of the cabinet shall be equipped with a louvered air entrance. The air inlet shall be large enough to allow sufficient air flow per the rated fan capacity. Louvers shall satisfy the NEMA rod entry test for 3R ventilated enclosures. A removeable, disposable air filter shall be secured to the air entrance, as mentioned in 1074.03 (a) (2) paragraph "c".

(a) (3) i. The roof of the cabinet shall incorporate an exhaust plenum with a vent screen. Perforations in the vent screen shall be 1/8 in. x 1/2 in. rectangular slots.

(a) (3) j. Anchor bolts shall be used to properly secure the cabinet to its base. The cabinet flange for securing the anchor bolts shall not protrude outward from the bottom of the cabinet. Four (4) 3/4 in. x 18 in. long right-angle anchor bolts shall be provided with the cabinet.

(a) (3) k. All cabinets shall be pre-wired for a minimum of eight (8) phases of vehicular, four (4) phases of pedestrian and four (4) phases of overlap operation.

Revise Article 1074.03 (a) (4) paragraph "a" to read:

"Surge Suppressor. The suppressor protecting the cabinet equipment shall consist of two stages: stage one which shall include a controller cabinet AC power protection and stage two which shall include AC circuit protection."

Revise Article 1074.03 (a) (5) paragraph "a" to read:

"Signal Flash in Absence of Subassemblies. The cabinet shall be capable of remaining in flashing operation with any of the following subassemblies removed: Input Assembly, Output Assembly, Cabinet Power Supply, and Controller."

Remove Article 1074.03 (a) (5) paragraphs "b", "c", and "d".

Replace Article 1074.03 (b) to read:

(b) ATC Cabinet Subassemblies.

(1) Output Assembly.

- a. The Output Assembly shall accommodate 3U plug-in cards and be mounted on the shelf. The shelf mounting shall include mounting flanges to allow the rack to be bolted to the shelf.
- b. The Output Assembly shall accommodate eight (8) Model 2202 High-Density Switch Pack/Flasher Units (HDSP/FU), providing a total of 48 output channels.

- c. The Output Assembly shall accommodate one (1) Model 2218 Serial Interface Unit (SIU) to provide interface and control via system SB1/SB2.
- d. The Output Assembly shall accommodate one (1) Model 2212 Cabinet Monitor Unit (CMUip).
- e. The Output Assembly shall include a hinged front panel with four (4) Circuit Breakers. The front panel shall be attached with thumb screws to allow access to the wiring. The circuit breakers shall be rated at 5 A. The breakers shall be Carling Technologies "B" series or approved equal. Each breaker shall protect two (2) HDSPs. The breakers shall be protected by a flip-up cover to protect against accidental activation.
- f. The Output Assembly shall utilize four (4) 24-pin connectors (Molex 39-28-8240) or eight (8) 12-pin connectors (Molex 39-28-8120) to interface the HDSP outputs to the Field Output Panel (FOP).
- g. All exposed AC voltage on the Output Assembly circuit boards shall be protected using a removable Lexan cover mounted on standoffs.

For a 32-channel cabinet where a second Output Assembly is used, the second Output Assembly shall meet the same requirements as the first Output Assembly, with the exception of accommodating a CMUip.

(2) Field Output Panel (FOP).

- a. The 16-Channel FOP shall be coupled with its respective 16-Channel Output Assembly to provide pluggable connectors for the signal output field terminals, flash programming, and flash transfer relays.
- b. The FOP shall house eight (8) Model 21H High-Density Flash Transfer Relays (HDFTRs) and sixteen (16) Flash Program Blocks (FPBs). The HDFTRs and FPBs shall be provided to control and select the color (red, yellow, or dark) during flashing operation.
- c. HDSP Suppressors shall be provided at the field terminals for the protection of the HDSP. These suppressors shall plug in on the back side of the FOP.
- d. Each HDFTR position shall be labeled with the number of its associated HDSP. Each FPB position shall be labeled with the number of its associated channel.

- e. The FOP shall be provided with sixteen (16) 6-position Phoenix Contact terminal block model number 1777765 plugs and 1720615 sockets. Each Field Terminal Block socket shall be labeled with the number of its associated channel. Additional labels shall be provided to clearly indicate which terminals correspond to the red, yellow, and green switch pack outputs.
- f. The FOP shall be mounted on the sawtooth rails on the back wall and shall swing down using thumbscrews to provide access to the HDSP Suppressors and the wiring for the FOP. The panel shall be angled to allow easy access to the field terminals.
- g. The FOP shall utilize eight (8) 12-pin connectors, Molex 39-28-8120, to interface the HDSP outputs to the FOP. The cables shall be long enough to allow the FOP to swing down with no interference.

For a 32-channel cabinet where a second FOP is used, the second FOP shall meet the same requirements as the first FOP.

(3) Combination Output Assembly-Field Output Panel Unit (16-Channel Loadbay).

The Output Assembly and Field Output Panel shall be optionally available as a combined unit, similar to a NEMA loadbay. This version is only available for a 16-channel configuration.

- a. The loadbay shall be mounted on the sawtooth rails at the back of the cabinet below the bottom shelf.
- b. The Output Assembly shall be mounted at the top of the loadbay.
- c. The Field Output Panel shall be mounted below the Output Assembly on an angled plate to allow easy access to the field terminals.
- d. All other requirements for the Output Assembly shall meet Article 1074.03 (b) (1).
- e. All other requirements for the Field Output Panel shall meet Article 1074.03 (b) (2).

(4) Input Assembly.

- a. The Input Assembly shall be a 3U high shelf mounted assembly providing twelve (12) slots of 22/44 pin PCB sockets for utilizing input devices such as loop detectors, AC and DC isolators, and emergency vehicle preemption (EVP) equipment.

- b. The Input Assembly shall accommodate one (1) Model 2218 Serial Interface Unit (SIU) to provide interface and control between the controller and the input devices via system SB1/SB2.
 - c. The Input Assembly shall house twelve (12) 2-channel detection modules, six (6) 4-channel detection modules, or a combination of 2 & 4 channel detection modules up to 24 channels.
 - d. The Input Assembly shall utilize two (2) 26-position ribbon cable connectors, TE Connectivity model 102321-6, for connections to the Field Input Panel.
- (5) Field Input Panel (FIP).
- a. The 24-Channel FIP shall be coupled with the 24-Channel Input Assembly. The FIP shall provide a convenient landing point with pluggable terminal blocks for the field input wires.
 - b. The FIP shall have positions for landing twenty-four (24) two-wire inputs and their associated earth ground wires. The landing points shall be pluggable terminal blocks with 10 positions for each block. The terminal blocks shall be Phoenix Contact model 1757093 or approved equivalent.
 - c. Each input terminal position shall be labeled with its associated channel number.
 - d. The FIP shall have positions for twelve (12) pluggable Detection Module Suppressors. The Detection Module Suppressors shall be supplied with the cabinet if required by procurement.
 - e. The circuit board shall be mounted on a 1/8 in. thick aluminum plate that includes mounting slots for channel mounting. The plate shall include pressed-in PEM standoffs to mount the circuit boards.

(6) Service Assembly.

The Service Assembly shall be modular and be accessible without the use of hand tools. The Service Assembly shall house the following items:

- a. Two (2) Model 2202-HV High-Density Switch Pack/Flasher Units (HDSPs/FUs).
- b. Pluggable Cabinet Suppressor/Filter – Hesco RLS model HE1750 or approved equal.
- c. Main Contactor.

- d. Four (4) HDFU output fuses (16-channel version) or eight (8) HDFU output fuses (32-channel version).
- e. Six (6) Circuit Breakers. The circuit breakers shall be Carling Technologies “B” series or approved equal. The circuit breakers shall be protected by flip-up covers to protect against accidental activation. The circuit breakers shall be provided for the following functions:
 - 1. Main – 30 A
 - 2. Clean AC Power – 15 A
 - 3. Raw AC Power – 15 A
 - 4. Output Assembly – 15 A
 - 5. HDFU #1 – Maximum 15 A
 - 6. HDFU #2 – Maximum 15 A (optional, for 32-channel version only)
- f. GFCI duplex receptacle.
- g. Earth Ground and AC Neutral bus bars.
- h. Raw AC utility power input terminal block having five screw terminals.

(7) DC Power/Communication Bus.

- a. The DC Power/Communication Bus shall include eight (8) DB25 D-sub socket connectors, TE Connectivity model 5745886-2, to interconnect the SB1/SB2 communication ports of the assemblies and Controller. It shall include a termination circuit at the end of the connections (S8) to prevent radio frequency signal reflection.
- b. The DC Power/Communication Bus shall include eight Phoenix Contact connectors, model 1830635, to bring DC power to the Bus and distribute it to the cabinet subassemblies. The copper traces for the DC voltages shall support at least 10 Amp.
- c. The circuit board shall be protected by an aluminum cover that includes the cabinet mounting flanges.
- d. The DC Power/Communication Bus shall be mounted on the left side wall of the cabinet.

(8) AC Clean Power Bus.

The AC Clean Power Bus shall include eight (8) NEMA 5-15 receptacles to provide AC Clean Power to the ATC Cabinet Assemblies, the Controller, and Cabinet Power Supply.

(9) Switch Shield.

- a. The cabinet shall include a technician switch shield. This shield shall protect the police panel switch wiring and include technician test switches for Stop Time, Auto/Flash, and a 24 VDC Bypass Switch. This 24 VDC Bypass switch shall be a momentary push button switch that, when pressed, energizes the 24 VDC to the HDSPs during Flash Mode. The button shall be labeled "24 VDC BYPASS". This allows a technician to momentarily apply 24 VDC power to the HDSPs while in a Flash condition.
- b. The switch shield shall include a duplex receptacle with USB ports for device charging. This receptacle shall be powered by the Raw AC Power circuit breaker.

(10) Police Panel.

- a. The cabinet shall include a police panel with switches for Auto/Flash, Signals On/Off, and Auto/Manual. The Auto/Manual shall enable Manual Control Enable in the controller when in the Manual position.
- b. The cabinet shall include a hard-wired manual control cable with a 6 ft coiled cord. This cable shall enable Interval Advance in the controller when depressed.

(11) Slide-out Drawer/Shelf.

- a. A telescoping slide-out drawer shall be provided for document storage.
- b. The Slide-Out Drawer/Shelf shall be mounted underneath the shelf and include a lip or handle for pulling.
- c. The drawer shall have a hinged top cover.
- d. The drawer shall be capable of accommodating one (1) complete set of cabinet prints and manuals.
- e. The drawer shall support 50 lb (23 kg) in weight when fully extended.
- f. The drawer shall open and close smoothly.
- g. The drawer dimensions shall make maximum use of available depth offered by the controller shelf and be a minimum of 18 in. (610mm) wide.

(12) Detector Test Switch Assembly (optional).

- a. The Detector Test Switch Assembly shall allow a technician to initiate a call to the controller by actuating the detectors in the Input Assembly. This allows the detectors to be tested without a loop or pedestrian push button actuation. This assembly shall be optional and will only be included when directed by procurement.
- b. The Detector Test Switch Assembly shall include twenty-four (24) toggle switches. The switches shall be configured for On (constant call), Off (calls are only actuated through the detector) and Call (momentary call). The switches shall be C&K Components model 7107SYZQE or equivalent.
- c. The assembly shall include twenty-four (24) red LED indicators to indicate that a call has been initiated by the corresponding switch. The LED indicators shall be Avago model HLMP-C025-P0000 or equivalent.
- d. The detector switch calls shall be routed through the SIU located in the Input Assembly. The assembly shall not include a separate SIU.
- e. Multiple Detector Test Switch Assemblies may be used if multiple Input Assemblies are included in the cabinet.

Add the following to Article 1074.03 of the Standard Specifications:

(c) ATC Cabinet Plugins.

(1) Model 2202-HV High-Density Switch Pack/Flasher Unit (HDSP/FU).

- a. The HDSP/FU shall be compact, pluggable, modular PCB-based, and equipped with a DIN connector.
- b. The HDSP/FU shall be compatible with ultra-low power LED signal heads and shall have a current monitoring feature for each output of each channel.
- c. The HDSP/FU shall use real-time standardized high speed SB3 communications with the Cabinet Monitor Unit to send a complete set of RMS voltage and load current measurements.
- d. The HDSP/FU shall be 4.5 in. H x 6.5 in. D and shall be equipped with a handle, reset push button switch, six RYG LED indicators, four flasher LED indicators, one power LED indicator, and two Rx/Tx LED indicators.

- e. The HDSP/FU can function as either a switch pack (HDSP) or as a flasher unit (HDFU).
 - 1. When installed in the Output Assembly, the HDSP shall provide two RYG channels of operation (6 individual field outputs).
 - 2. When installed in the Service Assembly, the HDFU shall function as a four output flasher.

(2) Model 2212-HV Cabinet Monitor Unit (CMUip).

- a. The Cabinet Monitor Unit (CMUip) shall be compact, pluggable and modular.
- b. The CMUip shall use real-time standardized 614.4 kbps SDLC communications with the ATC to transfer command and response data on Serial Bus #1 (SB1).
- c. The CMUip shall be capable of monitoring up to 32 physical switch pack channels (RYG) and shall have optional four virtual channels.
- d. The CMUip shall provide a Flasher Alarm feature. This alarm shall not put the cabinet into a Flash condition.
- e. The CMUip shall analyze the ATC output commands and field input status to isolate the failure source by channel and color.
- f. The CMUip configuration programming shall be provided by an interchangeable Datakey nonvolatile memory device. This rugged key shall store all CMUip configuration parameters and shall eliminate programming using jumpers, diodes, or DIP switches.
- g. The CMUip shall maintain a nonvolatile event log recording the complete intersection status as well as time stamped previous fault events, AC Line events, configuration changes, monitor resets, cabinet temperature and true RMS voltages and currents for all field inputs.
- h. The signal sequence history log stored in nonvolatile memory graphically shall display up to 30 seconds of signal status prior to the fault trigger event with 50 ms resolution to ease diagnosing of intermittent and transient faults.

(3) Model 2218 Serial Interface Unit (SIU).

- a. The Model 2218 Serial Interface Unit (SIU) shall be a compact, pluggable and modular.
- b. The SIU shall use real-time standardized 614.4 kbps SDLC communications with the ATC to transfer command and response data on Serial Bus #1 (SB1).
- c. The SIU shall be equipped with 54 programmable input/output pins, four (4) optically isolated input pins, one line sync reference input pin, and four (4) address select input pins. The optically isolated inputs shall work with either 12 VAC or 24 VDC.
- d. The SIU outputs shall be rated at 150 mA continuous sink current. Each output shall provide a 500 mA typical current limit and shall be rated to 50 V and utilize a voltage clamp for inductive transient protection.
- e. The SIU shall be equipped with a front panel LED indicator that can report the current SIU assembly address assignment of the SIU for cabinet configuration verification.
- f. The SIU shall require a nominal supply voltage of 24 VDC (+/- 2 VDC). A voltage of 16 VDC or less shall be considered loss of power, and a voltage of 18 VDC or greater shall be considered adequate for operation. The SIU shall not require more than 300 mA over the voltage range of 16 VDC to 30 VDC and the power surge shall be limited to a maximum of 1.25 A from initial application of DC power. The SIU shall not be damaged by insertion to, or removal from, powered input or output assemblies. The SIU shall operate normally for 700 ms after power loss.

(4) Model 2220 Auxiliary Display Unit (ADU).

- a. The ADU shall install in a 1U height of the rack space and shall provide a menu driven user interface to the enhanced features of the CMUip monitor, including the built-in Diagnostic Wizard.
- b. The ADU shall provide 32 channels of Red, Yellow and Green LED indicators that display full intersection status and 32 Blue fault status LED indicators to identify faulty channels.
- c. The ADU shall provide proper electrical termination to SB3.
- d. The ADU shall have a 4 line by 20 character menu driven liquid crystal display with backlight and heater.

- e. The ADU built-in Diagnostic Wizard shall automatically pinpoint faulty signals, offer trouble-shooting guidance, and automatically isolate and identify problems.
- f. The ADU shall be equipped with Event Logging displaying the CMUip time-stamped nonvolatile event log records with the complete intersection status, as well as AC Line events, monitor resets, temperature and true RMS voltages and currents.

(5) Model 2216 Cabinet Power Supply (CPS).

- a. The Model 2216 Cabinet Power Supply is a modular 19 in. rack mounted power supply device providing the DC voltages necessary for operating the ATC Cabinet. Power Factor Correction shall be provided. The PS2216-24-HV provides a regulated 24 VDC output and a regulated 48 VDC output. The PS2216-2412-HV model provides a regulated 24 VDC output, a regulated 48 VDC output, and a regulated 12 VDC output option for powering the Input Assembly devices. Unless otherwise specified, all PS2216 requirements apply to both model types.
- b. The CPS shall be 1U in height maximum and designed to mount into a 19 in. EIA rack. The maximum depth of the PS2216 shall be less than 8 in.
- c. The CPS shall be powered from AC Line provided by an AC Line cord with NEMA Type 515 plug. The input voltage range shall be 80 to 270 VAC, 45 to 65 Hz. Power Factor Correction shall be greater than 0.95.
- d. The PS2216-2412 shall provide:
 - 1. 48 VDC +/- 2 VDC at 1 A maximum
 - 2. 24 VDC +/- 2 VDC at 4 A maximum
 - 3. 12 VDC +/- 1 VDC at 5 A maximum
- e. Each DC output shall be electrically isolated from AC Mains and Earth Ground. The 24 VDC and 12 VDC outputs share a common ground.
- f. The DC Output Ripple on each output shall be less than 300 mVpp when measured at 20 MHz of bandwidth using a 12 in. twisted pair-wire terminated with a 0.1 μ f & 47 μ f capacitor.
- g. The DC outputs shall attain regulated output levels within 500 ms of applied AC Line voltage of 110 VAC nominal across the operating temperature range and at rated full load.

- h. The DC outputs shall maintain regulated output level for a minimum of 50 ms across the operating temperature range and at rated full load.
- i. All indicators shall be clear LEDs. Clear LEDs shall not depend on a reflector or diffusion as part of its design. Clear LEDs shall not appear to be ON when exposed to ambient light. The following indicators shall be provided:
 - 1. A green AC Line indicator shall illuminate to indicate Operational input voltage is proper and the AC Line fuse is intact.
 - 2. A green indicator shall illuminate to indicate the 48 VDC output is active and the fuse is intact.
 - 3. A green indicator shall illuminate to indicate the 24 VDC output is active and the fuse is intact.
 - 4. A green indicator shall illuminate to indicate the 12 VDC output is active and the fuse is intact (PS2216-2412 only).
- j. Banana style test jacks shall be provided on the front panel for each DC output and DC ground. Mating banana plug spring width shall be 0.175 in. Nominal.
- k. The output connector shall be a Phoenix Contact #1825161 and shall mate with a Phoenix Contact #1825352 or equivalent. Pin #1 shall be the right most pin when viewed from the rear of the supply.

Table 2 – Power Supply Connector Pin-Out

Pin	Function
1	+48VDC
2	48VDC Ground**
3	+24VDC
4	+12VDC (PS2216-2412 only)
5	24/12VDC Ground
6	Chassis Ground

**The 48 VDC output shall be electrically isolated from the AC Line input and the 24VDC and 12 VDC outputs. The 48VDC Ground (pin #2) must be connected within the cabinet to the same AC Neutral that the Cabinet Monitor Unit (CMU) is connected to in the cabinet.

(6) MonitorKey Programming Tool.

- a. The Programming Tool provides the capability to read and write data from the CMUip Datakey device.
- b. The MonitorKey software shall be compatible with the CMUip-2212.

(7) Model 21H High-Density Flash Transfer Relay (HDFTR).

- a. The HDFTR shall be a Struthers-Dunn model 21XBXHL-48VDC or approved equal.
- b. The HDFTR shall have a hermetically sealed cover and shall be moisture proof.
- c. The HDFTR shall be filled with dry nitrogen to protect contacts from corrosion and to prevent condensation.
- d. The HDFTR shall have a cupronickel cover that is salt water resistant.
- e. The HDFTR contacts shall be rated at 10 A @ 120 VAC.
- f. The coil of the HDFTR shall be rated at 48 VDC.
- g. The HDFTR shall have an LED indicator to display contact transfer status.

(8) Main Contactor (MC).

- a. The MC shall be a combination solid-state and electromechanical relay in parallel and shall be rated at 60 A @ 120 VAC and 50 A @ 240 VAC. The coil of the MC shall be rated at 48 VDC.
- b. The MC shall be equipped with input indicator and shall have SPST- N.O. contacts.
- c. The MC shall be hermetically sealed.
- d. The MC shall be easily accessible without removing any covers or panels.
- e. The MC shall be mounted on the Service Assembly for access to the wiring and to view the LED indicator.

(9) Cabinet Suppressor-Filter.

- a. The cabinet shall be equipped with a pluggable Cabinet Suppressor-Filter mounted in the Service Assembly. The pluggable Cabinet Suppressor-Filter shall be an Asco Power SHA-1250, Hesco HE1750, or approved equivalent.
- b. The unit shall incorporate the use of warning and failure indicators and shall have a dry relay contact remote sensing circuit. The unit shall be modular and pluggable with a 12-position Beau 5412 connector.
- c. The unit shall be rated at continuous service current of 15 A and maximum clamp voltage of 390 VAC. The unit shall filter noise and spike from 10 KHz to 25 MHz and shall have a peak surge current of 48 kA.

(10) Detection Module Suppressor.

- a. The Detection Module Suppressor shall be Hesco model HE6LC-6 or Asco Power model MRA-6LC-6.
- b. The Detection Module Suppressor shall be modular and pluggable.
- c. The unit shall be epoxy encapsulated and equipped with 6-position 5.08 mm Phoenix Contact or approved equal connector.
- d. The unit shall be able to protect 6 circuits.
- e. The device operating voltage shall be 75 VAC and clamping voltage shall be 130 VDC.
- f. The device dimensions shall be 2 in. H x 7/10 in. W x 1-1/5 in. D.

(11) HDSP Protector.

- a. The HDSP Protector shall be modular and pluggable. The unit shall be a Hesco HE103C-9, Asco MPA303-9, or approved equal.
- b. The unit shall be epoxy encapsulated and equipped with 9-position 5.08 mm Phoenix Contact connector or approved equal.
- c. The unit shall be able to protect 6 circuits.
- d. The device operating voltage shall be 120 VAC and clamping voltage shall be 340 VAC.
- e. The unit dimensions shall be 2 in. H x 7/10 in. W x 2 in. D.

(d) Auxiliary Cabinet Equipment.

(1) Ventilation Fans.

- a. Two (2) thermostatically controlled fans shall be provided to ventilate the cabinet.
- b. The fans shall be equipped with ball or roller bearings and shall each have a minimum capacity of 100 cu ft of free air delivery per minute.
- c. The fans shall be protected by a finger guard.
- d. The fan circuit shall be protected at 125% of the fan motor ampacity.

(2) Heater.

A 200 W thermostatically controlled electric heater shall be provided.

(3) Thermostat.

- a. The thermostat shall be manually adjustable between 80°F and 170°F with a differential of not more than 10°F between automatic turn on and off.
- b. The manual adjustment shall be graded in 10°F increment scale.
- c. The Thermostat shall be a Bud Industries TS-15-A or approved equal.

(4) Lighting.

- a. The cabinet shall include two (2) LED light panels to illuminate the interior of the cabinet.
- b. One LED panel shall be mounted on the fan panel, and the other shall be mounted underneath the lower shelf.
- c. Both LED panels shall illuminate whenever the main cabinet door is opened.
- d. The LED panels shall be provided from an approved Vendor.

Basis of Payment.

This work will be paid for at the Contract unit price each for ADVANCED TRANSPORTATION CONTROLLER AND TYPE IV CABINET; ADVANCED TRANSPORTATION CONTROLLER AND TYPE IV STRETCHED CABINET; ADVANCED TRANSPORTATION CONTROLLER AND TYPE V CABINET; ADVANCED TRANSPORTATION CONTROLLER AND TYPE SUPER P CABINET; ADVANCED TRANSPORTATION CONTROLLER AND TYPE SUPER P STRETCHED CABINET; ADVANCED TRANSPORTATION CONTROLLER AND TYPE SUPER R CABINET; ADVANCED TRANSPORTATION CONTROLLER AND TYPE IV CABINET, SPECIAL; ADVANCED TRANSPORTATION CONTROLLER AND TYPE IV STRETCHED CABINET, SPECIAL; ADVANCED TRANSPORTATION CONTROLLER AND TYPE V CABINET, SPECIAL; ADVANCED TRANSPORTATION CONTROLLER AND TYPE SUPER P CABINET (SPECIAL); ADVANCED TRANSPORTATION CONTROLLER AND TYPE SUPER P STRETCHED CABINET (SPECIAL); ADVANCED TRANSPORTATION CONTROLLER AND TYPE SUPER R CABINET (SPECIAL).

CENTRACS LICENSE EXPANSION

Effective: November 1, 2023
892.06TS

Description.

This work shall consist of providing a license for the addition of a traffic signal controller to the existing CENTRACS system and programming the intersection into the existing CENTRACS system.

General.

This pay item may be grouped per job. For example a 50 unit license pack is acceptable for a job with 45 intersections. Individual licenses not needed but part of package shall be provided to IDOT Electrical Maintenance Contractor. Vendor shall coordinate with EMC contractor to transfer the unused licenses.

The CENTRACS system shall be programmed for complete functionality of the intersection traffic signal controller.

Basis of Payment.

This work shall be paid for at the contract unit price per each for CENTRACS LICENSE EXPANSION. The unit price shall include all equipment; materials; licenses, programming; testing and documentation; and labor required to add a traffic signal controller to the CENTRACS system

COILABLE NON-METALLIC CONDUIT

Effective: May 22, 2002

Revised: July 1, 2015

810.01TS

Description.

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

General.

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

Add the following to Article 810.03 of the Standard Specifications:

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

Add the following to Article 811.03 of the Standard Specifications:

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

Basis of Payment.

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

CONCRETE FOUNDATIONS

Effective: May 22, 2002

Revised: March 1, 2024

878.01TS

Add the following to Article 878.03 of the Standard Specifications:

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

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

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

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

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

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

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

DETECTOR LOOP

Effective: May 22, 2002

Revised: March 1, 2024

886.01TS

Procedure.

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

Installation.

Revise Article 886.04 of the Standard Specifications to read:

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

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

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

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

(a) Type I. All loops installed in new asphalt pavement shall be installed in the binder course and not in the surface course. The edge of pavement, curb, and handhole shall be cut with a 1/4 in. (6.3 mm) deep x 4 in. (100 mm) saw cut to mark the location of each loop cable.

- (b) Loop sealant shall be two-component thixotropic chemically cured polyurethane from an approved Vendor. The sealant shall be installed 1/8 in. (3 mm) below the pavement surface. If installed above the surface, the excess shall be removed immediately.
- (c) Preformed. This work shall consist of furnishing and installing a rubberized or cross-linked polyethylene heat resistant preformed traffic signal loop in accordance with the Standard Specifications, except for the following:
1. Preformed detector loops shall be installed in the sub-base under the Portland cement concrete pavement. Loop lead-ins shall be extended to a temporary protective enclosure near the proposed handhole location. The protective enclosure shall provide sufficient protection from other construction activities and may be buried for additional protection.
 2. Handholes shall be placed next to the shoulder or back of curb when preformed detector loops enter the handhole. CNC, included in this pay item, shall be used to protect the preformed lead-ins from back of curb to the handhole.
 3. Preformed detector loops shall be factory assembled with ends capped and sealed against moisture and other contaminants. The loop configurations and homerun lengths shall be assembled for the specific application. The loop and homerun shall be constructed using a minimum 5/8 in. (16 mm) outside diameter, minimum 3/8 in. (9.5 mm) inside diameter Class A oil resistant synthetic cord reinforced hydraulic hose with 250 psi (1,720 kPa) internal pressure rating or a similarly sized XLPE cable jacket. The hose for the loop and homerun assembly shall be one continuous piece. No joints or splices shall be allowed in the hose except where necessary to connect homeruns to the loops. This will provide maximum wire protection and loop system strength. Hose tee connections shall be heavy duty high temperature synthetic rubber. The tee shall be of proper size to attach directly to the hose, minimizing glue joints. The tee shall have the same flexible properties as the hose to ensure that the whole assembly can conform to pavement movement and shifting without cracking or breaking. For XLPE jacketed preformed loops, all splice connections shall be soldered, sealed, and tested before being sealed in a high impact glass impregnated plastic splice enclosure. The wire used shall be #16 THWN stranded copper. The number of turns in the loop shall be application specific. Homerun wire pairs shall be twisted a minimum of eight turns per foot. No wire splices will be allowed in the preformed loop assembly. The loop and homeruns shall be filled and sealed with a flexible sealant to ensure complete moisture blockage and further protect the wire. The preformed loops shall be constructed to allow a minimum of 6-1/2 ft of extra cable in the handhole.”

Method of Measurement.

Add the following to Article 886.05 of the Standard Specifications:

“Preformed detector loops will be measured along the detector loop embedded in the pavement rather than the actual length of the wire. Detector loop measurements shall include the saw cut and the length of the detector loop wire to the edge of pavement. The detector loop wire, including all necessary connections for proper operations, from the edge of pavement to the handhole, shall be included in the price of the detector loop. CNC, trench and backfill, and drilling of pavement or handholes shall be included in detector loop quantities.”

Basis of Payment.

This work shall be paid for at the contract unit price per foot (meter) for DETECTOR LOOP, TYPE I or PREFORMED DETECTOR LOOP as specified in the plans, which price shall be payment in full for furnishing and installing the detector loop and all related connections for proper operation.

ELECTRIC CABLE

Effective: May 22, 2002

Revised: July 1, 2015

873.01TS

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

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

Service cable may be single or multiple conductor cable.

ELECTRIC METER

Effective: November 1, 2023

805.02TS

Description.

This work shall consist of furnishing a ringless meter socket meeting the requirements of the power company. The meter socket shall be installed on the side of the existing traffic signal controller cabinet, opposite of the UPS side of the cabinet in accordance with the details provided in the plans at existing unmetered traffic signal locations, or as directed by the engineer.

Materials.

The meter socket shall meet the following requirements:

- CECHA Approved
- Single Position
- Number of Jaws = 4 Terminal
- Voltage rating of 600 Volts Alternating Current
- Amperage rating of 200 Continuous Ampere

Basis of Payment.

This item will be paid for at the contract unit price per each for ELECTRIC METER. The unit price shall include all equipment, materials, and labor required to furnish, and install the electric meter socket and related hardware components.

ELECTRIC SERVICE DISCONNECT, LIGHTING AND TRAFFIC SIGNAL

Effective: January 1, 2012

Description:

This item shall consist of furnishing and installing for the Lighting and Traffic Signal System a service disconnect box, 2 or 3 wire mounted on a wood pole as specified below, and as shown on the detail drawings and as directed by the Engineer.

Materials:

The disconnect box shall be NEMA 4X stainless steel, nominally 12" W x 16" H x 8" D with piano hinged door, steel back panel, fast acting stainless steel enclosure clamps, padlock provisions and door stop kit (Hoffman catalog #A-16H1208SS6LP/A-16P12/A-DSTOPK/C-PMK12, or approved equal).

Circuit Breakers shall be thermal magnetic bolt-on type with a minimum interrupt capacity of 25,000 symmetrical amperes at 240 volts. Breakers shall be lockable in the off position for lockout/tag-out compliance.

Bus bars, connectors, and lugs shall be copper, insulated and isolated, and configured to prevent shorted conditions from tightening terminations. Lugs and connectors shall be rated for 75°C. Overall bus sections shall be configured behind an insulating barrier shield which is removable for access to connections. The circuit breakers and bus may be part of an approved panelboard assembly.

Disconnect surge protector shall be suitable for 240/120 volt single phase 60Hz, AC electrical service. Protector shall have a surge energy capability of 2160 joules or better at 8/20 microseconds, rate -40 to 60°C., with LED operating indicators and shall be UL listed per UL 1449. The surge protector shall be a Cutler Hammer CMOV230L065XST or approved equal.

Conduit, wire, and ground rods to complete the installation of the disconnect box shall be included as part of this item, as required and as indicated.

Combination ground and neutral bar shall be configured with separate ground and neutral sections and spare terminals as indicated. The heads of grounding screws shall be painted green. The heads of neutral screws shall be painted white.

A plastic laminated layout and circuit diagram shall be affixed to the interior side of the enclosure door.

A 2-color engraved plastic nameplate, attached with screws and engraved as indicated, shall be provided for each main breaker.

The exact mounting height for the Electric Service Disconnect shall be field determined and marked by the Engineer.

Electrical service shall be of the voltage indicated. Where 120 volt service is indicated, service drop cable shall be installed accordingly and lighting main breaker and all other service appurtenances shall be included regardless of the service voltage applied to the installation.

The electric service equipment assembly shall be UL labeled, suitable for use as service equipment.

Steel strut channel shall be provided for proper installation of the disconnect, as shown on the disconnect mounting detail.

Electric Utility charges will be paid separately and are not part of this item.

Installation:

The Electric Service Disconnect shall be installed as indicated in the Electric Service Disconnect detail. All work shall be fully coordinated with the electric utility company by the Contractor.

Method Of Measurement:

Each Electric Service Disconnect, installed complete as specified and as indicated on the plans, shall be counted each for payment.

Basis Of Payment:

This item shall be paid for at the contract unit price, each, for **ELECTRIC SERVICE DISCONNECT, LIGHTING AND TRAFFIC SIGNAL**, which shall be payment in full for the work.

ELECTRIC SERVICE INSTALLATION

Effective: January 1, 2012

Description. This item shall consist of all material and labor required to extend, connect or modify the electric services, as indicated or specified, which is over and above the work performed by the utility. Unless otherwise indicated, the cost for the utility work, if any, will be reimbursed to the Contractor separately under ELECTRIC UTILITY SERVICE CONNECTION. This item may apply to the work at more than one service location and each will be paid separately.

Materials. Materials shall be in accordance with the Standard Specifications.

CONSTRUCTION REQUIREMENTS

General. The Contractor shall ascertain the work being provided by the electric utility and shall provide all additional material and work not included by other contract pay items required to complete the electric service work in complete compliance with the requirements of the utility.

No additional compensation will be allowed for work required for the electric service, even though not explicitly shown on the Drawings or specified herein

Method Of Measurement. Electric Service Installation shall be counted, each.

Basis Of Payment. This work will be paid for at the contract unit price each for **ELECTRIC SERVICE INSTALLATION** which shall be payment in full for the work specified herein.

ELECTRIC UTILITY SERVICE CONNECTION (COMED)

Effective: January 1, 2012

Description. This item shall consist of payment for work performed by ComEd in providing or modifying electric service as indicated. THIS MAY INVOLVE WORK AT MORE THAN ONE ELECTRIC SERVICE. For summary of the Electrical Service Drop Locations see the schedule contained elsewhere herein.

CONSTRUCTION REQUIREMENTS

General. It shall be the Contractor's responsibility to contact ComEd. The Contractor shall coordinate his work fully with the ComEd both as to the work required and the timing of the installation. No additional compensation will be granted under this or any other item for extra work caused by failure to meet this requirement. **Please contact ComEd, New Business Center Call Center, at 866 NEW ELECTRIC (1-866-639-3532) to begin the service connection process. The Call Center Representatives will create a work order for the service connection. The representative will ask the requestor for information specific to the request. The representative will assign the request based upon the location of project.**

The Contractor should make particular note of the need for the earliest attention to arrangements with ComEd for service. In the event of delay by ComEd, no extension of time will be considered applicable for the delay unless the Contractor can produce written evidence of a request for electric service within 30 days of execution.

Method Of Payment. The Contractor will be reimbursed to the exact amount of money as billed by ComEd for its services. Work provided by the Contractor for electric service will be paid separately as described under ELECTRIC SERVICE INSTALLATION. No extra compensation shall be paid to the Contractor for any incidental materials and labor required to fulfill the requirements as shown on the plans and specified herein.

For bidding purposes, this item shall be estimated as \$50,000.

Basis Of Payment. This work will be paid for at the contract lump sum price for **ELECTRIC UTILITY SERVICE CONNECTION** which shall be reimbursement in full for electric utility service charges.

EMERGENCY VEHICLE PRIORITY SYSTEM

Effective: May 22, 2002

Revised: July 1, 2015

887.01TS

Revise Section 887 of the Standard Specifications to read:

It shall be the Contractor's responsibility to contact the municipality or fire district to verify the brand of emergency vehicle pre-emption equipment to be installed prior to the contract bidding. The equipment must be completely compatible with all components of the equipment currently in use by the Agency.

All new installations shall be equipped with Confirmation Beacons as shown on the "District One Standard Traffic Signal Design Details." The Confirmation Beacon shall consist of a 6 watt Par 38 LED flood lamp with a 30 degree light spread, or a 7 watt Par 30 LED flood lamp with a 15 degree or greater spread, maximum 7 watt energy consumption at 120V, and a 2,000 hour warranty for each direction of pre-emption. The lamp shall have an adjustable mount with a weatherproof enclosure for cable splicing. All hardware shall be cast aluminum or stainless steel. Holes drilled into signal poles, mast arms, or posts shall require rubber grommets. In order to maintain uniformity between communities, the confirmation beacons shall indicate when the control equipment receives the pre-emption signal. The pre-emption movement shall be signaled by a flashing indication at the rate specified by Section 4L.01 of the "Manual on Uniform Traffic Control Devices," and other applicable sections of future editions. The stopped pre-empted movements shall be signaled by a continuous indication.

All light operated systems shall include security and transit preemption software and operate at a uniform rate of 14.035 Hz \pm 0.002, or as otherwise required by the Engineer, and provide compatible operation with other light systems currently being operated in the District.

This item shall include any required modifications to an existing traffic signal controller as a result of the addition of the EMERGENCY VEHICLE PRIORITY SYSTEM.

Basis of Payment.

The work shall be paid for at the contract unit price each for furnishing and installing LIGHT DETECTOR and LIGHT DETECTOR AMPLIFIER. Furnishing and installing the confirmation beacon shall be included in the cost of the Light Detector. Any required modifications to the traffic signal controller shall be included in the cost of the LIGHT DETECTOR AMPLIFIER. The preemption detector amplifier shall be paid for on a basis of (1) one each per intersection controller and shall provide operation for all movements required in the pre-emption phase sequence.

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

Effective: January 1, 2013

Revised: July 1, 2015

873.03TS

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

Basis of Payment.

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

EXPOSED RACEWAYS

Effective: January 1, 2012

Revise the first paragraph of Article 811.03(a) of the Standard Specifications to read:

“General. Rigid metal conduit installation shall be according to Article 810.05(a). Conduits terminating in junction and pull boxes shall be terminated with insulated and gasketed watertight threaded NEMA 4X conduit hubs. The hubs shall be Listed under UL 514B. The insulated throat shall be rated up to 105° C. When PVC coated conduit is utilized, the aforementioned hubs shall also be PVC coated.”

Add the following to Article 811.03(b) of the Standard Specifications:

“Where PVC coated conduit is utilized, all conduit fittings, couplings and clamps shall be PVC coated. All other mounting hardware and appurtenances shall be stainless steel.”

“The personnel installing the PVC coated conduit must be trained and certified by the PVC coated conduit Manufacturer or Manufacturer’s representative to install PVC coated conduit. Documentation demonstrating this requirement must be submitted for review and approval.”

Add the following to Article 1088.01(a) of the Standard Specifications:

All iron and steel products, which are to be incorporated into the work, including conduit and all conduit fittings, shall be domestically manufactured or produced and fabricated as specified in Article 106.”

Revise Article 1088.01(a)(3) of the Standard Specifications to read:

a. PVC Coated Steel Conduit. The PVC coated rigid metal conduit shall be UL Listed (UL 6). The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations shall be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating shall be UL listed.

b. The PVC coating shall have the following characteristics:

Hardness:	85+ Shore A Durometer
Dielectric Strength:	400V/mil @ 60 Hz
Aging:	1,000 Hours Atlas Weatherometer
Temperature	The PVC compound shall conform at 0° F. to Federal Specifications PL-406b, Method 2051, Amendment 1 of 25 September 1952 (ASTM D 746)
Elongation:	200%

c. The exterior and interior galvanized conduit surface shall be chemically treated to enhance PVC coating adhesion and shall also be coated with a primer before the PVC coating to ensure a bond between the zinc substrate and the PVC coating. The bond strength created shall be greater than the tensile strength of the plastic coating.

d. The nominal thickness of the PVC coating shall be 1 mm (40 mils). The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above -1°C (30°F).

- e. An interior urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. The interior coating shall be applied in a manner so there are no runs, drips, or pinholes at any point. The coating shall not peel, flake, or chip off after a cut is made in the conduit or a scratch is made in the coating.
- f. Conduit bodies shall have a tongue-in-groove gasket for maximum sealing capability. The design shall incorporate a positive placement feature to assure proper installation. Certified test results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be submitted for review when requested by the Engineer.
- g. The PVC conduit shall pass the following tests:

Exterior PVC Bond test RN1:

Two parallel cuts 13 mm (1/2 inch) apart and 40 mm (1 1/2 inches) in length shall be made with a sharp knife along the longitudinal axis. A third cut shall be made perpendicular to and crossing the longitudinal cuts at one end. The knife shall then be worked under the PVC coating for 13 mm (1/2 inch) to free the coating from the metal.

Using pliers, the freed PVC tab shall be pulled with a force applied vertically and away from the conduit. The PVC tab shall tear rather than cause any additional PVC coating to separate from the substrate.

Boil Test:

Acceptable conduit coating bonds (exterior and interior) shall be confirmed if there is no disbondment after a minimum average of 200 hours in boiling water or exposure to steam vapor at one atmosphere. Certified test results from a national recognized independent testing laboratory shall be submitted for review and approval. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D870, a 6" length of conduit test specimen shall be placed in boiling water. The specimen shall be periodically removed, cooled to ambient temperature and immediately tested according to the bond test (RN1). When the PVC coating separates from the substrate, the boil time to failure in hours shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, a 6" conduit test specimen shall be cut in half longitudinally and placed in boiling water or directly above boiling water with the urethane surface facing down. The specimen shall be periodically removed, cooled to ambient temperature and tested in accordance with the Standard Method of Adhesion by Tape Test (ASTM D3359). When the coating disbonds, the time to failure in hours shall be recorded.

Heat/Humidity Test:

Acceptable conduit coating bonds shall be confirmed by a minimum average of 30 days in the Heat and Humidity Test. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D1151, D1735, D2247 and D4585, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. The specimens shall be periodically removed and a bond test (RN1) performed. When the PVC coating separates from the substrate, the exposure time to failure in days shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. When the coating disbonds, the time to failure in hours shall be recorded.

Add the following to Article 1088.01(a)(4) of the Standard Specifications:

"All liquid tight flexible metal conduit fittings shall have an insulated throat to prevent abrasion of the conductors and shall have a captive sealing O-ring gasket. The fittings shall be Listed under UL 514B. The insulated throat shall be rated up to 105° C."

Revise the second paragraph of Article 811.04 of the Standard Specifications to read:

"Expansion fittings and LFNC will not be measured for payment."

Revise Article 811.05 of the Standard Specifications to read:

"811.05 Basis of Payment. This work will be paid for at the contract unit price per meter (foot) for **CONDUIT ATTACHED TO STRUCTURE**, of the diameter specified, **RIGID GALVANIZED STEEL** or **CONDUIT ATTACHED TO STRUCTURE**, of the diameter specified, **RIGID GALVANIZED STEEL, PVC COATED.**"

FULL-ACTUATED CONTROLLER IN EXISTING CABINET

Effective: September 26, 1995

Revised: November 1, 2023

857.01TS

Description.

This work shall consist of furnishing and installing an "Eagle" brand traffic actuated solid state digital controller meeting the requirements of the current District One Traffic Signal Special Provisions 857.02TS FULL-ACTUATED CONTROLLER AND CABINET and 857.02TS RAILROAD, FULL-ACTUATED CONTROLLER AND CABINET. This pay item shall include furnishing and installing the controller complete including malfunction management unit, load switches and flasher relays, and all necessary connections for proper operation.

Materials.

Add the following to Article 857.02 of the Standard Specifications:

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

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

Basis of Payment.

This work will be paid for at the contract unit price each for FULL-ACTUATED CONTROLLER IN EXISTING CABINET.

GENERAL ELECTRICAL REQUIREMENTS

Effective: June 1, 2021

This special provision replaces Articles 801.01 – 801.07, 801.09 – 801-16 of the Standard Specifications.

Definition. Codes, standards, and industry specifications cited for electrical work shall be by definition the latest adopted version thereof, unless indicated otherwise.

Materials by definition shall include electrical equipment, fittings, devices, motors, appliances, fixtures, apparatus, all hardware and appurtenances, and the like, used as part of, or in connection with, electrical installation.

Standards of Installation. Materials shall be installed according to the manufacturer's recommendations, the NEC, OSHA, the NESC, and AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.

All like materials shall be from the same manufacturer. Listed and labeled materials shall be used whenever possible. The listing shall be according to UL or an approved equivalent.

Safety and Protection. Safety and protection requirements shall be as follows.

Safety. Electrical systems shall not be left in an exposed or otherwise hazardous condition. All electrical boxes, cabinets, pole handholes, etc. which contain wiring, either energized or non-energized, shall be closed or shall have covers in place and be locked when possible, during nonworking hours.

Protection. Electrical raceway or duct openings shall be capped or otherwise sealed from the entrance of water and dirt. Wiring shall be protected from mechanical injury.

Equipment Grounding Conductor. All electrical systems, materials, and appurtenances shall be grounded. Good ground continuity throughout the electrical system shall be assured, even though every detail of the requirements is not specified or shown. Electrical circuits shall have a continuous insulated equipment grounding conductor. When metallic conduit is used, it shall be bonded to the equipment grounding conductor, but shall not be used as the equipment grounding conductor.

Detector loop lead-in circuits, circuits under 50 volts, and runs of fiber optic cable will not require an equipment grounding conductor.

Where connections are made to painted surfaces, the paint shall be scraped to fully expose metal at the connection point. After the connection is completed, the paint system shall be repaired to the satisfaction of the Engineer.

Bonding of all boxes and other metallic enclosures throughout the wiring system to the equipment grounding conductor shall be made using a splice and pigtail connection. Mechanical connectors shall have a serrated washer at the contact surface.

All connections to structural steel or fencing shall be made with exothermic welds. Care shall be taken not to weaken load carrying members. Where connections are made to epoxy coated reinforcing steel, the epoxy coating shall be sufficiently removed to facilitate a mechanical connection. The epoxy coating shall be repaired to the satisfaction of the Engineer. Where connections are made to insulated conductors, the connection shall be wrapped with at least four layers of electrical tape extended 6 in. (150 mm) onto the conductor insulation.

Submittals. At the preconstruction meeting, the Contractor shall submit a written listing of manufacturers for all major electrical and mechanical items. The list of manufacturers shall be binding, except by written request from the Contractor and approval by the Engineer. The request shall include acceptable reasons and documentation for the change.

Within 30 calendar days after contract execution, the Contractor shall submit, for approval, through the Traffic Operations Construction Submittals Application (TOCS) system the manufacturer's product data (for standard products and components) and detailed shop drawings (for fabricated items). Submittals for the materials for each individual pay item shall be complete in every respect. Submittals which include multiple pay items shall have all submittal material for each item or group of items covered by a particular specification, grouped together and the applicable pay item identified. Various submittals shall, when taken together, form a complete coordinated package. A partial submittal will be returned without review unless prior written permission is obtained from the Engineer.

Each PDF document must be a vector format PDF from the originating supplier or program and not scanned images.

The submittal must clearly identify the specific model number or catalog number of the item being proposed.

For further information and requirements regarding the TOCS system, the Contractor should reference the *TOCS Contractors User Guide*.

The submittal shall be properly identified by route, section, county, and contract number.

The Contractor shall have reviewed the submittal material and affixed his/her stamp of approval, with date and signature, for each individual item.

Illegible print, incompleteness, inaccuracy, or lack of coordination will be grounds for rejection.

Items from multiple disciplines shall not be combined on a single submittal and transmittal. Items for lighting, signals, surveillance and CCTV must be in separate submittals since they may be reviewed by various personnel in various locations.

The Department may provide a list of pay items broken out by discipline upon request for a particular contract.

The Engineer will review the submittals for conformance with the design concept of the project according to Article 105.04 and the following. The Engineer will stamp the drawings indicating their status as "Approved", "Approved as Noted", "Disapproved", or "Information Only". Since the Engineer's review is for conformance with the design concept only, it shall be the Contractor's responsibility to coordinate the various items into a working system as specified. The Contractor shall not be relieved from responsibility for errors or omissions in the shop, working, or layout drawings by the Engineer's approval thereof. The Contractor shall still be in full compliance with contract and specification requirements.

All submitted items reviewed and marked "Disapproved" or "Approved as Noted" shall be resubmitted by the Contractor in their entirety, unless otherwise indicated within the submittal comments.

Work shall not begin until the Engineer has approved the submittal. Material installed prior to approval by the Engineer, will be subject to removal and replacement at no additional cost to the Department.

Certifications. When certifications are specified and are available prior to material manufacture, the certification shall be included in the submittal information. When specified and only available after manufacture, the submittal shall include a statement of intent to furnish certification. All certificates shall be complete with all appropriate test dates and data.

Authorized Project Delay. See Article 801.08

Maintenance transfer and Preconstruction Inspection:

General. Before performing any excavation, removal, or installation work (electrical or otherwise) at the site, the Contractor shall request a maintenance transfer and preconstruction site inspection, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting and/or traffic control systems which may be affected by the work. The request for the maintenance transfer and preconstruction inspection shall be made no less than fourteen (14) calendar days prior to the desired inspection date. The maintenance transfer and preconstruction inspection shall:

Establish the procedures for formal transfer of maintenance responsibility required for the construction period.

Establish the approximate location and operating condition of lighting and/or traffic control systems which may be affected by the work

Marking of Existing Cable Systems. The party responsible for maintenance of any existing lighting and/or traffic control systems at the project site will, at the Contractor's request, mark and/or stake, once per location, all underground cable routes owned or maintained by the State. A project may involve multiple "locations" where separated electrical systems are involved (i.e. different controllers). The markings shall be taken to have a horizontal tolerance of at least 1 foot (304.8 mm) to either side. The request for the cable locations and marking shall be made at the same time the request for the maintenance transfer and preconstruction inspection is made. The Contractor shall exercise extreme caution where existing buried cable runs are involved. The markings of existing systems are made strictly for assistance to the Contractor and this does not relieve the Contractor of responsibility for the repair or replacement of any cable run damaged in the course of his work, as specified elsewhere herein. Note that the contractor shall be entitled to only one request for location marking of existing systems and that multiple requests may only be honored at the contractor's expense. No locates will be made after maintenance is transferred, unless it is at the contractor's expense.

Condition of Existing Systems. The Contractor shall conduct an inventory of all existing electrical system equipment within the project limits, which may be affected by the work, making note of any parts which are found broken or missing, defective or malfunctioning. Megger and load readings shall be taken for all existing circuits which will remain in place or be modified. If a circuit is to be taken out in its entirety, then readings do not have to be taken. The inventory and test data shall be reviewed with and approved by the Engineer and a record of the inventory shall be submitted to the Engineer for the record. Without such a record, all systems transferred to the Contractor for maintenance during construction shall be returned at the end of construction in complete, fully operating condition."

Maintenance and Responsibility During Construction.

Lighting Operation and Maintenance Responsibility. The scope of work shall include the assumption of responsibility for the continuing operation and maintenance of the existing, proposed, temporary, sign and navigation lighting, or other lighting systems and all appurtenances affected by the work as specified elsewhere herein. Maintenance of lighting systems is specified elsewhere and will be paid for separately

The proposed lighting system must be operational prior to opening the roadway to traffic unless temporary lighting exists which is designed and installed to properly illuminate the roadway.

Energy and Demand Charges. The payment of basic energy and demand charges by the electric utility for existing lighting which remains in service will continue as a responsibility of the Owner, unless otherwise indicated. Unless otherwise indicated or required by the Engineer duplicate lighting systems (such as temporary lighting and proposed new lighting) shall not be operated simultaneously at the Owner's expense and lighting systems shall not be kept in operation during long daytime periods at the Owner's expense. Upon written authorization from the Engineer to place a proposed new lighting system in service, whether the system has passed final acceptance or not, (such as to allow temporary lighting to be removed), the Owner will accept responsibility for energy and demand charges for such lighting, effective the date of authorization. All other energy and demand payments to the utility shall be the responsibility of the Contractor until final acceptance.

Damage to Electrical Systems. Should damage occur to any existing electrical systems through the Contractor's operations, the Engineer will designate the repairs as emergency or non-emergency in nature.

Emergency repairs shall be made by the Contractor, or as determined by the Engineer, the Department, or its agent. Non-emergency repairs shall be performed by the Contractor within six working days following discovery or notification. All repairs shall be performed in an expeditious manner to assure all electrical systems are operational as soon as possible. The repairs shall be performed at no additional cost to the Department.

Lighting. An outage will be considered an emergency when three or more lights on a circuit or three successive lights are not operational. Knocked down materials, which result in a danger to the motoring public, will be considered an emergency repair.

Temporary aerial multi-conductor cable, with grounded messenger cable, will be permitted if it does not interfere with traffic or other operations, and if the Engineer determines it does not require unacceptable modification to existing installations.

Marking Proposed Locations for Highway Lighting System. The Contractor shall mark or stake the proposed locations of all poles, cabinets, junction boxes, pull boxes, handholes, cable routes, pavement crossings, and other items pertinent to the work. A proposed location inspection by the Engineer shall be requested prior to any excavation, construction, or installation work after all proposed installation locations are marked. Any work installed without location approval is subject to corrective action at no additional cost to the Department.

Inspection of electrical work. Inspection of electrical work shall be according to Article 105.12 and the following.

Before any splice, tap, or electrical connection is covered in handholes, junction boxes, light poles, or other enclosures, the Contractor shall notify and make available such wiring for the Engineer's inspection.

Testing. Before final inspection, the electrical work shall be tested. Tests may be made progressively as parts of the work are completed or may be made when the work is complete. Tests shall be made in the presence of the Engineer. Items which fail to test satisfactorily shall be repaired or replaced. Tests shall include checks of control operation, system voltages, cable insulation, and ground resistance and continuity.

The forms for recording test readings will be available from the Engineer in electronic format. The Contractor shall provide the Engineer with a written report of all test data including the following:

- Voltage Tests
- Amperage Tests
- Insulation Resistance Tests
- Continuity tests
- Detector Loop Tests

Lighting systems. The following tests shall be made.

- (1) Voltage Measurements. Voltages in the cabinet from phase to phase and phase to neutral, at no load and at full load, shall be measured and recorded. Voltage readings at the last termination of each circuit shall be measured and recorded.
- (2) Insulation Resistance. Insulation resistance to ground of each circuit at the cabinet shall be measured and recorded with all loads disconnected. Prior to performance of the insulation resistance test, the Contractor shall remove all fuses within all light pole bases on a circuit to segregate the luminaire loads.

On tests of new cable runs, the readings shall exceed 50 megohms for phase and neutral conductors with a connected load over 20A and shall exceed 100 megohms for conductors with a connected load of 20A or less.

On tests of cable runs which include cables which were existing in service prior to this contract, the resistance readings shall be the same or better than the readings recorded at the maintenance transfer at the beginning of the contract. Measurements shall be taken with a megohm meter approved by the Engineer.

- (3) Loads. The current of each circuit, phase main, and neutral shall be measured and recorded. The Engineer may direct reasonable circuit rearrangement. The current readings shall be within ten percent of the connected load based on material ratings.
- (4) Ground Continuity. Resistance of the system ground as taken from the farthest extension of each circuit run from the controller (i.e. check of equipment ground continuity for each circuit) shall be measured and recorded. Readings shall not exceed 2.0 ohms, regardless of the length of the circuit.
- (5) Resistance of Grounding Electrodes. Resistance to ground of all grounding electrodes shall be measured and recorded. Measurements shall be made with a ground tester during dry soil conditions as approved by the Engineer. Resistance to ground shall not exceed 10 ohms.

ITS. The following test shall be made in addition to the lighting system test above.

Detector Loops. Before and after permanently securing the loop in the pavement, the resistance, inductance, resistance to ground, and quality factor for each loop and lead-in circuit shall be tested. The loop and lead-in circuit shall have an inductance between 20 and 2500 microhenries. The resistance to ground shall be a minimum of 50 megohms under any conditions of weather or moisture. The quality factor (Q) shall be 5 or greater.

Fiber Optic Systems. Fiber optic testing shall be performed as required in the fiber optic cable special provision and the fiber optic splice special provision.

All test results shall be furnished to the Engineer seven working days before the date the inspection is scheduled.

Contract Guarantee. The Contractor shall provide a written guarantee for all electrical work provided under the contract for a period of six months after the date of acceptance with the following warranties and guarantees.

- (a) The manufacturer's standard written warranty for each piece of electrical material or apparatus furnished under the contract. The warranty for light emitting diode (LED) modules, including the maintained minimum luminance, shall cover a minimum of 120 months from the date of delivery.
- (b) The Contractor's written guarantee that, for a period of six months after the date of final acceptance of the work, all necessary repairs to or replacement of said warranted material or apparatus for reasons not proven to have been caused by negligence on the part of the user or acts of a third party shall be made by the Contractor at no additional cost to the Department.
- (c) The Contractor's written guarantee for satisfactory operation of all electrical systems furnished and constructed under the contract for a period of six months after final acceptance of the work.

The warranty for an uninterruptable power supply (UPS) shall cover a minimum of two years from date the equipment is placed in operation; however, the batteries of the UPS shall be warranted for full replacement for a minimum of five years.

Record Drawings. Alterations and additions to the electrical installation made during the execution of the work shall be made on the PDF copy of the as-Let documents using a PDF editor. Hand drawn notations or markups and scanned plans are not acceptable. These drawings shall be updated daily and shall be available for inspection by the Engineer during the work. The record drawings shall include the following:

- Cover Sheet
- The Electrical Maintenance Contract Management System (EMCMS) location designation, i.e. "L" number
- Summary of Quantities, electrical items only
- Legends, Schedules, and Notes
- Plan Sheets
- Pertinent Details
- Single Line Diagrams
- Other useful information useful to locate and maintain the systems.

Any modifications to the details shall be indicated. Final quantities used shall be indicated on the Summary of Quantities. Foundation depths used shall also be listed.

As part of the record drawings, the Contractor shall inventory all materials, new or existing, on the project and record information on inventory sheets provided by the Engineer.

The inventory shall include:

- Location of Equipment, including rack, chassis, slot as applicable.
- Designation of Equipment
- Equipment manufacturer
- Equipment model number
- Equipment Version Number
- Equipment Configuration
 - Addressing, IP or other
 - Settings, hardware or programmed
- Equipment Serial Number

The following electronic inventory forms are available from the Engineer:

- Lighting Controller Inventory
- Lighting Inventory
- Light Tower Inspection Checklist
- ITS Location Inventory

The information shall be entered in the forms; handwritten entries will not be acceptable; except for signatures. Electronic file shall also be included in the documentation.

When the work is complete, and seven days before the request for a final inspection, the set of contract drawings, stamped "**RECORD DRAWINGS**", shall be submitted to the Engineer for review and approval and shall be stamped with the date and the signature of the Contractor's supervising Engineer or Electrician. . The record drawings shall be submitted in PDF format through TOCS, on CD-ROM as well as hardcopy's for review and approval.

In addition to the record drawings, PDF copies of the final catalog cuts which have been Approved and Approved as Noted with applicable follow-up shall be submitted along with the record drawings. The PDF files shall clearly indicate either by filename or PDF table of contents the respective pay item number. Specific part or model numbers of items which have been selected shall be clearly visible. Hard copies of the catalog are not required with this submittal.

The Contractor shall provide three sets of electronically produced drawings in a moisture proof pouch to be kept on the inside door of the controller cabinet or other location approved by the Engineer. These drawings shall show the final as-built circuit orientation(s) of the project in the form of a single line diagram with all luminaires numbered and clearly identified for each circuit.

Final documentation shall be submitted as a complete submittal package, i.e. record drawings, test results, inventory, etc. shall be submitted at the same time. Partial piecemeal submittals will be rejected without review.

A total of three hardcopies and two CD-ROMs of the final documentation shall be submitted. The identical material shall also be submitted through the TOCS system utilizing the following final documentation pay item numbers:

Pay Code	Description	Discipline
FDLRD000	Record Drawings - Lighting	Lighting
FDSRD000	Record Drawings - Surveillance	Surveillance
FDTRD000	Record Drawings - Traffic Signal	Traffic Signal
FDIRD000	Record Drawings - ITS	ITS
FDLCC000	Catalog Cuts - Lighting	Lighting
FDSCC000	Catalog Cuts – Surveillance	Surveillance
FDTCC000	Catalog Cuts – Traffic Signal	Traffic Signal
FDICC000	Catalog Cuts - ITS	ITS
FDLWL000	Warranty - Lighting	Lighting
FDSWL000	Warranty - Surveillance	Surveillance
FDTWL000	Warranty - Traffic Signal	Traffic Signal
FDIWL000	Warranty - ITS	ITS
FDLTR000	Test Results - Lighting	Lighting
FDSTR000	Test Results - Surveillance	Surveillance
FDTTR000	Test Results - Traffic Signal	Traffic Signal
FDITR000	Test Results - ITS	ITS
FDLINV00	Inventory - Lighting	Lighting
FDSINV00	Inventory - Surveillance	Surveillance
FDTINV00	Inventory - Traffic Signal	Traffic Signal
FDIINV00	Inventory - ITS	ITS
FDLGPS00	GPS - Lighting	Lighting
FDSGPS00	GPS - Surveillance	Surveillance
FDTGPS00	GPS - Traffic Signal	Traffic Signal
FDIGPS00	GPS - ITS	ITS

Record Drawings shall include Marked up plans, controller info, Service Info, Equipment Settings, Manuals, Wiring Diagrams for each discipline.

Test results shall be all electrical test results, fiber optic OTDR, and Fiber Optic power meter as applicable for each discipline.

GPS Documentation. In addition to the specified record drawings, the Contactor shall record GPS coordinates of the following electrical components being installed, modified or being affected in other ways by this contract:

- All light poles and light towers.
- Handholes and vaults.
- Junction Boxes
- Conduit roadway crossings.
- Controllers.
- Control Buildings.
- Structures with electrical connections, i.e. DMS, lighted signs.
- Electric Service locations.
- CCTV Camera installations.
- Roadway Surveillance installations.
- Fiber Optic Splice Locations.
- Fiber Optic Cables. Coordinates shall be recorded along each fiber optic cable route every 200 feet.
- All fiber optic slack locations shall be identified with quantity of slack cable included. When sequential cable markings are available, those markings shall be documented as cable marking into enclosure and marking out of enclosure.

Datum to be used shall be North American 1983.

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

1. District
2. Description of item
3. Designation
4. Use
5. Approximate station
6. Contract Number
7. Date
8. Owner
9. Latitude
10. Longitude
11. Comments

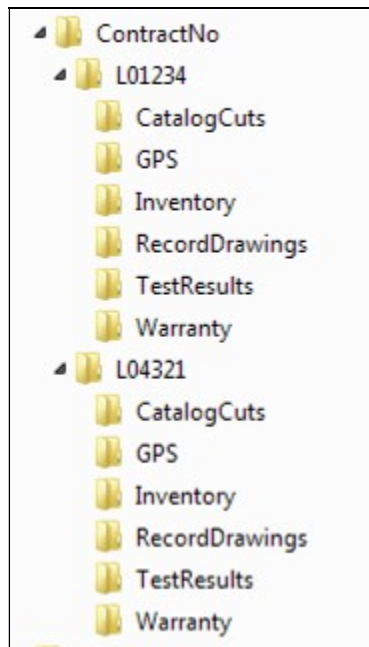
A spreadsheet template will be available from the Engineer for use by the Contractor.

Accuracy. Data collected is to be mapping grade. A handheld mapping grade GPS device shall be used for the data collection. The receiver shall support differential correction and data shall have minimum 5 meter accuracy after post processing.

GPS receivers integrated into cellular communication devices, recreational and automotive GPS devices are not acceptable.

The GPS shall be the product of an established major GPS manufacturer having been in the business for a minimum of 6 years.”

The documents on the CD shall be organized by the Electrical Maintenance Contract Management System (EMCMS) location designation. If multiple EMCMS locations are within the contract, separate folders shall be utilized for each location as follows:



Extraneous information not pertaining to the specific EMCMS location shall not be included in that particular folder and sub-folder.

The inspection will not be made until after the delivery of acceptable record drawings, specified certifications, and the required guarantees.

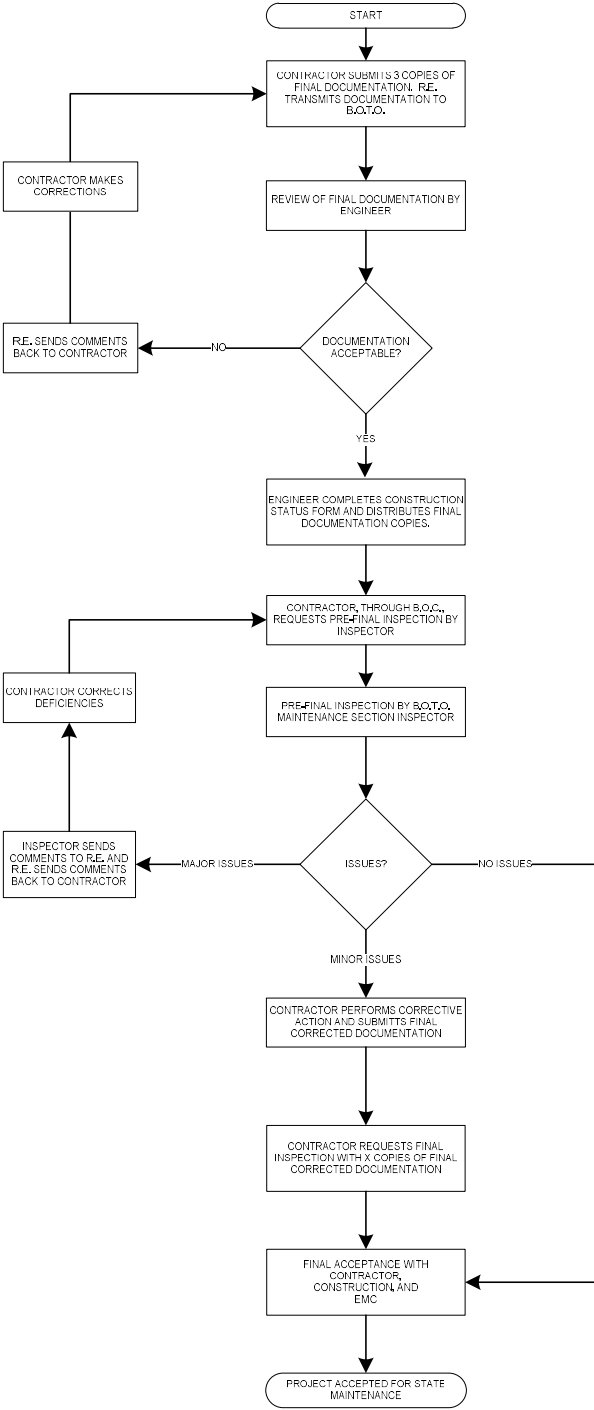
The Final Acceptance Documentation Checklist shall be completed and is contained elsewhere herein.

All CD's shall be labeled as illustrated in the CD Label Template contained herein.

Acceptance. Acceptance of electrical work will be given at the time when the Department assumes the responsibility to protect and maintain the work according to Article 107.30 or at the time of final inspection.

When the electrical work is complete, tested, and fully operational, the Contractor shall schedule an inspection for acceptance with the Engineer no less than seven working days prior to the desired inspection date. The Contractor shall furnish the necessary labor and equipment to make the inspection.

A written record of the test readings taken by the Contractor according to Article 801.13 shall be furnished to the Engineer seven working days before the date the inspection is scheduled. Inspection will not be made until after the delivery of acceptable record drawings, specified certifications, and the required guarantees.



Final Acceptance Documentation Checklist

LOCATION	
Route	Common Name
Limits	Section
Contract #	County
Controller Designation(s)	EMC Database Location Number(s)

ITEM	Contractor (Verify)	Resident Engineer (Verify)
Record Drawings -Three hardcopies (11" x 17") -Scanned to two CD-ROMs	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Field Inspection Tests -Voltage -Amperage -Cable Insulation Resistance -Continuity -Controller Ground Rod Resistance (Three Hardcopies & scanned to two CD's)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
GPS Coordinates -Excel file (Check Special Provisions, Excel file scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Job Warranty Letter (Three Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Catalog Cut Submittals -Approved & Approved as Noted (Scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Lighting Inventory Form (Three Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Lighting Controller Inventory Form (Three Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>
Light Tower Inspection Form (If applicable, Three Hardcopies & scanned to two CD's)	<input type="checkbox"/>	<input type="checkbox"/>

Three Hardcopies & scanned to two CD's shall be submitted for all items above. The CD ROM shall be labeled as shown in the example contained herein.

General Notes:

Record Drawings – The record drawings should contain contract cover sheet, summary of quantities showing all lighting pay item sheets, proposed lighting plans and lighting detail sheets. Submit hardcopies shall be 11” x 17” size. Temporary lighting plans and removal lighting plans should not be part of the set.

Field Inspection Tests – Testing should be done for proposed cables. Testing shall be per standard specifications. Forms shall be neatly filled out.

GPS Coordinates – Check special provisions “General Electrical Requirements”. Submit electronic “EXCEL” file.

Job Warranty Letter – See standard specifications.

Cutsheet Submittal – See special provisions “General Electrical Requirements”. Scan Approved and Approved as Noted cutsheets.

Lighting Inventory Form – Inventory form should include only proposed light poles, proposed light towers, proposed combination (traffic/light pole) lighting and proposed underpass luminaires.

Lighting Controller Inventory Form – Form should be filled out for only proposed lighting controllers.

Light Tower Safety Inspection Form – Form should be filled out for each proposed light tower.

CD LABEL FORMAT TEMPLATE.

Label must be printed; hand written labels are unacceptable and will be rejected.



HANDHOLES

Effective: January 01, 2002

Revised: November 1, 2023

814.01TS

Description.

Add the following to Section 814 of the Standard Specifications:

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

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

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

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

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

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

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

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

Add the following to Section 814 of the Standard Specifications:

Cast-In-Place Handholes.

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

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

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

Precast Round Handholes.

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

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

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

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

INTERCEPT EXISTING CONDUIT

Description

This work shall consist of intercepting an existing underground conduit and rerouting into and out of a hand hole or communication vault.

Materials

Materials shall conform to Article 810.02

Construction Requirements

Installation

The contractor shall reroute and extend the conduit as needed to allow conductors to pass through hand hole or vault. New conduit and fittings that match existing conduit shall be added as needed to allow conductors to pass through the hand hole or vault.

The existing cable shall be removed prior to rerouting the conduit.

Method of Measurement

This work will be measured for payment per each hole that is drilled in an existing junction box.

Basis of Payment

This work will be paid for at the contract unit price each for INTERCEPT EXISTING CONDUIT which will be payment in full for performing the work described herein.

LED MODULE REPLACEMENT

Effective: August 1, 2023
880.05TS

Description.

This work shall be in accordance with Sections 880, 881, 895, and 1078 of the Standard Specifications except as modified herein. The Contractor shall remove LED modules from an existing traffic or pedestrian signal head and furnish and install new LED modules for each indication as shown on the plans. Lens covers and visor heaters shall be removed and reinstalled if needed. In case of discrepancies between the plans and existing field conditions, the Contractor shall coordinate the correct module installation with the Traffic Signal Area Engineer. The Contractor shall recycle all LED modules at an electronics recycling facility. The LED module must be replaced in kind for whatever color, size, and movement is being replaced (Red, Yellow, Green, Any Color Arrows, Ped, Walk, Don't Walk, etc.). All LED modules shall conform to the requirements specified in the special provisions 880.01TS – LED SIGNAL HEAD AND OPTICALLY PROGRAMMED LED SIGNAL HEAD and 881.01TS – LED PEDESTRIAN SIGNAL MODULE REPLACEMENT.

Basis of Payment.

This work will be paid for at the contract unit price per each for LED SIGNAL MODULE REPLACEMENT and LED PEDESTRIAN SIGNAL MODULE REPLACEMENT. All labor and equipment required to complete this work, including removal and reinstallation of lens covers and visor heaters, shall be included in the contract unit price.

LED SIGNAL FACE, LENS COVER

Effective: July 1, 2021
Revised: March 1, 2024
880.03TS

Description.

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

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

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

Basis of Payment.

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

LED SIGNAL FACE, VISOR HEATER

Effective: July 1, 2021

Revised: March 1, 2024

880.04TS

Description.

This work shall consist of furnishing and installing a heated signal visor or retrofitting an existing signal visor with a heater to prevent snow buildup on and around a signal lens allowing for clear signal indication during inclement weather.

The heater shall keep a constant temperature on every point of the heating element and shall not rise above the Manufacturer's safe temperature levels. The heater shall be made from flexible material mounted to the underside of an existing or proposed signal visor. The heater shall be controlled by a temperature and humidity probe to determine if conditions for snow are present. A single probe with the LED confirmation light should be installed at the traffic signal cabinet to control the entire intersection with the confirmation light visible from the street. Power for the heater shall be supplied using an extra, unused wire from the signal head. Installation of the heater shall not create conditions where dust, debris, or water can enter the inside of the signal head. Any control modules necessary for the proper operation should be installed inside the cabinet for easy maintenance, and its capacity should match the number of red signal head indications present at the intersection or as directed by the Engineer.

The heating element shall operate during typical snowing conditions below 35.6°F and above 75 percent relative humidity. The heater shall be installed such that it is de-energized when traffic signals are powered by an alternative energy source such as a generator or uninterruptible power supply (UPS).

Revised cabinet wiring diagrams showing the heater shall be provided.

The snow resistant heated signal visor shall be warranted for a period of three (3) years from final inspection and free from material and workmanship defects.

Basis of Payment.

This work shall be paid for at the Contract unit price each for LED SIGNAL FACE, VISOR HEATER, the price of which shall include the cost for all work and material described herein and includes furnishing, installing, and all mounting hardware necessary for proper operation.

LIGHT EMITTING DIODE (LED) PEDESTRIAN SIGNAL HEAD

Effective: May 22, 2002

Revised: March 1, 2024

881.01TS

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

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

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

Add the following to Article 881.03 of the Standard Specifications:

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

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

Materials.

Add the following to Article 1078.02 of the Standard Specifications:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Basis of Payment.

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

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

Add the following to Article 881.04 of the Standard Specifications:

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

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

Effective: May 22, 2002

Revised: March 1, 2024

880.01TS

Materials.

Add the following to Section 1078 of the Standard Specifications:

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

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

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

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

(a) Physical and Mechanical Requirements

(1) Modules can be manufactured under this specification for the following faces:

- a. 12 in. (300 mm) circular, multi-section
- b. 12 in. (300 mm) arrow, multi-section

(2) The maximum weight of a module shall be 4 lb (1.8 kg).

(3) Each module shall be a sealed unit to include all parts necessary for operation (a printed circuit board, power supply, a lens and gasket, etc.) and shall be weatherproof after installation and connection.

(4) The lens of the module shall be tinted with a wavelength-matched color to reduce sun phantom effect and enhance on/off contrast. The tinting shall be uniform across the lens face. Polymeric lens shall provide a surface coating or chemical surface treatment applied to provide abrasion resistance. The lens of the module shall be integral to the unit, convex with a smooth outer surface and made of plastic. The lens shall have a textured surface to reduce glare.

(5) The use of tinting or other materials to enhance ON/OFF contrasts shall not affect chromaticity and shall be uniform across the face of the lens.

- (6) Each module shall have a symbol of the type of module (i.e. circle, arrow, etc.) in the color of the module. The symbol shall be 1 in. (25.4 mm) in diameter. Additionally, the color shall be written out in 1/2 in. (12.7mm) letters next to the symbol.

(b) Photometric Requirements

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

(c) Electrical

- (1) Maximum power consumption for LED modules as per the tables in Article 1078.01.
- (2) Operating voltage of the modules shall be 120 VAC. All parameters shall be measured at this voltage.
- (3) The modules shall be operationally compatible with currently used controller assemblies (solid state load switches, flashers, and conflict monitors).
- (4) When a current of 20 mA AC or less is applied to the unit, the voltage read across the two leads shall be 15 VAC or less.
- (5) The LED modules shall provide constant light output under power. Modules with dimming capabilities shall have the option disabled or set on a non-dimming operation.
- (6) LED arrows shall be wired such that a loss or the failure of one or more LEDs

(d) Retrofit Traffic Signal Module

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

- (1) Retrofit modules can be manufactured under this specification for the following faces:
 - a. 12 in. (300 mm) circular, multi-section
 - b. 12 in. (300 mm) arrow, multi-section
- (2) Each Retrofit module shall be designed to be installed in the doorframe of a standard traffic signal housing. The Retrofit module shall be sealed in the doorframe with a one-piece EPDM (ethylene propylene rubber) gasket.

- (3) The maximum weight of a Retrofit module shall be 4 lb (1.8 kg).
 - (4) Each Retrofit module shall be a sealed unit to include all parts necessary for operation (a printed circuit board, power supply, a lens and gasket, etc.) and shall be weatherproof after installation and connection.
 - (5) Electrical conductors for modules, including Retrofit modules, shall be 39-2/5 in. (1 m) in length, with quick disconnect terminals attached.
 - (6) The lens of the Retrofit module shall be integral to the unit, shall be convex with a smooth outer surface and made of plastic or of glass.
- (e) The following specification requirements apply to the 12 in. (300 mm) arrow module only. All general specifications apply unless specifically superseded in this section.
- (1) The arrow module shall meet specifications stated in Section 9.01 of the Equipment and Material Standards of the Institute of Transportation Engineers (November 1998) [ITE Standards], Chapter 2 (Vehicle Traffic Control Signal Heads) or applicable successor ITE specifications for arrow indications.
 - (2) The LEDs arrow indication shall be a solid display with a minimum of three (3) outlining rows of LEDs and at least one (1) fill row of LEDs.
- (f) The following specification requirement applies to the 12 in. (300 mm) programmed visibility (PV) module only. All general specifications apply unless specifically superseded in this section.
- (1) The LED module shall be a module designed and constructed to be installed in a programmed visibility (PV) signal housing without modification to the housing.

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

Basis of Payment.

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

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

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

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

MAST ARM ASSEMBLY AND POLE

Effective: May 22, 2002

Revised: July 01, 2015

877.01TS

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

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

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

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

MAST ARM SIGN PANELS

Effective: May 22, 2002

Revised: July 1, 2015

720.01TS

Add the following to Article 720.02 of the Standard Specifications:

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

MODIFY EXISTING CONTROLLER CABINET

Effective: May 22, 2002

Revised: July 1, 2015

895.01TS

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

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

Basis of Payment.

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

PEDESTRIAN SIGNAL POST

Effective: January 1, 2020

Revised:
875.02TS

Description.

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

Materials.

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

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

- e. Finish. The steel post, steel post cap and the cast iron base shall be hot-dipped galvanized according to AASHTO M 111. If the Department approves painting, powder coating by the manufacturer will be required over the galvanization in accordance with 851.01TS TRAFFIC SIGNAL PAINTING Special Provisions. If the post and the base are threaded after the galvanization, the bare exposed metal shall be immediately cleaned to remove all cutting solvents and oils, and then spray painted with two coats of an approved galvanized paint.

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

Installation.

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

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

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

Basis of Payment.

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

REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT

Effective: May 22, 2002

Revised: March 1, 2024

895.02TS

Add the following to Article 895.05 of the Standard Specifications:

“The traffic signal equipment which is to be removed and is to become the property of the Contractor shall be disposed of outside the right-of-way at the Contractor’s expense.

All equipment to be returned to the State shall be delivered by the Contractor to the State's Traffic Signal Maintenance Contractor's main facility. The Contractor shall contact the State's Electrical Maintenance Contractor to schedule an appointment to deliver the equipment. No equipment will be accepted without a prior appointment. All equipment shall be delivered within thirty (30) days of removing it from the traffic signal installation. The Contractor shall provide one hard copy and one electronic file of a list of equipment that is to remain the property of the State, including model and serial numbers, where applicable. The Contractor shall also provide a copy of the Contract plan or special provision showing the quantities and type of equipment. Controllers and peripheral equipment from the same location shall be boxed together (equipment from different locations may not be mixed) and all boxes and controller cabinets shall be clearly marked or labeled with the location from which they were removed. If equipment is not returned according to these requirements, it will be rejected by the State's Electrical Maintenance Contractor. The Contractor shall be responsible for the condition of the traffic signal equipment from the time Contractor takes maintenance of the signal installation until approval by the Department. A delivery receipt will be signed by the State's Electrical Maintenance Contractor indicating the items have been returned.

The Contractor shall safely store and arrange for pick up or delivery of all equipment to be returned to agencies other than the State. The Contractor shall package the equipment and provide all necessary documentation as stated above.

Traffic signal equipment which is lost, damaged, or not returned to the Department for any reason shall be replaced with new equipment meeting the requirements of these Specifications at no cost to the contract.”

REBUILD EXISTING HANDHOLE

Effective: January 1, 2002

Revised: November 1, 2023

895.04TS

This item shall consist of rebuilding and bringing to grade a handhole or double handhole at a location shown on the plans or as directed by the Engineer. The work shall consist of removing the handhole frame and cover and the walls of the handhole to a depth of eight (8) inches below the finished grade.

Handhole

Four (4) holes, four (4) inches in depth and one half (1/2) inch in diameter, shall be drilled into the remaining concrete; one hole centered on each of the four handhole walls. Four (4) #3 epoxy coated steel rebar, eight (8) inches in length, shall be furnished and shall be installed in the drilled holes with a masonry epoxy.

Double Handhole

Six (6) holes, four (4) inches in depth and one half (1/2) inch in diameter, shall be drilled into the remaining concrete; one hole centered on both short walls and two spaced equally on both long walls. Six (6) #3 epoxy coated steel rebar, eight (8) inches in length, shall be furnished and shall be installed in the drilled holes with a masonry epoxy.

All concrete debris shall be disposed of outside the right-of-way. All rebar must meet the specifications set forth in 1006.10.

The area adjacent to each side of the handhole shall be excavated to allow forming. All steel hooks, handhole frame, cover, and concrete shall be provided to construct a rebuilt handhole according to applicable portions of Section 814 of the Standard Specification and as modified in 814.01TS HANDHOLES Special Provision. The existing frame and cover shall be replaced if it was damaged during removal or as determined by the Engineer.

Basis of Payment.

This work shall be paid for at the contract unit price each for REBUILD EXISTING HANDHOLE, which price shall be payment in full for all labor, materials, and equipment necessary to complete the work described above and as indicated on the drawings.

REBUILD EXISTING HANDHOLE TO HEAVY-DUTY HANDHOLE

Effective: January 1, 2002

Revised: July 1, 2015

895.05TS

This item shall consist of partial removal of an existing concrete traffic signal handhole, reconstruction to the specifications of heavy duty handhole including new frame and cover, and bringing it to grade at location(s) shown in the plans or as directed by the Engineer. This work shall consist of removing the existing handhole frame and cover and the walls of the handhole to a depth of fifteen (15) inches below the finished grade.

Upon completion of the above work, four (4) holes, four (4) inches in depth, and one-half (1/2) inch in diameter shall be drilled into the top of the remaining concrete; one hole centered into each of the four handhole walls. Four (4) #3 steel dowels eight inches in length, shall be furnished and installed in the drilled holes with a masonry epoxy.

All concrete debris shall be disposed of outside the right-of-way.

Any pavement or asphalt surface removal required to install the new concrete shall have straight and neat edges using a method approved by the Engineer. Care shall be taken to protect the existing traffic signal cable. Any cable damage shall be reported immediately and repaired as directed by the Area Traffic Signal Engineer.

All steel hooks, handhole frame, cover, and concrete shall be provided to construct a rebuilt heavy duty handhole according to applicable portions of Section 814 of the Standard Specification and as modified in 814.01TS HANDHOLES Special Provision.

Basis of Payment.

This work shall be paid for at the contract unit price each for REBUILD EXISTING HANDHOLE TO HEAVY-DUTY HANDHOLE.

POE EXTENDER

Effective: November 1, 2023

892.03TS

Description.

This work shall consist of furnishing and installing a long range power over ethernet (PoE) extender kit for devices powered by PoE with cable runs greater than 250 feet.

Materials.

The PoE extender kit shall consist of a base extender, device extender, power supply for base extender, mounts and all accessories required to install the PoE extender kit. The PoE extender shall support IEEE 802.3af and IEEE 802.3at compliant devices. The PoE extender shall be TS2 compatible. The PoE extender shall be able to extend PoE to a maximum distance of 3280 feet and be able to operate in temperatures from -40° F to 158° F with maximum humidity of 85% RH (non-condensing). The power supply shall have an input voltage of 90-265 V AC and an output voltage of 44-57 V DC with a max current of 0.7 A.

Installation.

The power supply and base extender shall be installed in the traffic signal control cabinet. The power supply shall be hard-wired to the cabinet power, not plugged into one of the traffic signal cabinet power outlets. The device extender shall be installed in the devices power supply cabinet located on the traffic signal mast arm pole.

Basis of Payment.

This work will be paid for at the contract unit price per each for POE EXTENDER, the price of which shall include all equipment, materials, and labor required to furnish, configure and install the switch, including all necessary connectors, cables, fiber optic jumpers, hardware, software, and other peripheral equipment required to place the switch in operation to the satisfaction of the Traffic Engineer.

The OUTDOOR RATED NETWORK cable from the traffic signal cabinet to the PoE device will be paid for separately.

ROADSIDE DETECTOR

The roadside detector continuously monitors and timestamps the presence of Bluetooth devices within the range of the receiver. This data is collected by the IDOT Advanced Traffic Management System (ATMS) (see ATMS Integration Pay Item) every 5 minutes or less.

Equipment and component parts furnished shall be new, be of the latest design and manufacture, and be in an operable condition at the time of delivery and installation. All parts shall be of high-quality workmanship, and no part or attachment shall be substituted or applied contrary to the manufacturer's recommendations and standard practices. The Contractor shall be responsible for providing all materials (Mounting brackets, connectors, software, and hardware) to install and place into operation, a complete and operational system.

The detector shall consist of the Bluetooth sensor, cellular modem, solar power supply, battery, processor, and antennas integrated into a NEMA 4 enclosure with no penetrations to the enclosure except for the antenna and solar panel interconnection. All devices must comply with FCC regulations governing Bluetooth and Cellular emissions. The enclosure shall be self-contained, with provision for mounting to light poles, sign trusses, and other structures using stainless steel straps.

The Bluetooth sub assembly shall have the highest allowed transceiver power. The internal microprocessor should be capable of up to 1 GB storage. The integral cellular modem (Sim Chip supplied by IDOT District 1) shall operate within the suburban and rural environment with no external gain antennas. In order to provide the Sim Chips, the Contractor shall supply IDOT with Manufacturer, Model number, ESN, and Location for each detector.

The Bluetooth sensor shall contain advanced features designed to allow the unit to operate efficiently in a remote environment. Diagnostic heartbeat information such as voltage and temperature monitoring, as well as software stability information should be periodically sent along with the MAC addresses. The system is to be designed to be able to automatically reboot if a condition is detected that requires such action. In the case when a total system recovery is required, the sensor is to be designed to automatically reimage the system memory.

In addition, the sensor should have the ability to download software patches and upgrades over the air without the need to physically visit the unit. These patches and upgrades shall be included in this pay item at no additional cost to the State.

Operating range	-20 to +75 degrees C
Enclosure	NEMA 4 - Constructed for outdoor use to provide a degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, and hose-directed water; and that will be undamaged by the external formation of ice on the enclosure.
Battery	12 VDC - 40 Ah (min.) Sealed Lead-Acid non-spillable, and maintenance-free
Power	Maximum consumption, including cell modem transmit 5.5 watt. Typical power consumption no greater than 2.5 watt
Solar Panel	Capable of creating 30 watts of power (min.) at 12 VDC
Bluetooth Range	150 ft

Installation

The Contractor, in conjunction with the IDOT District 1 Representative, the Manufacturer and Resident Engineer, shall identify locations for the roadside detectors as shown on the plans. It shall be the Contractor's responsibility to verify each location's viability and make any alternate site recommendations to the Department. The cost of the site survey shall be incidental to the cost of the roadside detector pay item.

The manufacturer shall provide guidance and assistance during site survey and installation.

The Bluetooth Detectors shall be mounted on poles as shown in the plans. The recommended mounting height for the Bluetooth sensor is 12 – 15 feet above the travelled lane (or as recommended by the manufacturer).

The solar panel shall be mounted in accordance with environmental and location conditions, as recommended by the manufacturer.

Warranty

The Bluetooth manufacturer shall provide a five-year warranty, to IDOT and its Agents, on parts, labor and postage, for all detectors, hardware and software. The warranty shall also include five years of software patches and updates. Software licenses shall not expire.

Method of Measurement

This work shall be measured for payment as each and consists of the site verification, supply, install, testing, and alignment of a complete function Bluetooth detector installation properly reporting to IDOT's Server.

Basis of Payment

This work will be paid for at the contract unit price per each for ROADSIDE DETECTOR.

ROD AND CLEAN EXISTING CONDUIT

Effective: January 1, 2015

Revised: July 1, 2015

810.03TS

Description.

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

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

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

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

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

Basis of Payment.

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

RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, DETECTOR UNIT

Effective: January 1, 2002

Revised: July 1, 2015

887.02TS

This item shall consist of relocating the existing emergency vehicle priority system, detector unit (single channel or dual channel) from its existing location to a new traffic signal post or mast arm assembly and pole, and connecting it to an emergency vehicle priority system, phasing unit. If the existing Emergency Vehicle Priority System, Detector Unit Assembly includes a Confirmation Beacon, the Confirmation Beacon shall also be relocated and connected to the Emergency Vehicle Priority System, Detector Unit and shall be included at no cost in this item.

The emergency vehicle system is not to be inoperative for more than 8 hours and the Contractor must notify the Municipality or Fire Protection District 72 hours prior to the disconnection of the equipment.

Basis of Payment.

This item will be paid for at the contract unit price each for RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, DETECTOR UNIT.

RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, PHASING UNIT

Effective: January 1, 2002

Revised: July 1, 2015

887.03TS

This item shall consist of relocating the existing emergency vehicle priority system phasing unit from an existing traffic signal controller cabinet to a new traffic signal controller cabinet, as indicated in the plans or as directed by the Engineer.

The work shall include disconnecting the emergency vehicle priority system phasing unit(s) and reconnecting it into the new traffic signal controller cabinet.

The emergency vehicle system is not to be inoperative for more than 8 hours and the Contractor must notify the Municipality or Fire Protection District 72 hours prior to the disconnection of the equipment. The Contractor must demonstrate to the satisfaction of the Engineer that the emergency vehicle system operates properly.

Basis of Payment.

This item will be paid for on a basis of one (1) each per intersection for RELOCATE EXISTING EMERGENCY VEHICLE PRIORITY SYSTEM, PHASING UNIT.

REMOTE CONTROLLED VIDEO SYSTEM

Effective: November 1, 2023
892.08TS

Description.

This work shall consist of furnishing and installing an IP based remote controlled video system at a location designated by the Traffic Engineer. The work shall include a color camera, dome assembly, all mounting hardware, connectors, cables, power injectors, and related equipment necessary to complete the installation according to the manufacturer's specifications. Any licensing required for adding the camera to the CENTRACS CCTV VIDEO MODULE will be provided by The Department. Configuration of the camera into the centralized system shall be part of this pay item.

Materials.

The PTZ camera shall be one of the following approved models:

- TKH Security Solutions PD1103Z2-E
- AXIS Q6075-E
- Cohu 4220HD

The Contractor shall furnish the required number of power injectors for the camera make and model selected, including operation of the camera heater, as well as all required mounting hardware, connectors, patch cables, and power supplies. The system shall have anonymous FTP capabilities disabled by the vendor/equipment supplier or provide a feature for the user to disable the functionality through the standard internal menu.

Installation.

The camera shall be installed as shown on the plans, either on the luminaire arm near the luminaire, or on the combination mast arm assembly pole, angled toward the center of the intersection using a mounting bracket compatible with the camera and procured from one of the approved camera manufacturers. When installed on the pole, the camera shall be mounted to provide a minimum of 12 inches clear space between face of the pole and the camera housing. When installed on the luminaire arm, the camera shall be installed with a 30-degree tilt-adjustable bracket. The camera and any external hardware and housing shall be installed with stainless steel straps.

All holes drilled into signal poles, mast arms, or posts shall require rubber grommets to prevent the chafing of wires.

The Contractor shall contact the Traffic Engineer prior to installing the camera and associated wiring, to receive final approval on the camera location. If the Remote Controlled Video System will be connected to the Gigabit Ethernet network, then a Layer II (Datalink) Switch and/or a Layer III (Network) Switch shall be required. Layer II and Layer III switches shall be installed as shown on the plans. Contractor to coordinate with IDOT Electric Maintenance Contractor and Network engineer for proper set up and IP configuration. The remote controlled video system shall be warranted, free from material and workmanship defects for a period of three years from final acceptance.

Basis of Payment.

This work will be paid for at the contract unit price per each for REMOTE CONTROLLED VIDEO SYSTEM, The unit price shall include all associated equipment, hardware, cables, materials and labor required to install the complete system in place and in operation to the satisfaction of the Traffic Engineer. The OUTDOOR RATED NETWORK cable from the traffic signal cabinet will be paid for separately. If required, the LAYER II (DATALINK) SWITCH and/or the LAYER III (NETWORK) SWITCH will be paid for separately.

REMOVE AND REPLACE BATTERIES FOR UNINTERRUPTABLE POWER SUPPLY

Effective: November 1, 2023

862.03TS

Description.

Remove and Replace Batteries for Uninterruptable Power Supply (UPS) shall meet the requirements of Special Provision 862.01TS Uninterruptable Power Supply, Special for the batteries requirements including sizing, rating, and warranty. This item requires that the Contractor remove the existing batteries in the uninterruptable power supply and replace them with new batteries that provide a minimum of six (6) hours of full run- time operation.

The Contractor is responsible for modifying the existing uninterruptable power supply to make the cabinet and controller compatible for extra batteries if needed to ensure a minimum of six (6) hours of full run-time operation. Any connectors, wiring, seals, battery heating mats if needed shall be part of this pay item and included in the cost of this pay item. The Contractor is responsible for verifying that the existing battery heating mats are working properly and relocate these or replace with new heating mats as needed. This work shall also include properly cleaning of the inside of UPS cabinet of any battery acid residue or other debris to the satisfaction of the Engineer.

The existing batteries at an intersection shall be removed and recycled at an electronics recycling facility in an environmentally and properly way in meeting all applicable sections of US EPA and IL EPA publications along with the Code of Federal Regulations for transportation. Salvage value shall be included in the bid price.

All batteries in a UPS installation shall be the same type; mixing of gel cell and AGM types within a UPS installation is not permitted. All batteries shall have a clear label with the date it was manufactured and date it was installed inside a UPS.

Basis of Payment.

This work shall be paid for at the contract unit price each of all batteries in cabinet per intersection for REMOVE AND REPLACE BATTERIES FOR UNINTERRUPTABLE POWER SUPPLY, the price of which shall include the cost for all of the work and material described herein and includes furnishing, installing, and all mounting hardware necessary for proper operation to the satisfaction of the Traffic Engineer.

SERVICE INSTALLATION (TRAFFIC SIGNALS)

Effective: May 22, 2002

Revised: March 1, 2024

805.01TS

Revise Section 805 of the Standard Specifications to read:

Description.

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

General.

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

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

Materials.

- a. General. The completed control panel shall be constructed in accordance with UL Std. 508A, Industrial Control Panel, and carry the UL label. Wire terminations shall be UL listed.

b. Enclosures.

- (1) Pole Mounted Cabinet. The cabinet shall be UL 50, NEMA Type 4X, unfinished single door design, fabricated from minimum 0.080 in. (2.03 mm) thick Type 5052 H-32 aluminum. Seams shall be continuous welded and ground smooth. Stainless steel screws and clamps shall secure the cover and assure a watertight seal. The cover shall be removable by pulling the continuous stainless steel hinge pin. The cabinet shall have an oil-resistant gasket and a lock kit shall be provided with an internal O-ring in the locking mechanism assuring a watertight and dust-tight seal. The cabinet shall be sized to adequately house all required components with extra space for arrangement and termination of wiring. A minimum size of 14 in. (350 mm) high, 9 in. (225 mm) wide and 8 in. (200 mm) in depth is required. The cabinet shall be channel mounted to a wooden utility pole using assemblies recommended by the Vendor.
 - (2) Ground Mounted Cabinet. The cabinet shall be UL 50, NEMA Type 3R unfinished single door design with back panel. The cabinet shall be fabricated from Type 5052 H-32 aluminum with the frame and door 0.125 in. (3.175 mm) thick, the top 0.250 in. (6.350 mm) thick and the bottom 0.500-inch (12.70 mm) thick. Seams shall be continuous welded and ground smooth. The door and door opening shall be double flanged. The door shall be approximately 80% of the front surface, with a full length tamperproof stainless steel .075 in. (1.91 mm) thick hinge bolted to the cabinet with stainless steel carriage bolts and nylock nuts. The locking mechanism shall be slam-latch type with a keyhole cover. The cabinet shall be sized to adequately house all required components with extra space for arrangement and termination of wiring. A minimum size of 40 in. (1000 mm) high, 16 in. (400 mm) wide and 15 in. (375 mm) in depth is required. The cabinet shall be mounted upon a Type A concrete foundation as indicated on the plans. The foundation is paid for separately.
 - (3) All enclosures shall include a green external power indicator LED light with circuitry as shown in the Electrical Service-Panel Diagram detail sheet. For pole mounted service enclosures, the power indicator light shall be mounted as shown in the detail. For ground mounted enclosures, the power indicator light shall be mounted on the side of the enclosure most visible from the major roadway.
- (c) Electric Utility Meter Housing and Riser. The electric meter housing and meter socket shall be supplied and installed by the Contractor. The Contractor is to coordinate the work to be performed and the materials required with the utility company to make the final connection at the power source. Electric utility required risers, weather/service head, and any other materials necessary for connection shall also be included in the pay item. Materials shall be in accordance with the electric utility's requirements. For ground-mounted service, the electric utility meter housing shall be mounted to the enclosure. The meter shall be supplied by the utility company.

- (d) Surge Protector. Overvoltage protection, with LED indicator, shall be provided for the 120 V load circuit by the means MOV and thermal fusing technology. The response time shall be < 5 ns and operate within a range of -40°C to $+85^{\circ}\text{C}$. The surge protector shall be UL 1449 Listed.
- (e) Circuit Breakers. Circuit breakers shall be standard UL listed molded case, thermal-magnetic bolt-on type circuit breakers with trip free indicating handles. 120 V circuit breakers shall have an interrupting rating of not less than 65,000 rms symmetrical amperes. Unless otherwise indicated, the main disconnect circuit breaker for the traffic signal controller shall be rated 60 A, 120 V and the auxiliary circuit breakers shall be rated 10 A, 120 V.
- (f) Fuses and Fuseholders. Fuses shall be small-dimensional cylindrical fuses of the dual element time-delay type. The fuses shall be rated for 600 VAC and shall have a UL listed interrupting rating of not less than 10,000 rms symmetrical amperes at rated voltage.
- (g) Ground and Neutral Bus Bars. A single copper ground and neutral bus bar, mounted on the equipment panel shall be provided. Ground and neutral conductors shall be separated on the bus bar. Compression lugs, plus 2 spare lugs, shall be sized to accommodate the cables with the heads of the connector screws painted green for ground connections and white for neutral connections.
- (h) Utility Services Connection. The Contractor shall notify the utility company marketing representative a minimum of thirty (30) working days prior to the anticipated date of hook-up. This 30-day advance notification will begin only after the utility company marketing representative has received service charge payments from the Contractor. Prior to contacting the utility company marketing representative for service connection, the service installation controller cabinet and cable must be installed for inspection by the utility company.
- (i) Ground Rod. Ground rods shall be copper-clad steel, a minimum of 10 ft (3.0m) in length, and 3/4 in. (20mm) in diameter. Ground rod resistance measurements to ground shall be 25 ohms or less. If necessary additional rods shall be installed to meet resistance requirements at no additional cost to the Contract.

Installation.

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

Basis of Payment.

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

TACTICS LICENSE EXPANSION

Effective: November 1, 2023
892.07TS

Description.

This work shall consist of providing a license for the addition of a traffic signal controller to the existing TACTICS system and programming the intersection into the existing TACTICS system.

General.

This pay item may be grouped per job. For example a 50 unit license pack is acceptable for a job with 45 intersections. Individual licenses not needed but part of package shall be provided to IDOT Electrical Maintenance Contractor. Vendor shall coordinate with EMC contractor to transfer the unused licenses.

The TACTICS system shall be programmed for complete functionality of the intersection traffic signal controller.

Basis of Payment.

This work shall be paid for at the contract unit price per each for TACTICS LICENSE EXPANSION. The unit price shall include all equipment; materials; licenses, programming; testing and documentation; and labor required to add a traffic signal controller to the TACTICS system.

TEMPORARY TRAFFIC SIGNAL INSTALLATION

Effective: May 22, 2002

Revised: March 1, 2024

890.01TS

Revise Section 890 of the Standard Specifications to read:

Description.

This work shall consist of furnishing, installing, maintaining, and removing a temporary traffic signal installation as shown on the plans, including but not limited to temporary signal heads, emergency vehicle priority systems, interconnect, vehicle detectors, uninterruptable power supply, and signing. When temporary traffic signals will be operating within a traffic signal system, the equipment shall be compatible with the current operating requirements of the system. For integration into an Advanced Traffic Management System (ATMS) such as Centrac, Tactics, or TransSuite, the controller shall have the latest version of approved NTCIP software installed.

General.

Only an approved controller Vendor will be allowed to assemble a temporary traffic signal and railroad traffic signal cabinet. Traffic signal inspection and TURN-ON shall be according to 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS special provision.

Construction Requirements.

(a) Controllers. Only controllers supplied by one of the District approved Vendors will be approved for use at temporary signal locations. All controllers used for temporary traffic signals shall be fully actuated NEMA microprocessor based with RS232 data entry ports compatible with existing monitoring software approved by IDOT District 1, installed in NEMA TS2 cabinets with 8 phase back panels, capable of supplying 255 seconds of cycle length and individual phase length settings up to 99 seconds. On projects with one lane open and two-way traffic flow, such as bridge deck repairs, the temporary signal controller shall be capable of providing an adjustable all red clearance setting of up to 250 seconds in length. All controllers used for temporary traffic signals shall meet or exceed the requirements of Section 857 of the Standard Specifications with regards to internal time base coordination and preemption. All railroad interconnected temporary controllers and cabinets shall be new and shall satisfy the requirements of Article 857.02 of the Standard Specifications and as modified herein. On projects with multiple temporary traffic signal installations, all controllers shall be the same Manufacturer brand and model number with the latest version software installed at the time of the signal TURN-ON, or as specified in the Contract.

- (b) Cabinets. Only control equipment, including controller cabinet and peripheral equipment, supplied by one of the District approved Vendors will be approved for use at temporary traffic signal locations. All control equipment for the temporary traffic signal(s) shall be furnished by the Contractor unless otherwise stated in the Contract. All temporary traffic signal cabinets shall have a closed bottom. The bottom shall be sealed along the entire perimeter of the cabinet base to ensure a water, dust, animal, and insect-proof seal. The bottom shall provide a minimum of two (2) 4 in. (100 mm) diameter holes to run the electric cables through. The 4 in. (100 mm) diameter holes shall have a bushing installed to protect the electric cables and shall be sealed after the electric cables are installed.
- (c) Grounding. Grounding shall be provided for the temporary traffic signal cabinet meeting or exceeding the applicable portions of the National Electrical Code, Section 806 of the Standard Specifications and shall meet the requirements of the "Grounding of Traffic Signal Systems" section of 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS special provision.
- (d) Traffic Signal Heads. All traffic signal sections shall be 12 in. (300 mm). Pedestrian signal sections shall be 16 in. (406mm) x 18 in. (457mm). All signal heads shall be furnished with tunnel visors unless otherwise specified in the contract. Traffic signal sections shall be Light Emitting Diode (LED) with expandable view, unless otherwise approved by the Engineer. Pedestrian signal heads shall be LED Pedestrian Countdown Signal Heads. The temporary traffic signal heads shall be placed as indicated on the temporary traffic signal plan or as directed by the Engineer. If no traffic staging is in place or will not be staged on the day of the turn on, the temporary traffic signal shall have the signal head displays, signal head placements and controller phasing match the existing traffic signal or shall be as directed by the Engineer. The Contractor shall furnish enough extra cable length to relocate heads to any position on the span wire or at locations illustrated on the plans for construction staging. The temporary traffic signal shall remain in operation during all signal head relocations. Each temporary traffic signal head shall have its own cable from the controller cabinet to the signal head.
- (e) Interconnect.
- (1) Temporary traffic signal interconnect shall be provided using fiber optic cable or wireless interconnect technology as specified in the Contract. If the Contract specifies fiber optic cable to be used for temporary interconnect, the Contractor may request, in writing, to substitute the fiber optic temporary interconnect with a wireless interconnect. The Contractor must provide assurances that the radio device will operate properly at all times and during all construction staging. If approved for use by the Engineer, the Contractor shall submit marked-up traffic signal plans indicating locations of radios and antennas and installation details. If wireless interconnect is used, and in the opinion of the Engineer it is not viable, or if it fails during testing or operations, the Contractor shall be responsible for installing all necessary poles, fiber optic cable, and other infrastructure for providing temporary fiber optic interconnect at no cost to the Contract.

- (2) The existing system interconnect and phone lines are to be maintained as part of the Temporary Traffic Signal Installation specified for on the plan. If the existing traffic signal has a cellular modem, the modem shall be temporarily relocated to the temporary signal. The temporary signal cabinet shall have an antenna supplied by the Contractor. Any existing network switches shall be temporarily relocated to the temporary signal. Any existing pan-tilt-zoom (PTZ) cameras shall be temporarily relocated to the temporary signal. The interconnect, including any required fiber splices and terminations, shall be installed into the temporary controller cabinet as per the notes or details on the plans. All labor and equipment required to install and maintain the existing interconnect as part of the Temporary Traffic Signal Installation shall be included in the cost of TEMPORARY TRAFFIC SIGNAL INSTALLATION. The temporary traffic signal interconnect shall maintain interconnect communications throughout the entire signal system for the duration of the project.
- (3) Temporary wireless interconnect for closed-loop systems. The radio interconnect system shall be compatible with Eagle/Yunex or Econolite controller closed loop systems. This work shall include all temporary wireless interconnect components at the adjacent existing traffic signal(s) to provide a completely operational closed loop system. This work shall include all materials, labor and testing to provide the completely operational closed loop system as shown on the plans. The radio interconnect system shall include the following components:
- a. Rack or Shelf Mounted RS-232 Frequency Hopping Spread Spectrum (FHSS) Radio
 - b. Software for Radio Configuration (Configure Frequency and Hopping Patterns)
 - c. Antennas (Omni Directional or Yagi Directional)
 - d. Antenna Cables, LMR400, Low Loss. Maximum 100 ft from controller cabinet to antenna
 - e. Brackets, Mounting Hardware, and Accessories Required for Installation
 - f. RS232 Data Cable for Connection from the radio to the local or master controller
 - g. All other components required for a fully functional radio interconnect system

All controller cabinet modifications and other modifications to existing equipment that are required for the installation of the radio interconnect system components shall be included in the cost of TEMPORARY TRAFFIC SIGNAL INSTALLATION.

The radio interconnect system may operate at 900Mhz (902-928) or 2.4 Ghz depending on the results of a site survey. The telemetry shall have an acceptable rate of transmission errors, time outs, etc. comparable to that of a hardwire system.

The proposed or existing master controller and telemetry module shall be configured for use with the radio interconnect at a minimum rate of 9600 baud.

The radio interconnect system shall include all other components required for a complete and fully functional telemetry system and shall be installed in accordance with the Vendor's recommendations.

Temporary wireless interconnect for Advanced Traffic Management Systems. The radio interconnect system shall be compatible with an ATMS.

- (f) Emergency Vehicle Preemption. All emergency vehicle preemption equipment (light detectors, light detector amplifiers, confirmation beacons, etc.) as shown on the temporary traffic signal plans shall be provided by the Contractor. It shall be the Contractor's responsibility to contact the municipality or fire district to verify the brand of emergency vehicle preemption equipment to be installed prior to the Contract bidding. The equipment must be completely compatible with all components of the equipment currently in use by the Agency. All light operated systems shall operate at a uniform rate of 14.035 hz \pm 0.002, or as otherwise required by the Engineer, and provide compatible operation with other light systems currently being operated in the District. All labor and material required to install and maintain the Emergency Vehicle Preemption installation shall be included in the item TEMPORARY TRAFFIC SIGNAL INSTALLATION.
- (g) Vehicle Detection. All temporary traffic signal installations shall have vehicular detection installed at all approaches of the intersection and as directed by the Engineer. Video vehicle detection systems shall be approved by IDOT prior to the Contractor furnishing and installing. The Contractor shall install, wire, and adjust the alignment of the video vehicle detection system in accordance to the Manufacturer's recommendations and requirements. The Contractor shall be responsible for adjusting the alignment of the video vehicle detection system for all construction staging changes and for maintaining proper alignment throughout the project. The Vendor shall be present and assist the contractor in setting up the video vehicle detection system. An in-cabinet video monitor shall be provided with all video vehicle detection systems and shall be included in the item TEMPORARY TRAFFIC SIGNAL INSTALLATION.
- (h) Pedestrian push-buttons. Pedestrian push-buttons shall be provided for all pedestrian signal heads/phases or as directed by the Engineer. Accessible Pedestrian Signal (APS) buttons shall be installed at any location where they currently exist. All push-buttons shall be latching and have MUTCD R10-3e signs with proper arrows.

- (i) Uninterruptable Power Supply. All temporary traffic signal installations shall have an Uninterruptable Power Supply (UPS). The UPS cabinet shall be mounted to the temporary traffic signal cabinet and shall be according to the applicable portions of Section 862 of the Standard Specifications and as modified in the current District One Traffic Signal Special Provision 862.01TS UNINTERRUPTABLE POWER SUPPLY, SPECIAL.
- (j) Signs. All existing signs shall be removed from existing poles and relocated to the temporary signal. If new mast arm assembly and pole(s) and posts are specified for the permanent signals, the signs shall be relocated to the new equipment at no extra cost. Any signs that are required for the temporary traffic signal shall be provided as shown on the plans or as directed by the Engineer. Relocation, removing, bagging and installing signs for the various construction stages shall be provided as shown on the plans or as directed by the Engineer. If Illuminated Street Name Signs exist, they shall be taken down and stored by the Contractor, and the Contractor shall furnish reflectorized street name signs on the temporary traffic signal installation.
- (k) Energy Charges. The electrical utility energy charges for the operation of the temporary traffic signal installation shall be paid for by others if the installation replaces an existing signal. Otherwise, charges shall be paid for under 109.05 of the Standard Specifications.
- (l) Maintenance.
 - (1) Maintenance shall meet the requirements of the Standard Specifications and the "Maintenance and Responsibility of Traffic Signal and Flashing Beacon Installations" section of the current District One Traffic Signal Special Provision 800.01TS TRAFFIC SIGNAL GENERAL REQUIREMENTS.
 - (2) Maintenance of temporary signals and of the existing signals shall be included in the cost of the TEMPORARY TRAFFIC SIGNAL INSTALLATION pay item. When temporary traffic signals are to be installed at locations where existing signals are presently operating, the Contractor shall be fully responsible for the maintenance of the existing signal installation as soon as they begin any physical work on the Contract or any portion thereof.
 - (3) The temporary signal responsibility shall begin at the start of temporary signal construction and shall end with the removal of the signal as directed by the Engineer.

(m) Temporary Traffic Signals for Bridge Projects. Temporary Traffic Signals for bridge projects shall follow the State Standards, Standard Specifications, Special Provisions and any plans for Bridge Temporary Traffic Signals included in the Contract. The installation shall meet the Standard Specifications and all other requirements in this TEMPORARY TRAFFIC SIGNAL INSTALLATION specification. In addition, all electric cable shall be aerially suspended at a minimum height of 18 ft (5.5m) on temporary wood poles (Class 5 or better) of 45 ft (13.7 m) minimum height. The signal heads shall be span wire mounted or bracket mounted to the wood pole or as directed by the Engineer. The Controller cabinet shall be mounted to the wood pole as shown in the plans, or as directed by the Engineer. A video vehicle detection system may be used in place of detector loops as approved by the Engineer or as shown in the Contract.

(n) Temporary Portable Traffic Signal for Bridge Projects.

(1) The controller and cabinet shall be NEMA type designed for NEMA TS2 Type 1 operation. Controller and LED signal displays shall meet the applicable Standard Specifications and all other requirements in this TEMPORARY TRAFFIC SIGNAL INSTALLATION special provision.

(2) Work shall be according to Article 701.18(b) of the Standard Specifications except as noted herein.

(3) General.

a. The temporary portable bridge traffic signals shall be trailer-mounted units. The trailer-mounted units shall be set up securely and level. Each unit shall be self-contained and consist of two signal heads. The left signal head shall be mounted on a mast arm capable of extending over the travel lane. Each unit shall contain a solar cell system to facilitate battery charging. There shall be a minimum of twelve (12) days backup reserve battery supply and the units shall be capable of operating with a 120 V power supply from a generator or electrical service.

b. All signal heads located over the travel lane shall be mounted at a minimum height of 17 ft (5 m) from the bottom of the signal back plate to the top of the road surface. All far right signal heads located outside the travel lane shall be mounted at a minimum height of 8 ft (2.5 m) from the bottom of the signal back plate to the top of the adjacent travel lane surface.

c. The long all red intervals for the traffic signal controller shall be adjustable up to 250 seconds in one-second increments.

d. As an alternative to detector loops, temporary portable bridge traffic signals may be equipped with other approved methods of vehicle detection and traffic actuation.

- e. All portable traffic signal units shall be interconnected using hardwire communication cable. Radio communication equipment may be used only with the approval of the Engineer. If radio communication is used, a site analysis shall be completed to ensure that there is no interference present that would affect the traffic signal operation. The radio equipment shall meet all applicable FCC requirements.
- f. The temporary portable bridge traffic signal system shall meet the physical display and operational requirements of conventional traffic signals as specified in Part IV and other applicable portions of the currently adopted version of the Manual on Uniform Traffic Control Devices (MUTCD) and the Illinois MUTCD. The signal system shall be designed to continuously operate over an ambient temperature range between -30°F (-34°C) and 120°F (48°C). When not being utilized to inform and direct traffic, portable signals shall be treated as non-operating equipment according to Article 701.11.

Basis of Payment.

This work shall be paid for at the Contract unit price each for TEMPORARY TRAFFIC SIGNAL INSTALLATION, TEMPORARY BRIDGE TRAFFIC SIGNAL INSTALLATION, or TEMPORARY PORTABLE BRIDGE TRAFFIC SIGNAL INSTALLATION, the price of which shall include all costs for the modifications required for traffic staging, changes in signal phasing as required in the Contract plans, video vehicle detection systems, any maintenance or adjustment to the video vehicle detection system, the temporary wireless interconnect system, temporary fiber optic interconnect system, all material required, the installation and complete removal of the temporary traffic signal, and any changes required by the Engineer. Each location will be paid for separately.

TEMPORARY TRAFFIC SIGNAL TIMING

Effective: May 22, 2002

Revised: March 1, 2024

890.02TS

Description.

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

All timings and adjustments necessary for this work shall be performed by an approved Consultant who has previous experience in optimizing Traffic Signal Systems for District One of the Illinois Department of Transportation. The Contractor shall contact the Traffic Signal Engineer for a listing of approved Consultants.

The following tasks are associated with TEMPORARY TRAFFIC SIGNAL TIMING:

- (a) Consultant shall attend temporary traffic signal inspection (turn-on) and/or detour meeting and conduct on-site implementation of the traffic signal timings.
- (b) Consultant shall be responsible for making fine-tuning adjustments to the timings in the field to alleviate observed adverse operating conditions and to enhance operations.
- (c) Consultant shall provide monthly observation of traffic signal operations in the field.
- (d) Consultant shall provide on-site consultation and adjust timings as necessary for construction stage changes, temporary traffic signal phase changes, and any other conditions affecting timing and phasing, including lane closures, detours, and other construction activities.
- (e) Consultant shall make timing adjustments and prepare comment responses as directed by the Area Traffic Signal Maintenance and Operations Engineer.
- (f) Return original timing plan once construction is complete.

Basis of Payment.

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

TEMPORARY WOOD POLE, INSTALL ONLY

Effective: January 1, 2012

Description. This item shall consist of retrieving from storage, transporting, and installing a temporary wood pole, and mast as applicable, as specified herein and as indicated on the plans.

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

Item	Article/Section
(a) Light Pole Identification.....	1069.06

CONSTRUCTION REQUIREMENTS

Inspection And Acceptance. The Contractor shall examine the wood pole, and mast as applicable, in the presence of the Engineer and after accepting the pole(s) shall be held responsible for preservation of the condition of each pole, as it was at the time of acceptance, until the Final Acceptance Inspection.

Transportation. The Contractor shall transport, handle the wood pole in complete conformance with industry standard recommendations. The Contractor shall make arrangements to transfer the light poles from the State's storage facility located within District 1 on weekdays between the hours of 8:00 a.m. and 4:00 p.m., excluding State holidays applicable to the Department.

Installation. Installation shall be as described in Article 830.03(c). Unless otherwise indicated, the Contractor shall provide all hardware to install the pole and mast arm as specified herein and indicated on the plans.

Unless otherwise indicated, the wood pole and mast arm, as applicable, shall remain the property of the owner and shall be removed as specified elsewhere herein.

Method Of Measurement. Wood poles shall be counted as, each installed.

Basis Of Payment. This item shall be paid at the contract unit price each for **TEMPORARY WOOD POLE**, of the mounting height, mast arm quantity and length indicated, **(INSTALL ONLY)**.

TERMINAL SERVER

Effective: November 1, 2023
892.02TS

Description.

This work shall consist of furnishing and installing a terminal server used to transmit signal controller data from one or more traffic signal controllers onto the District 1 Advanced Traffic Management System Ethernet network. The Contractor shall furnish and install the required hardware at the location shown on the plans and/or as directed by the Traffic Engineer.

General.

The terminal server shall be one of the following:

- Digi PortServer TS Hcc 4 four-port serial-to-Ethernet device with 120V power supply and Digi RJ45/DB25-male-DCE-48" cable
- Control DeviceMaster DM-2304 four-port serial-to-Ethernet device with 120V power supply and a 9-pin to 25-pin serial cable

The Contractor shall provide a null modem if required by the manufacturer for communication.

The terminal server shall have anonymous FTP capabilities disabled by the vendor/equipment supplier or provide a feature for the user to disable the functionality through the standard device menus.

The terminal server shall be properly configured for its location within the District 1 Traffic Ethernet Network, and for proper communication with the signal equipment being connected to it. Except where indicated otherwise in the special provisions or plans, District 1 Traffic will provide the IP address and serial drop addresses upon request.

The required programming shall be included in the cost of this pay item.

Basis of Payment.

This work shall be paid for at the contract unit price per each for TERMINAL SERVER. The unit price shall include all equipment; materials; licenses, programming; testing and documentation; and labor required to add a traffic signal controller to the centralized system.

TRAFFIC SIGNAL BACKPLATE

Effective: May 22, 2002

Revised: March 1, 2024

882.01TS

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

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

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

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

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

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

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

TRAFFIC SIGNAL GENERAL REQUIREMENTS

Effective: May 22, 2002

Revised: March 1, 2024

800.01TS

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

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

Definitions of Terms.

Add the following to Section 101 of the Standard Specifications:

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

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

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

Submittals.

Revise Article 801.05 of the Standard Specifications to read:

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

- (1) All material approval requests shall be made prior to or no later than the date of the preconstruction meeting. A list of major traffic signal items can be found in Article 801.05. Material or equipment which is similar or identical shall be the product of the same manufacturer, unless necessary for system continuity. Traffic signal materials and equipment shall bear the U.L. label whenever such labeling is available.
- (2) Product data and shop drawings shall be assembled by pay item. Only the top sheet of each pay item submittal will be stamped by the Department with the review status, except shop drawings for mast arm pole assemblies and the like will be stamped with the review status on each sheet.
- (3) Original manufacturer published product data and shop drawing sheets with legible dimensions and details shall be submitted for review.
- (4) When hard copy submittals are necessary, four (4) complete copies of the manufacturer’s descriptive literatures and technical data for the traffic signal materials shall be submitted. For hard copy or electronic submittals, the descriptive literature and technical data shall be adequate for determining whether the materials meet the requirements of the plans and specifications. If the literature contains more than one item, the Contractor shall indicate which item or items will be furnished.
- (5) When hard copy submittals are necessary for structural elements, four (4) complete copies of the shop drawings for the mast arm assemblies and poles, and the combination mast arm assemblies and poles showing, in detail, the fabrication thereof and the certified mill analyses of the materials used in the fabrication, anchor rods, and reinforcing materials shall be submitted.
- (6) Partial or incomplete submittals will be returned without review.
- (7) Certain non-standard mast arm poles and special structural elements will require additional review from IDOT’s Central Office. Examples include ornamental/decorative, non-standard length mast arm pole assemblies and monotube structures.
- (8) The Contract number or Permit number, project location/limits, and corresponding pay code number must be on each sheet of correspondence, material approval, and mast arm poles and assemblies drawings.

- (9) Where certifications and/or warranties are specified, the information submitted for approval shall include certifications and warranties. Certifications involving inspections and/or tests of material shall be complete with all test data, dates, and times.
- (10) After the Engineer reviews the submittals for conformance with the design concept of the project, the Engineer will stamp the drawings indicating their status as 'Approved', 'Approved-As-Noted', 'Disapproved', or 'Incomplete'. Since the Engineer's review is for conformance with the design concept only, it is the Contractor's responsibility to coordinate the various items into a working system as specified. The Contractor shall not be relieved from responsibility for errors or omissions in the shop, working, layout drawings, or other documents by the Department's approval thereof. The Contractor must still be in full compliance with Contract and specification requirements.
- (11) The Contractor shall secure approved materials in a timely manner to assure construction schedules are not delayed.
- (12) All submitted items reviewed and marked 'APPROVED AS NOTED', 'DISAPPROVED', or 'INCOMPLETE' are to be resubmitted in their entirety, unless otherwise indicated within the submittal comments, with a disposition of previous comments to verify Contract compliance at no additional cost to the Contract.
- (13) Exceptions to and deviations from the requirements of the Contract Documents will not be allowed. It is the Contractor's responsibility to note any deviations from Contract requirements at the time of submittal and to make any requests for deviations in writing to the Engineer. In general, substitutions will not be acceptable. Requests for substitutions must demonstrate that the proposed substitution is superior to the material or equipment required by the Contract Documents. No exceptions, deviations or substitutions will be permitted without the approval of the Engineer.
- (14) The Contractor shall not order major equipment such as mast arm assemblies prior to Engineer approval of the Contractor marked proposed traffic signal equipment locations to assure proper placement of Contract required traffic signal displays, push buttons and other facilities. Field adjustments may require changes in proposed mast arm length and other coordination.
- (15) Revised cabinet wiring diagrams shall be submitted whenever any wiring modifications are made to the traffic signal cabinet."

Marking Proposed Locations.

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

Add the following to Article 801.09 of the Standard Specifications:

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

Inspection of Electrical Systems.

Add the following to Article 801.10 of the Standard Specifications:

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

Maintenance and Responsibility of Traffic Signal and Flashing Beacon Installations.

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

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

- (1) General.

- a. The Contractor must notify the Area Traffic Signal Maintenance and Operations Engineer of their intent to begin any physical construction work on the Contract or any portion thereof. This notification must be made a minimum of seven (7) working days prior to the start of construction to allow sufficient time for inspection of the existing traffic signal installation(s) and transfer of maintenance to the Contractor. The Department will attempt to fulfill the Contractor's inspection date request(s); however, workload and other conditions may prevent the Department from accommodating specific dates or times. The Contractor shall not be entitled to any other compensation if the requested inspection date(s) cannot be scheduled by the Department.

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

- g. Maintenance shall not include automatic traffic enforcement equipment such as red light enforcement cameras, detectors, or peripheral equipment. This equipment is operated and maintained by others and shall be deactivated while on Contractor maintenance.
- h. The energy charges for the operation of the traffic signal installation shall be paid for by the Contractor.

(2) Maintenance.

- a. The Contractor shall inspect all traffic signal equipment and appurtenances every two (2) weeks to ensure they are functioning properly. Signal heads shall be properly adjusted, including plumb, and tightly mounted. All controller cabinets, signal posts, and controller pedestals shall be tight on their foundations and in alignment. Deficient equipment shall be repaired or replaced as necessary. The Contractor shall check signal system communications and phone lines to assure proper operation. This item includes, as routine maintenance, all portions of EVP equipment. The Contractor shall always maintain enough materials and equipment in stock to provide effective temporary and permanent repairs. The Contractor shall supply a detailed maintenance log monthly that includes dates, locations, names of electricians performing the required checks and inspections, and any other information requested by the Engineer. The Contractor shall attend any additional inspections as requested by the Engineer. The Contractor shall check the controllers, relays, and detectors after receiving complaints or calls to ascertain that they are functioning properly and make all necessary repairs and replacement.
- b. The Contractor is advised that the existing and/or temporary traffic signal installation must remain in operation during all construction stages, except for the most essential down time. Any shutdown of the traffic signal installation which exceeds fifteen (15) minutes must have prior approval from the Engineer. Approval to shut down the traffic signal installation will only be granted during the period extending from 9:00 a.m. to 3:00 p.m. on weekdays. Shutdowns shall not be allowed during inclement weather or holiday periods.

- c. The Contractor shall provide immediate corrective action when any part(s) of the signal fail to function properly. Two far side heads facing each approach shall be considered the minimum acceptable signal operation pending permanent repairs. When repairs at a signalized intersection require that the controller be disconnected or otherwise removed from normal operation, and power is available, the Contractor shall place the traffic signal installation in flashing operation. The signals shall flash RED for all directions unless a different indication has been specified by the Engineer. The Contractor shall install cones on all lane lines at the stop bar on each approach, R1-1 (36 in. minimum) "STOP" signs at the stop bar on each approach on the right side and on raised medians (where applicable), and black on fluorescent orange "SIGNALS OUT AHEAD" warning signs followed by fluorescent orange W3-1 symbolic stop ahead warning signs on all approaches to the intersection.
- d. Temporary replacement of a damaged or knocked down mast arm pole assembly shall require construction of a full or partial span wire signal installation or other method approved by the Engineer to assure signal heads are located overhead and over traveled pavement. Temporary replacement of mast arm mount signals with post mount signals is not permitted.
- e. The Contractor shall provide the Engineer with two (2) 24-hour telephone numbers for the maintenance of the traffic signal installation and for emergency calls by the Engineer.
- f. Traffic signal equipment which is lost, damaged, or not returned to the Department for any reason shall be replaced with new equipment meeting the requirements of the Standard Specifications and these special provisions.

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

- i. The Contractor shall be responsible to clear snow, ice, dirt, debris, vegetation, temporary fence, or other condition that obstructs visibility of any traffic signal display or access to traffic signal equipment.
- j. The Contractor shall maintain the traffic signal in normal operation during any loss of utility or battery backup power. Temporary power to the traffic signal must meet applicable NEC and OSHA guidelines and may include portable generators and/or replacement batteries. Temporary power shall not be paid for separately but shall be included in the Contract.

(3) Basis of Payment. This work will be paid for at the Contract unit price per each for MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION, TEMPORARY TRAFFIC SIGNAL INSTALLATION, TEMPORARY BRIDGE TRAFFIC SIGNAL INSTALLATION, or TEMPORARY PORTABLE BRIDGE TRAFFIC SIGNAL INSTALLATION. Each location will be paid for separately. Maintenance of a flashing beacon shall be paid for at the Contract unit price for MAINTENANCE OF EXISTING FLASHING BEACON INSTALLATION. Each flashing beacon will be paid for separately.

Damage to Traffic Signal System.

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

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

ITEM	RESPONSE TIME	SERVICE RESTORATION	PERMANENT REPAIR (calendar days)
Cabinet	1 hour	24 hours	21 days
Controllers and Peripheral Equipment	1 hour	4 hours	21 days
System Detector Loop	1 hour	N/A	7 days
All Other Detectors	1 hour	N/A	21 days
Signal Head and Lenses	1 hour	4 hours	7 days
Aviation Red Beacon	1 hour	4 hours	7 days
Mast Arm Assembly and Pole	1 hour	4 hours	7 days
Traffic Signal Post	1 hour	4 hours	7 days
Cable and Conduit	1 hour	4 hours	7 days
Interconnect and Telemetry	1 hour	4 hours	7 days
Graffiti Removal	N/A	N/A	7 days
Misalignment of Signal Heads	1 hour	4 hours	4 hours
Closed Loop Monitoring System	1 hour	24 hours	14 days
Post and Poles Plumb Vertically	N/A	N/A	21 days
Controller, Post & Pole Foundations	N/A	N/A	21 days
Complaints, Calls, Controller or System Alarms, Timing, Phasing, Programming	1 hour	4 hours	N/A
Patrol Truck Deficiencies	N/A	24 hours	24 hours
Signal Heads Visibility	1 day	2 days	14 days

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

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

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

Traffic Signal Inspection (TURN-ON).

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

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

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

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

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

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

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

Final Project Documentation:

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

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

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

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

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

Record Drawings.

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

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

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

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

Add the following to Article 801.16 of the Standard Specifications:

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

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

Datum to be used shall be North American 1983.

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

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

Examples:

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

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

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

Restoration of Work Area.

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

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

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

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

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

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

Bagging Signal Heads.

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

Turn-on of New Traffic Signal Installations.

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

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

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

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

NEW
TRAFFIC
SIGNAL

STARTING
MMM ##

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

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

NEW
SIGNAL
AHEAD

BE
PREPARED
TO STOP

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

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

Locating Underground Facilities.

Revise Section 803 to the Standard Specifications to read:

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

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

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

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

Grounding of Traffic Signal Systems

Revise Section 806 of the Standard Specifications to read:

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

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

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

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

TRAFFIC SIGNAL POST

Effective: May 22, 2002

Revised: July 14, 2021

875.01TS

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

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

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

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

UPGRADE EXISTING CONTROLLER TO NTCIP SPECIAL

Effective: November 1, 2023

857.04TS

Description.

This work shall comply with Section 857 of the Standard Specifications and shall also comply with the following requirements.

General.

This item shall consist of installing the latest version of software, PROM, or PROM SET as well as enabling the NTCIP mode of the operations in an existing traffic signal controller. At locations that contain coordination modules, all PROMS in the controller module, telemetry module, and coordination module must be of the same version and revision. New system interface board shall be included in this item. updating all the communication parameters necessary for communication in the Ethernet-based signal system, including the NTCIP address. Contact IDOT System Engineer for the approved most up to date software version to be used for this item. Any modifications required for the completion of this work shall be included in the cost of this item.

Basis of Payment.

This work will be paid for at the contract unit price per each for UPGRADE EXISTING CONTROLLER TO NTCIP SPECIAL, which price shall be payment in full for performing all work described herein and includes furnishing, installing, testing, and all appurtenances necessary for a complete and operational unit as directed/approved by the Traffic Signal Engineer.

UNDERGROUND RACEWAYS

Effective: May 22, 2002

Revised: March 1, 2024

810.02TS

Revise Article 810.04 of the Standard Specifications to read:

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

Add the following to Article 810.04 of the Standard Specifications:

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

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

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

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

UNINTERRUPTABLE POWER SUPPLY, SPECIAL

Effective: January 1, 2013

Revised: March 1, 2024

862.01TS

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

Add the following to Article 862.01 of the Standard Specifications:

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

Add the following to Article 862.02 of the Standard Specifications:

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

Add the following to Article 862.03 of the Standard Specifications:

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

Revise Article 862.04 of the Standard Specifications to read:

Installation.

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

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

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

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

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

Materials.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

"All batteries supplied in the UPS shall be either gel cell or AGM type, deep cycle, completely sealed, prismatic lead calcium based, silver alloy, valve regulated lead acid (VRLA) requiring no maintenance. All batteries in a UPS installation shall be the same type; mixing of gel cell and AGM types within a UPS installation is not permitted."

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

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

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

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

Add the following to Article 1074.04 of the Standard Specifications:

- (e) Warranty. The warranty for an uninterruptable power supply (UPS) and batteries (full replacement) shall cover a minimum of five (5) years from date the equipment is placed in operation.
- (f) Installation. Bypass switch shall completely disconnect the traffic signal cabinet from the utility provider.
- (g) The UPS shall be set-up to run the traffic signal continuously without going to a red flashing condition when switched to battery power unless otherwise directed by the Engineer. The Contractor shall confirm set-up with the Engineer. The continuous operation mode when switched to battery may require modification to unit connections and these modifications are included in the unit price for this item.

Revise Article 862.04 of the Standard Specifications to read:

Basis of Payment.

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

VIDEO VEHICLE DETECTION SYSTEM

Effective: January 1, 2020

Revised: March 1, 2024

886.04TS

Description.

This work shall consist of furnishing and installing a video vehicle detection system as specified and/or as shown on the plans. This pay item shall include all necessary work and equipment required to have a fully operational system including but not limited to the detector unit(s), the interface unit and all the necessary hardware, cables, and accessories required to complete the installation in accordance with the manufacturer's specifications.

The video vehicle detection system shall work under all weather conditions, including rain, freezing rain, snow, wind, dust, fog, and changes in temperature and light. It shall work in an ambient temperature range of -30°F to 165°F.

The video vehicle detection system shall be compatible with the District's approved traffic controller assemblies utilizing NEMA TS 1 or NEMA TS 2 controllers and cabinet components for full time operation. The video vehicle detection system shall provide a minimum of one interface unit that has Ethernet connectivity, surge protection and shall be capable of supporting a minimum of 2 detector units. The video vehicle detection system shall include a display and stand inside the cabinet that has a minimum 10 in. screen with a minimum 1280 x 800 resolution. The display shall be temperature rated for the cabinet environment.

The video vehicle detection system shall be one of the following systems or an approved equivalent:

- Autoscope Vision
- Iteris Vantage Next

A representative from the supplier of the video vehicle detection system shall supervise the installation and testing of the video vehicle detection system and shall be present at the traffic signal turn-on inspection. Once the video vehicle detection system is configured, it shall not need reconfiguration to maintain performance, unless the roadway configuration or the application requirements change.

The mounting location(s) of the detector unit(s) shall be per the manufacturer's recommendations. If an extension mounting assembly is needed, it shall be included in this item. All holes drilled into signal poles, mast arms, or posts shall require rubber grommets to prevent chafing of wires.

The video detection system shall be warrantied for a period of two (2) years from final inspection and shall be free from material and workmanship defects.

Basis of Payment.

This work shall be paid for at the Contract unit price each for VIDEO VEHICLE DETECTION SYSTEM, SINGLE APPROACH, the price of which shall include the cost for all of the work and material described herein and includes furnishing, installing, delivery, handling, testing, set-up and all appurtenances and mounting hardware necessary for a fully operational video vehicle detection system.

WIRE AND CABLE

Effective: January 1, 2012

Add the following to the first paragraph of Article 1066.02(a):

“The cable shall be rated at a minimum of 90°C dry and 75°C wet and shall be suitable for installation in wet and dry locations, and shall be resistant to oils and chemicals.”

Revise the Aerial Electric Cable Properties table of Article 1066.03(a)(3) to read:

Aerial Electric Cable Properties

Phase Conductor		Messenger wire			
Size AWG	Stranding	Average Insulation Thickness		Minimum Size AWG	Stranding
		mm	mils		
6	7	1.1	(45)	6	6/1
4	7	1.1	(45)	4	6/1
2	7	1.1	(45)	2	6/1
1/0	19	1.5	(60)	1/0	6/1
2/0	19	1.5	(60)	2/0	6/1
3/0	19	1.5	(60)	3/0	6/1
4/0	19	1.5	(60)	4/0	6/1

Add the following to Article 1066.03(b) of the Standard Specifications:

“Cable sized No. 2 AWG and smaller shall be U.L. listed Type RHH/RHW and may be Type RHH/RHW/USE. Cable sized larger than No. 2 AWG shall be U.L. listed Type RHH/RHW/USE.”

Revise Article 1066.04 to read:

“Aerial Cable Assembly. The aerial cable shall be an assembly of insulated aluminum conductors according to Section 1066.02 and 1066.03. Unless otherwise indicated, the cable assembly shall be composed of three insulated conductors and a steel reinforced bare aluminum conductor (ACSR) to be used as the ground conductor. Unless otherwise indicated, the code word designation of this cable assembly is “Palomino”. The steel reinforced aluminum conductor shall conform to ASTM B-232. The cable shall be assembled according to ANSI/ICEA S-76-474.”

Revise the second paragraph of Article 1066.05 to read:

“The tape shall have reinforced metallic detection capabilities consisting of a woven reinforced polyethylene tape with a metallic core or backing.”

ATMS SYSTEM INTEGRATION

Description. This work shall consist of integrating one Dynamic Message Sign (DMS) installation shown on the plans into the IDOT Advanced Traffic Management System (ATMS). Data from the DMS will be collected and integrated via the existing iNET interface to the ATMS.

Integration. This item includes all software, programming, miscellaneous devices, cabinets, racks, and cables necessary to provide the successful integration of the proposed stations in the project to the existing expressway traffic monitoring system. Work as necessary will be performed at the:

Illinois Department of Transportation
Bureau of Traffic Operations/Electrical Field Office
445 W. Harrison Street
Oak Park, Illinois 60304

The contractor shall subcontract with the development and maintenance contractor for the ATMS to perform all ATMS software and hardware modifications. Contact information is:

Parsons
Project Manager
650 E Algonquin Road, Suite 104
Schaumburg, IL 60173
Phone: (847) 925-0120

The ATMS system shall be upgraded and expanded to add the DMS shown on the plans. The integration must be made to make this expansion a seamless transition, and function in an identical manner as the existing expressway surveillance. Work under this item includes but is not limited to the following:

- (a) Modify the existing graphic user interface, report generators, data bases, broadcast feeds (both subscriber and internal), and data tables for the dynamic message sign control.
- (b) Create new segments and groupings used to display travel time and congestion data to the Dynamic Message Signs.
- (c) Develop an integration acceptance test plan and conduct said test to verify that the DMS has been properly integrated according to the requirements. This acceptance plan shall conclude with a 30-day burn-in period. During the burn-in period, the subcontractor shall identify and resolve any problems identified with the integration.
- (d) Coordinate with the DMS manufacturer, ATMS Integration Programmer, and Gateway Integration Programmer.

Method of Measurement. This work will be measured for payment on a lump sum basis.

Basis of Payment. This work will be paid for at the contract lump sum price for ATMS SYSTEM INTEGRATION, which price shall be payment in full for the work described for a complete integration of the new Dynamic Message sign into the existing IDOT ATMS System. Acceptance shall be granted after integration and after passing an acceptance test proposed by the subcontractor, and agreed upon by the Engineer.

CABINET, MODEL 334

Description

This work shall consist of furnishing and installing a ground-mounted Model 334 cabinet at locations as shown in the Plans. The cabinet shall be used to house CCTV camera or DMS controller equipment and any associated Ethernet switches, and other communications devices/infrastructure as shown on the plans.

The furnishing and installation of CCTV camera equipment shall be paid for separately.

The furnishing and installation of DMS controller equipment shall be paid for separately.

Materials

General

Cabinet, Model 334 shall be a durable, weatherproof enclosure, constructed of 3/16 in. (4.75mm) thick aluminum or 1/8 inch (3.175 mm) thick aluminum lined with bullet resistant fiberglass panels that shall be UL listed and tested for UL752 Level 3 with a nominal thickness of 1/2 inch (12.7mm) maximum, and a nominal weight of 5.0 lbs. per square foot (24.5 kg per square meter) maximum. The cabinet shall have a nominal outside dimension of 66 in. (1.7m) height x 24 inches (600mm) wide X 30 inches (762mm) deep. Cabinet, Model 334 shall consist of the following components: double door each equipped with a Corbin # 2 Brass lock or equal for front and rear cabinet entry, housing, mounting cage, power distribution assembly, service panel, thermostatically controlled fan, and all necessary mounting hardware and wiring, and other equipment, as shown in the Plans and specified in these special provisions.

All bolts, nuts, washers, screws, hinges, and hinge pins that are subject to corrosion shall be stainless steel unless otherwise specified. All equipment under this item shall be in accordance with Section 1074.03 of the Standard Specifications except as modified herein.

Cabinet Components

The housing and the mounting cage assembly shall conform to those of the Model 334 cabinet provisions of the "Traffic Signal Control Equipment Specifications" (TSCES) issued by the State of California, Department of Transportation, and to all addenda thereto current at the time of project advertising. The housing shall be rainproof with the top of the enclosure crowned to prevent standing water. All exterior seams for the enclosure and doors shall be continuously welded and shall be smooth. The housing shall have no provisions for a police panel or door.

The cabinet shall have single front and rear doors, each equipped with a Corbin # 2 lock. The enclosure door frames shall be double flanged out on all 4 sides and shall have strikers to hold tension on and form a firm seal between the door gasketing and the frame. The front and rear doors shall be provided with catches to hold the door open at both 90 and 180 +/- 10 degrees. Gasketing shall be provided on all door openings and shall be dust-tight. For horizontal support and bolt attachment, cage bottom support mounting angles shall be provided on either side, level with the bottom edge of the door.

The latching handles on the doors shall have provisions for padlocking in the closed position. When the door is closed and latched, the door shall be locked. The locks and handles shall be on the right side of the front door and the left side of the rear door. The lock and lock support shall be rigidly mounted to the door. The locks shall be Corbin #2 and two keys shall be supplied to the Department with each lock. The keys shall be removable in the locked position only.

The front and rear doors shall be provided with louvered vents. A removable and reusable air filter shall be housed behind the door vents. The filter filtration area shall cover the vent opening area, and the filter shell shall be provided that fits over the filter providing mechanical support for the filter. The shell shall be louvered to direct the incoming air downward.

The intake (including filter with shell) and exhaust areas shall pass a minimum of 60 cubic feet (1.7 cubic meters) of air per minute for housing #1 and 26 cubic feet (0.74 cubic meters) of air per minute for housing #2. The thermostatically controlled fan with ball or roller bearings shall be mounted within the housing and vented. The fan shall provide a capacity of at least 150 cubic feet (4.25 cubic meters) of free air delivery per minute of ventilation. The fan shall be thermostatically controlled and activated when the temperature inside the cabinet exceeds 75° F (24° Celsius) and shut off when the temperature is less than 64°F (18° Celsius). In addition, the fan shall be manually adjustable for automatic turn on and off. The fan circuit shall be protected at 125% of the fan motor ampacity.

All subassemblies shall be mounted in removable 19 in. (482 mm) EIA self-standing rack assemblies. The EIA rack portion of the cage shall consist of 2 pairs of continuous, adjustable equipment mounting angles that comply with Standard EIA RS-310-B. The cage shall be centered within the cabinet and bolted to the cabinet at 4 points.

Each cabinet shall be equipped with 2 shelves. Shelves shall be the full width of the rack and 12 in. (300mm) deep. The shelves shall be designed to support a minimum of 50 lbs. (23 kg).

The power distribution assembly shall be as shown in Plans and shall consist of input files that are common to both Model 332 and 336 type cabinets and provides 9 AC outputs and up to 28 isolated inputs. The power distribution assembly for cabinets not at DMS locations shall consist of the following: one 30A, 120V main circuit breaker; three 15A, 120V single pole secondary circuit breakers; eight standard 117 VAC controller and equipment receptacles; and one duplex, 3-prong, NEMA GF1 Type 5-15R grounded utility type outlet. Cabinets at DMS locations shall be provided with one 60A, 240V, two-pole main circuit breaker, one 40A, 240V, two-pole secondary breaker, three 15A, 120V single pole secondary circuit breakers, eight standard controller and equipment receptacles, and one duplex GFI outlet.

Rating of breakers shall be shown on face of breaker or handle. Breaker function shall also be labeled below breakers on front panel. The first equipment receptacle in the circuit shall have ground-fault circuit interruption as defined in the NEC. Circuit interruption shall occur on 6 mA of ground-fault current. All conductors from the power distribution assembly routed to the cabinet wiring shall be connected to the terminal block on the common side, except for the AC power conductor between the service terminal block and main circuit breaker. All internal conductors terminating at the blocks shall be connected to the other side of the blocks.

Two side panels shall be provided and mounted on the cabinet sidewalls. In viewing from the front door, the left side panel shall be designated as the "Input/Communications" and the right side panel shall be designated as the "Service Panel". The panel shall be drilled and tapped, as necessary, to mount the terminal blocks and other attachments described herein, as well as to mount the panel to the cabinet wall.

The terminal blocks shall be barrier type rated at 20 A 600 V RMS minimum. The terminal screws shall be nickel-plated brass binder head type with screw inserts of same material. The terminals of the power line service terminal block shall be labeled "AC+, AC-, and AC GND", and shall be covered with a clear insulating material to prevent inadvertent contact. Terminating lugs large enough to accommodate No. 2 conductors shall be furnished for the service terminal block. The terminal block shall be rated for 50 A at 600 V peak, minimum.

The power distribution assembly shall also protect the equipment powered by the assembly from power transients. Over voltage protection shall be provided for the power distribution assembly and shall contain, as a minimum, a surge arrester, which shall reduce the effect of power line voltage transients and be mounted to the service panel. The arrester shall have the following minimum features:

Recurrent Peak Voltage:	184 V
Energy Rating (Minimum):	50 J
Power Dissipation, Average:	0.85 W
Peak Current for pulses less than 7 microseconds	1250 A
Stand-by Current for 60 Hz Sinusoidal:	1mA or less

Each cabinet shall be equipped with one LED lighting fixture mounted to the inside top front portion of the cabinet. The fixture shall have an cool white color. A door-activated switch shall be installed to turn the cabinet light on when the front door is opened. The door switch shall be on a separate circuit by itself and used only to turn on the cabinet light.

Each cabinet shall be supplied with a heavy-duty plastic envelope to store plans, wiring diagrams, schematics, etc. This envelope shall have metal grommets so that it hangs from the door hooks. The envelope shall have minimum dimensions of 10 in. (250mm) x 15 in. (381mm).

Foundations shall conform to those shown in the Plans. The foundation is paid for separately.

Disconnect Switch

Cabinets shall be provided with a disconnect switch to allow for the ability to cut off power to the cabinet and associated devices without having to open the cabinet. Disconnect switches shall be:

- 1) 30A, 2-Pole, 120/240V rated for cabinets not at DMS locations.
- 2) 100A, 2-Pole, 120/240V rated for cabinets at DMS locations.
- 3) NEMA 4X rated
- 4) Non-fusible
- 5) Lockable

Identification

The Cabinet, Model 334 shall be identified and labeled with external markings as specified in Article 1069.06 of the Standard Specifications and as shown in the Plans.

Construction Requirements

The Contractor shall deliver the Cabinet Model 334 mounted on a plyboard-shipping pallet that is bolted to the cabinet base. The cabinet shall be enclosed in a slipcover cardboard packaging shell. The housing doors shall be blocked to prevent movement during transportation to the site.

The Contractor shall securely fasten the Cabinet Model 334 on the new concrete foundation at the locations shown in the Plans. The Contractor shall confirm the orientation of the Cabinet Model 334 installation and its front door side with the Engineer prior to installation. Stainless steel bolted connections shall be provided with lock-washers, locking nuts, or other approved means to prevent the connection nuts from backing off. Dissimilar materials shall be isolated from one another by stainless steel fittings.

The Contractor shall make all power connections to the cabinet in accordance with the Plans and as required. The neutral bus shall be isolated from the cabinet and equipment ground. It shall terminate at the neutral lug ultimately attached to the meter pedestal. All conductors used in cabinet wiring shall terminate with properly sized non-insulated (if used, for DC logic only) or clear insulated spring-spade type terminals except when soldered to a through-panel solder lug on the rear side of the terminal block or as specified otherwise. All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor. Cabling shall be routed to prevent conductors from being in contact with metal edges. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

All equipment in the cabinet, when required, shall be clearly and permanently labeled using marker strips. The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item that they are to identify and must be clearly visible with the items installed.

Testing

Cabinet Acceptance Test – in addition to the environmental and design approval tests specified in the FHWA Type 170 Traffic Signal control System Hardware Specification, the following water spray test shall be performed for each type of cabinet:

Spray water from a point directly overhead at an angle of 60° from the vertical axis of the cabinet. Repeat for each of eight equally spaced positions around the cabinet for a period of five minutes in each position. The water shall be sprayed using a domestic type sprinkling nozzle at a rate of not less than 10 gal./min (40 liters/min) per square foot (0.1 meters) of surface area. The cabinet shall then be inspected for leakage. Evidence of water leakage shall be cause for rejection.

Operational Standalone Test: The operational standalone test for each Cabinet, Model 334 installed shall consist of the following:

Visual inspection of the cabinet and its contents for workmanship

Verification of the cabinet grounding in accordance with Article 1074.03 (a)(4) of the Standard Specifications

Measurement of the voltage at the input panel

Documentation

Shop drawings and wiring lists showing the proposed layout of each type of cabinet shall be submitted to the Engineer for approval prior to the start of fabrication. Wiring lists for the internal manufacturer cut sheets for all electrical equipment included in each type of cabinet shall be included in the submission.

Four copies of drawings showing the wiring for each cabinet shall be provided. One copy shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

For each cabinet, four copies of a configuration of the equipment reporting to that cabinet shall be provided. The sheet shall also list field settable options for the equipment contained in the cabinet. This shall include device addresses and output voltage settings for power supplies. One of these copies shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

Warranty

The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. The warranty shall warrant and guarantee repair of the component parts of the Cabinet Model 334 furnished by the Contractor that prove to be defective in workmanship and materials during the first two years of operation as defined and noted above at no additional cost to the Department.

The Engineer will notify the Contractor that a warranted item needs repair. The Contractor shall acknowledge the notification within 24 hours and replace or correct any part or parts of materials and equipment that are found defective within the two-year in-service warranty period. All items needing repair shall be returned to the Department in two weeks from the date of receipt at the Contractor's facility or replaced in-kind by the Contractor, and the Contractor shall be responsible for any return shipping costs. No compensation will be made to the Contractor for such replacements or corrections.

The Contractor shall provide a warranty certificate for this item and its related components to the Department. The Department reserves the right to transfer this service to other parties who may be contracted with in order to provide overall maintenance of this item.

Basis of Payment

This work will be paid for at the contract unit price per each for CABINET, MODEL 334.

CAMERA MOUNTING ASSEMBLY

Effective: November 1, 2023
877.02TS

Description.

This work shall consist of modifying an existing traffic signal mast arm pole to accommodate an extension pole suitable for mounting a CCTV Camera.

Materials.

The pole extension shall be a Schedule 40 galvanized steel pipe, 20 feet in length and 4 inch in diameter.

General.

The pole extension shall be fastened to the existing mast arm pole with adjustable, galvanized steel clamps as shown on the plan detail. The galvanized clamps shall fit securely around the tapered mast arm. The contractor shall use galvanized shims and shall modify clamps as required to maintain a plumb vertical alignment of the camera mounting assembly pole. The exposed wires shall be trained into a drip loop and protected with black plastic spiral cable wrap. Relocation, adjustments or any temporary removal and reinstallation of any mast arm mounted sign panels or any other equipment in conflict with the installation of Camera Mounting Assembly shall be part of this pay item and included in the unit price.

All holes drilled into signal poles, mast arm, or posts shall require a rubber grommets to prevent the chafing of wires.

Basis of Payment.

This work will be paid for at the contract unit price each for CAMERA MOUNTING ASSEMBLY. The unit price shall include all equipment, materials, mounting hardware, shims, gromets, cable wrap, components, and labor required to securely fasten the assembly to an existing pole and place the camera into operation to the satisfaction of the Traffic Engineer. The camera and cables will be paid for separately as part of unit price for REMOTE CONTROLLER VIDEO SYSTEM, and OUTDOOR RATED NETWORK CABLE.

CLOSED CIRCUIT TELEVISION CABINET

Description.

This work shall consist of furnishing, installing, and testing a pole mounted CCTV equipment cabinet.

Materials.

The Cabinet, Model 336 shall meet the Caltrans Transportation Electrical Equipment Specifications (TEES) for the components applied in the project. The cabinet shall be a durable, weatherproof enclosure constructed of 3/16 in. (4.75mm) thick aluminum or 1/8 inch (3.175 mm) thick aluminum lined with bullet resistant fiberglass panels that shall be UL listed and tested for UL752 Level 3 with a nominal thickness of 1/2 inch (12.7mm) maximum, and a nominal weight of 5.0 lbs. per square foot (24.5 kg per square meter) maximum. The cabinet shall be sized to adequately house all required components with extra space for arrangement and termination of wiring. The minimum size of the cabinet shall have a nominal outside dimension of 46 inches height x 24 inches wide X 24 inches deep. Cabinet, Model 336 shall consist of the following components: double door each equipped with a Corbin # 2 Brass lock or equal for front and rear cabinet entry, housing, manufacturer recommended mounting hardware for pole-mount application, mounting cage, power distribution assembly/service panel (including RFI filter surge suppression, outlets, circuit breakers, terminal blocks, and neutral and ground bus bars), thermostatically controlled fan, door switch, LED light, fiber optic patch panel, power data unit, and all necessary mounting hardware and wiring, and other equipment, as shown on the Plans and specified in these special provisions.

All bolts, nuts, washers, screws, hinges, and hinge pins shall be stainless steel unless otherwise specified. All equipment under this item shall be in accordance with Section 1074.03 of the Standard Specifications except as modified herein.

Power Data Unit.

The power data unit shall be installed in the cabinet and allow the CCTV camera PoE and network switch power supply to be remotely rebooted. The power distribution assembly shall meet the minimum requirements:

- 1) Minimum of eight individually switched 120V, 15-amp outlet circuits
- 2) Ethernet Interface: 10/100 autosensing, static IP, TCP port selectable, RJ-45 w/internal FCC filtering
- 3) Operating Temperature: -30°F to 170°F
- 4) Power Dissipation: 3.9W Typ Max (all on) <3W idle
- 5) Power Fail Hold-Over: 350ms minimum (all relays on)

Fiber Patch Panel.

A fiber patch panel shall be provided and installed within the cabinet. The fiber patch panel shall be paid for separately as FIBER OPTIC INTERCONNECT CENTER, 48 PORT.

Ground and Neutral Bus Bars. Separate ground and neutral bus bars, mounted on the equipment panel shall be provided. The neutral bus bar shall be isolated from the cabinet and equipment ground. Compression lugs, plus 2 spare lugs, shall be sized to accommodate the cables with the heads of the connector screws painted green for ground connections and white for neutral connections.

CONSTRUCTION REQUIREMENTS

Installation.

The cabinet shall be installed on the CLOSED CIRCUIT TELEVISION POLE STRUCTURE, 50 FT. MOUNTING HEIGHT at 180 degrees from the camera arm orientation as shown on the plans. The front door side of the cabinet shall be positioned at 90 degrees from the pole handhole; the back door side of the cabinet shall be positioned at 120 degrees from the pole letters and numerals labeling. The Contractor shall confirm the orientation of the Cabinet Model 336 installation and its front door side with the Engineer prior to installation. Stainless steel bolted connections shall be provided with lock-washers, locking nuts, or other approved means to prevent the connection nuts from backing off. Dissimilar materials shall be isolated from one another by stainless steel fittings.

All conduit entrances into the cabinet installation shall be sealed with a pliable waterproof material.

The Contractor shall make all power connections to the cabinet in accordance with the Plans and as required. The neutral bus shall be isolated from the cabinet and equipment ground. It shall terminate at the neutral lug ultimately attached to the meter pedestal. All conductors used in cabinet wiring shall terminate with properly sized non-insulated (if used, for DC logic only) or clear insulated spring-spade type terminals except when soldered to a through-panel solder lug on the rear side of the terminal block or as specified otherwise. All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor. Cabling shall be routed to prevent conductors from being in contact with metal edges. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

All equipment in the cabinet shall be clearly and permanently labeled using marker strips. The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item that they are to identify and must be clearly visible with the items installed.

Testing.

Cabinet Acceptance Test – in addition to the environmental and design approval tests specified in the FHWA Type 170 Traffic Signal control System Hardware Specification, the following water spray test shall be performed for each type of cabinet:

Spray water from a point directly overhead at an angle of 60° from the vertical axis of the cabinet. Repeat for each of eight equally spaced positions around the cabinet for a period of five minutes in each position. The water shall be sprayed using a domestic type sprinkling nozzle at a rate of not less than 10 gal./min (40 liters/min) per square foot (0.1 meters) of surface area. The cabinet shall then be inspected for leakage. Evidence of water leakage shall be cause for rejection.

Operational Standalone Test: The operational standalone test for each cabinet installed shall consist of the following:

- Visual inspection of the cabinet and its contents for workmanship
- Verification of the cabinet grounding in accordance with Article 801.04, Article 806, and the GROUNDING OF ITS SUBSYSTEMS (TSC T 420#8) special provision
- Measurement of the voltage at the input panel

Documentation.

Shop drawings and wiring lists/diagrams showing the proposed layout of the cabinet shall be submitted to the Engineer for approval prior to the start of fabrication. Wiring lists for the internal manufacturer cut sheets for all electrical equipment included in each type of cabinet shall be included in the submission.

Four copies of drawings showing the wiring for each cabinet shall be provided. One copy shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

For each cabinet, four copies of a configuration of the equipment reporting to that cabinet shall be provided. The sheet shall also list field settable options for the equipment contained in the cabinet. This shall include device addresses and output voltage settings for power supplies. One of these copies shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

Warranty.

The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. The warranty shall warrant and guarantee repair of the component parts of the cabinet furnished by the Contractor that prove to be defective in workmanship and materials during the first two years of operation as defined and noted above at no additional cost to the Department.

The Engineer will notify the Contractor that a warranted item needs repair. The Contractor shall acknowledge the notification within 24 hours and replace or correct any part or parts of materials and equipment that are found defective within the two-year in-service warranty period. All items needing repair shall be returned to the Department in two weeks from the date of receipt at the Contractor's facility or replaced in-kind by the Contractor, and the Contractor shall be responsible for any return shipping costs. No compensation will be made to the Contractor for such replacements or corrections.

The Contractor shall provide a warranty certificate for this item and its related components to the Department. The Department reserves the right to transfer this service to other parties who may be contracted with in order to provide overall maintenance of this item.

Method of Measurement.

This work will be measured for payment per each CLOSED CIRCUIT TELEVISION CABINET furnished, installed and tested.

Basis of Payment. This work will be paid for at the contract unit price each for CLOSED CIRCUIT TELEVISION cabinet, which price shall be payment in full for furnishing and installing the cabinet and all connections, testing, labor, tools, equipment, transportation, and incidentals necessary to complete this item of work.

CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE FOUNDATION, 30" DIAMETER

Description.

This work shall consist of constructing a reinforced concrete foundation, of the dimensions indicated, complete with raceways. The foundation depth shall be as shown in the Plans or as directed by the Engineer.

The foundation shall include boring/excavation, reinforcement, concrete, grout, anchor bolts, nuts, washers and raceways as well as clean up and restoration of the location.

Materials.

Concrete shall be Class SI complying with Article 1020.04 of the Standard Specifications.

Reinforcement bars shall comply with Article 1006.10 of the Standard Specifications.

Anchor bolts/rods shall comply with Article 1006.09 of the Standard Specifications.

The entire length of the anchor bolts as well as the nuts and washers shall be hot dip galvanized in accordance with the requirements of ASTM Designation A 153.

Unless otherwise indicated, conduit raceways shall be heavy wall rigid polyvinylchloride (PVC) conduit, (Schedule 40) UL listed and in conformance with NEMA TC2 and Federal Specification WC 1094A. Raceways shall be of the number and size as indicated.

CONSTRUCTION REQUIREMENTS

The foundation depths shall be as directed by the Engineer based upon evaluation of the soil conditions encountered. The Engineer may determine soil condition by visual inspection or, where practical, by the use of a pocket penetrometer and will establish foundation depth based upon the Foundation Depth Table shown in the Plans, where applicable.

The hole for the foundation shall be made by drilling with an auger, of the same diameter as the foundation. The foundation shall be cast in place and allowed to cure for 10 days minimum before the pole is erected. If soil conditions require the use of a liner to form the hole, the liner shall be withdrawn as the concrete is deposited. The top of the foundation shall be constructed level so that no shims or other leveling device will be needed to set the light standard plumb on the foundation. A liner or form shall be used to produce a uniform smooth side to the top of the foundation. Foundation top shall be chamfered $\frac{3}{4}$ inch unless otherwise indicated.

Extreme care shall be used in establishing the top elevation of concrete foundations, especially when foundations are installed before final grading is complete. Foundations shall not protrude above grade more than the limits indicated in the Plans, except for specifically indicated locations, and where not otherwise indicated, foundation shall not protrude above grade more than 4 inches above a 60 inch chord centered at the foundation, at any point around the circumference. Where foundation heights extend beyond specified limits, the Engineer may direct replacement of the foundation and the incorrect foundation will not be measured for payment.

The steel reinforcement, the raceway conduits and the anchor bolts shall be secured in place to each other and properly positioned in the augered hole so that at time of pouring of concrete mixture in place the above said components retain their proper positions. Special attention shall be paid to the positioning of the anchor bolts. It is of utmost importance that the anchor bolt projections on top of the foundation, after placement of the concrete, remain in a perfectly vertical position.

The Contractor shall restore areas that have been disturbed or temporarily graded to their original condition. The cost of seeding the restored areas is included in this pay item.

Method of Measurement.

This work will be measured for payment in feet in place. The length measured will be limited to that shown in the Plans or authorized by the Engineer.

Basis of Payment.

This work will be paid for at the contract unit price per foot for CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE FOUNDATION, 30" DIAMETER.

CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, 50 FT. MOUNTING HEIGHT

Description.

This work shall consist of furnishing and installing a conventional type round tapered aluminum pole complete with CCTV camera mount and all required hardware including bolt covers as specified.

Materials.

Pole Shaft

Unless otherwise indicated the pole shaft shall be made of aluminum conforming to current ASTM designation B 221, alloy 6063 with final temper T6. The shaft shall be spun drawn to smooth circular, tubular, seamless, tapered design.

Unless otherwise indicated, the pole shall be designed and manufactured to withstand equipment dead loadings of up to and a 350 pound cabinet having an effective projected area of 6.25 ft², a 75 pound camera having an effective projected area of 1.6 ft² on a single 2-foot arm, and shall also to withstand loadings of up to and including the same camera on each of two 4-foot arms oriented at any angle from 45 to 180 degrees apart, meeting the criteria of AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals (2015) with 2017 & 2018 Interim Revisions for 120 mph wind zone. These loading requirements shall include all camera and arm orientations possible for the given pole height, up to and including the limits given. Information submitted for approval shall document satisfaction of this requirement.

The mounting heights for the cabinet and camera shall be taken from the bottom of the pole shaft base plate as shown on the plans and shall be obtained with a nominal arm rise of 12 inches as specified elsewhere herein. This shall determine the required length of the pole shaft regardless of the actual mounting method of the pole.

Unless otherwise indicated, poles shall have a 10 inch outside bottom diameter tapering to 6 inch outside top diameter. The shaft shall be designed to accommodate loading of the arm configuration indicated, with a minimum wall thickness of 0.312 inch. Where the indicated arm configuration exceeds these minimum criteria, the wall thickness shall be increased to satisfy the design loading requirements. Field drilling of holes will not be allowed.

Handhole

There shall be an oval shaped opening in the side of the shaft for the purpose of a handhole. Unless otherwise indicated, the centerline of the handhole shall be 18 inches from the bottom of the shaft. The handhole shall be 4 inch x 8 inch in size with the 8 inch dimension being situated vertically and in the same plane as any one of the sides of the base. The opening in the shaft shall be reinforced with a handhole frame situated on the inside of the shaft and welded to the shaft. A 1/2"-13 tapped hole shall be provided in the frame for attaching a mechanical grounding connector. The handhole cover shall be fastened to the frame with 1/4"-20 size steel core nylon hex-head screws and the holes for the screws shall be tapped to match the screws. Unless otherwise indicated, the orientation of the handhole shall be such that its pole face shall be oriented on a face 90 degrees from the camera arm orientation as shown on the plans.

All exposed surfaces of the shaft shall be of a smooth, even texture, free from marks and imperfections. The pole shall have a satin ground finish, 100 grit or finer.

Pole Cap

The top of the pole shaft shall be enclosed with a removable aluminum pole cap of the same thickness as the pole shaft. The pole cap shall be secured in place with 300 series galvanized steel screws. The design of the pole cap shall be such that it shall not permit entry of water into the shaft.

At the top portion of the shaft, two 1½ inch diameter openings shall be made and two 1¼ inch inside diameter rubber grommets shall be provided, for wiring purposes through the arm(s). The grommet openings shall be at 90 degree angles from the position of the handhole, i.e., there shall be two (2) grommet openings for each shaft, 180 degrees apart from each other and at 90 degrees apart from the handhole, unless otherwise indicated.

Base Plate

The bottom portion of the shaft shall be fitted with a base. The base shall be a permanent mold casting of aluminum alloy conforming to current Aluminum Association designations A356 with final temper T6. The base shall be welded to the shaft by the inert gas shielded arc method. All welds shall be free from cracks and pores. All shafts with base plates shall be heat treated after welding. The base shall be equipped with anchor bolt covers. Four anchor bolt slots shall be provided in the base to accommodate the required bolt circle diameter. Unless otherwise indicated, poles shall have 15 inch bolt circles. The size of the slots shall be 1¼ inch by 2 inches as detailed on the pole drawing.

Conduit Routing

At the bottom portion of the shaft two openings shall be provided to allow for the installation of 1-1/2" chase nipples for routing of cables into/out of the CLOSED CIRCUIT TELEVISION CABINET. The openings shall be positioned at 62 inches above the bottom of the base plate and at 90 degrees from the handhole and 180 degrees from the camera arm orientation as shown on the plans. The chase nipples, insulated throat bushing, locknut, and neoprene seal gasket shall be included as part of this pay item.

Rodent Guard

The space between the finished top of the foundation and the bottom of the base plate of the pole shall be enclosed with an expanded metal screen made of stainless steel. The size of the mesh of the screen shall be 1/4 in. (6 mm) or less and #18 gauge (1.22 mm) thick, or heavier as approved by the Engineer. The screen shall be held in place with a stainless-steel band installed around the tower base plate. The band shall be held tight by a ratchet-type device. Grouting shall not be used to enclose the above described space.

Anchor Bolt Covers

The anchor bolt covers shall be made from aluminum, conforming to current ASTM B 108, S5A F or, B 26, SG70A. The anchor bolt covers shall be fastened to the base with ¼ inch - 20 threaded steel reinforced plastic fasteners. The fasteners shall be threaded with ¼ inch - 20 threaded holes for bolt covers.

Vibration Damper

The pole shall be coordinated with all cameras being provided on this project to be free of susceptibility to harmful harmonics and vibrations. The pole shall incorporate an internal vibration damper. The material submitted for approval shall address this requirement.

Bundling

The shafts shall be shipped in bundles without any wrapping on the individual shafts or the entire bundle. Appropriate bundling materials shall be used to make a rigid, long lasting bundle capable of being handled, shipped and stored without shifting or breaking of contents.

Arm

The arm (bracket) shall be manufactured by the CCTV camera manufacturer and be fully coordinated with the CLOSED CIRCUIT TELEVISION DOME CAMERA, HD pay item. All openings extending to the camera bracket shall be free of burrs and rough edges and shall have a grommet installed to protect the camera wires.

Vibration Requirements

The detailed design and fabrication of the shaft and of the arms shall be such as to withstand 120 mph AASHTO criteria for wind and vibrations, caused by the wind pressure. There shall be no excessive vibrations in the shaft, arm(s) under moderate wind pressure, where damage may result to the camera(s) and/or its component parts, and/or arms(s). A dampening device, as an integral part of the shaft, shall be installed in the shaft to alleviate such excessive vibrations. The proposed vibration dampening device shall be submitted for Engineer's approval.

No information contained herein shall be construed to relieve the Contractor of the above requirements.

Certification and Guarantee

The submittal information shall include a written certification of compliance with the contract requirements from the Manufacturer. The certification shall specifically identify the project route, location, section number, and contract number, as applicable and shall identify specifically the equipment covered by the certification. The certification shall be made on the Manufacturer's corporate stationary and it shall be dated and signed by a responsible officer of the company, with the signee's title listed.

In addition, submittal information shall include the guarantee as specified under General Electrical Provisions.

CONSTRUCTION REQUIREMENTS

The structure shall be set plumb on the foundation without the use of shims, grout or any other leveling devices under the pole base. The camera arm shall be set at right angles to the centerline of the pavement. This item shall be coordinated with the applicable CLOSED CIRCUIT TELEVISION DOME CAMERA, HD, CLOSED CIRCUIT TELEVISION CABINET, and CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE FOUNDATION, 30" DIAMETER, which shall be provided under separate pay items.

Poles shall not be installed until cameras and cabinets are available for installation at the same time the poles are installed. Poles shall not be installed and left standing without a coordinated installation of camera and cabinet.

Method of Measurement.

This work will be measured for payment per each CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, 50 FT. MOUNTING HEIGHT installed.

Basis of Payment.

This work will be paid for at the contract unit price each for CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, 50 FT. MOUNTING HEIGHT.

CLOSED CIRCUIT TELEVISION DOME CAMERA, HD

Description. This work shall consist of furnishing, installing, and testing a High-Definition (HD) Closed-Circuit Television (CCTV) Dome Camera Assembly at a location as shown on the plans. The work shall include a color camera, dome assembly, all mounting hardware, connectors, cables, power injectors, and related equipment necessary to complete the installation according to the manufacturer's specifications. Any licensing required for adding the camera to the CENTRACS CCTV VIDEO MODULE shall be provided under the CENTRACS ADVANCED CCTV MODULE AND SERVER pay item. Any licensing required for adding the camera to IDOT District One's Video Distribution and Control System (Cameleon ITS) will be provided by the Contractor as a part of this pay item. Configuration of the camera into the centralized system shall be part of this pay item.

Materials. The PTZ camera shall be one of the following approved models:

- AXIS Q6075-E
- Cohu 4220HD

The Contractor shall furnish the required number of power injectors and Ethernet surge suppressors for the camera make and model selected, including operation of the camera heater, as well as all required mounting hardware, connectors, patch cables, and power supplies. The system shall have anonymous FTP capabilities disabled by the vendor/equipment supplier or provide a feature for the user to disable the functionality through the standard internal menu.

CONSTRUCTION REQUIREMENTS

Installation. The Contractor shall install the CCTV camera in accordance with manufacturer's instructions and as shown in the Plans. The camera firmware shall be the latest stable release available at the time of installation. The camera power injector and surge suppression device shall be securely mounted in the CCTV cabinet or traffic signal cabinet and wired in accordance with the manufacturer's installation instructions.

The camera shall be installed as shown on the plans, either on the CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, 50 FT. MOUNTING HEIGHT, or on a mast arm assembly pole using a mounting bracket/mounting arm compatible with the camera and procured from one of the approved camera manufacturers. When installed on a mast arm assembly pole, the camera shall be installed on a CAMERA MOUNTING ASSEMBLY extension pole as shown in the plans. The camera/mounting bracket/mounting arm and any external hardware and housing shall be installed with stainless steel straps. The camera mounting bracket/mounting arm shall be angled perpendicular to IL 64 (North Avenue) at all locations shown on the plans with the exception of IL 64 (North Avenue) and Wolf Road; at IL 64 (North Avenue) and Wolf Road, the camera mounting bracket/mounting arm shall be angled to view the Dynamic Message Sign (DMS) west of the intersection.

All holes drilled into signal poles, mast arms, posts, or the CLOSED CIRCUIT TELEVISION CAMERA STRUCTURE, 50 FT. MOUNTING HEIGHT shall require rubber grommets to prevent the chafing of wires.

The Contractor shall contact the Traffic Engineer prior to installing the camera and associated wiring, to receive final approval on the camera location. The Contractor shall coordinate with the IDOT Electric Maintenance Contractor and Network engineer for proper set up and IP configuration.

Testing. The Contractor shall test each CCTV camera in the presence of the Engineer after the camera and associated components are installed. This test may be done locally at the traffic signal cabinet.

Documentation. In addition to the initial submittal(s) prior to procurement, the Contractor shall provide installation and operation manuals, documentation of exact equipment model and serial numbers, software/firmware version numbers, in hardcopy and PDF formats on CD-ROM.

Warranty. The CLOSED CIRCUIT TELEVISION DOME CAMERA, HD shall be warrantied, free from material and workmanship defects for a period of three years from final acceptance.

Method of Measurement. This work will be measured for payment per each CLOSED CIRCUIT TELEVISION DOME CAMERA, HD furnished, installed and tested.

Basis of Payment. This work will be paid for at the contract unit price each for CLOSED CIRCUIT TELEVISION DOME CAMERA, HD. The unit price shall include all associated equipment, hardware, cables, materials and labor required to install the complete system in place and in operation to the satisfaction of the Traffic Engineer. The OUTDOOR RATED NETWORK cable from the CCTV cabinet or traffic signal cabinet will be paid for separately.

COMMUNICATIONS VAULT (D-1)

Effective: March 1, 2010

Description

This work shall consist of constructing a composite concrete handhole and cover, in accordance with the details shown in the Plans and as specified herein.

Materials

The composite concrete handhole and two piece vault lid shall be constructed of polymer concrete material, and shall be gray in color. The composite concrete handhole shall be 48 inches x 48 inches and shall have an effective depth of 36 inches.

The composite concrete handhole and cover shall have a design/test loading of 22,500/33,750 lbs respectively. The cover shall have a permanently recessed logo that reads "IDOT COMMUNICATIONS", or as otherwise designated by the Engineer. The composite concrete handhole lid shall have two 1/2-in x 4-in pull slots. The lid surface shall have a coefficient of friction of 0.50 in accordance with ASTM C-1028.

The Contractor shall install manufacturer-approved gasketing between the lid and the handhole to prevent water from entering the composite concrete handhole.

The composite concrete handhole lid shall be secured to the vault with two 3/8-inch NC stainless steel penta-head bolts and washers to lock the lid. In addition, a "lock tool" shall be provided for composite concrete handhole entry.

A fiber optic cable support assembly shall be recommended by the manufacturer and approved by the Engineer for fiber optic cable and splice enclosures used in the vault. Each support assembly shall consist of multiple brackets, racks, and/or rails required to suspend the required surplus cabling and any splice enclosures required.

The support assembly shall be made from or coated with weather resistant material such that there is no corrosion of the supports. The support assemblies shall be anchored to the vault using stainless steel hardware.

The fiber optic cable support assemblies shall be included in the Contract unit price for the composite concrete handhole. Void areas between openings and conduit shall be filled with self-curing caulking consisting of a permanent, flexible rubber which is unaffected by sunlight, water, oils, mild acids or alkalis. The caulking shall be mildew resistant and non-flammable. The material shall provide a permanent bond between the conduit entering the vault and the polymer concrete. The caulking shall be gray in color.

Construction Requirements

Composite concrete handholes shall be installed in accordance with applicable requirements of Section 800 of the Standard Specifications and as provided herein.

A manufacturer-approved knockout punch driver shall be used to provide openings in the vaults for conduit, or the required openings may be machined at the time of stackable vault fabrication. Voids between entering conduits and punch driven or machined openings shall not exceed 1/2 inch.

Any void areas shall be caulked from the interior and exterior of the composite concrete handhole. The caulk shall be allowed to fully cure per the manufacturer's specifications, prior to backfilling. The composite concrete handhole shall be placed on 12 inches of coarse aggregate, CA-5 or CA 7 Class A, as specified in Section 1004 of the Standard Specifications. Seal and flash test the vault per the manufacturer's recommendations.

A minimum of 150 feet of excess cable per cable run shall be coiled in each composite concrete handhole containing splices to allow moving the splice enclosure to the splicing vehicle unless otherwise indicated in the Plans.

Basis of Payment

This work will be paid for at the contract unit price each for COMMUNICATIONS VAULT.

CONCRETE FOUNDATION, SURVEILLANCE CABINET MODEL 334

Description

This work shall consist of constructing a concrete foundation to support ITS equipment cabinets at locations as indicated in the Plans. This work shall include installing any necessary hardware (entering conduits, bolts, anchor rods, grounding, etc.) as shown in the Plans. This work shall also include any topsoil, fertilizing, seeding, and mulching of the disturbed areas in accordance with Sections 211, 250, and 251 of the Standard Specifications.

Materials

Concrete foundations shall be according to materials defined in Article 836.02 of Section 836 of the Standard Specifications. All anchor bolts shall be in accordance with Section 1006.09 of the Standard Specifications except that all anchor bolts shall be hot dipped galvanized the full length of the anchor bolt including the hooks. Anchor bolts shall provide bolt spacing as shown in the Plans and as required by the cabinet manufacturer.

The Concrete foundations shall also be fabricated in accordance with Section 1070 of the Standard Specifications. These concrete foundations shall be fabricated from material new and unused in any previous application. The manufacturer shall provide a Certificate of Compliance that the materials are new and meet the specified requirements in accordance with the Standard Specifications and as shown in the Plans.

Construction Requirements

The Engineer will determine the final placement of the concrete foundations. Concrete foundation dimensions shall be in accordance with those dimensions shown on the Plans. The foundation shall be located as required in order to avoid existing and relocated utilities. The top of the foundation shall be finished level. Shimming of the appurtenance to be attached will not be permitted.

Prior to pouring the foundation, the Contractor shall check the Plans for the specific number, size, and direction of conduit entrances required at the given location. All conduit in the foundation shall be installed rigidly in place before concrete is deposited in the form. Bushings shall be provided at the ends of the conduit. Anchor rods and ground rod shall be set in place before the concrete is deposited by means of a template constructed to space the anchor rods according to the pattern of the bolt holes in the base of the appurtenance to be attached. The appurtenance shall not be erected on the foundation until the bases have cured for at least (7) days. The Concrete shall cure according to Article 1020.13 of the Standard Specifications.

The Contractor shall restore areas that have been disturbed or temporarily graded to their original condition. The cost of seeding the restored areas is included in this pay item.

Measurement

This work will be paid for at the contract unit price for each foundation installed.

Basis of Payment

This work will be paid for at the contract unit price per each for CONCRETE FOUNDATION, SURVEILLANCE CABINET MODEL 334.

DRILL EXISTING JUNCTION BOX

Description

This work shall consist consists of drilling a hole in an existing junction box or wall-mounted cabinet for the installation of a new conduit(s).

General Requirements

General requirements must be in accordance with Section 801 of the Standard Specifications.

Installation

The size of the hole must be as close as possible to the size of the conduit. Conduit openings must be fitted with the appropriate conduit fittings, nuts and accessories. The type and orientation of the conduit must be as shown in the Plans.

Field cut openings shall be uniform and smooth. All burrs and rough edges shall be filed smooth prior to the installation of the conduit(s) into the junction box. Any gaps around the conduit penetration shall be sealed against moisture or animal entry.

Cleaning the existing junction box (if required) shall be included in this item and shall be done as directed by the Engineer.

Method of Measurement

This work will be measured for payment per each hole that is drilled in an existing junction box.

Basis of Payment

This work will be paid for at the contract unit price each for DRILL EXISTING JUNCTION BOX, which will be payment in full for performing the work described herein.

DRILL EXISTING WINGWALL

Description

This work shall consist of drilling a hole in an existing concrete wingwall (retaining wall) and furnishing and installing a new conduit per the applicable portions of Section 879 of the Standard Specifications.

Method of Measurement

This work will be measured for payment per each hole that is drilled in an existing wingwall.

Basis of Payment

This work will be paid for at the contract unit price each for DRILL HOLE THROUGH RETAINING WALL, which price shall include all the work described in Article 879.03 of the Standard Specifications.

DYNAMIC MESSAGE SIGN, FULL MATRIX, COLOR, NTCIP 1203 V2

Description. This item shall consist of furnishing and installing a Front Access, Full matrix, Color, NTCIP 1203 V2 Dynamic Message Sign (DMS) as shown in the plans and as described herein.

General Requirements. The high resolution, full color display shall be a full matrix configuration of 64 pixels high by 288 pixels wide. The pixel pitch shall be 20 MM (0.81"). The size of the sign shall be as shown in the plans. All display elements and modules shall be solid state. No mechanical or electromechanical elements or shutters shall be used.

Equipment/items to be furnished at each DMS field site shown in the plans shall include, but not be limited to the following: LED DMS, sign controller, cabling, sign enclosure, mounting hardware, documentation, warranties, latest vendor maintenance diagnostic software with 20 licenses to load software on Department/Department's maintenance forces laptops, and five (5) primary and five (5) secondary units of Teledyne FLIR 360 Cameleon Client ITS site license for each installed DMS on the Department's primary server and secondary server.

The Central Controller resides at the Illinois Department of Transportation's Traffic Systems Center, located at 445 Harrison Street, Oak Park, Illinois 60304. The DMS Central Software was developed by 360 Surveillance, Inc. The successful sign vendor shall perform an on-site working sample demonstration test to prove their product is compatible with the 360 Cameleon Client/Server Software. The Working Sample demonstration test criteria are outlined within the General Requirements of this special provision.

Each DMS assembly shall consist of a LED DMS sign case including contents, mounting brackets, its associated sign controller unit (SCU), communication unit, cabling between the DMS case and the sign controller unit, and optically coupled interface from controller to sign. Each LED DMS shall be capable of displaying three lines of text. Each line shall consist of a string of 21 alphanumeric characters. Each character shall be composed from a luminous dot matrix system. The matrix system for a high resolution, full color display shall consist of a minimum 256 dots composed of a minimum of 16 columns and a minimum of 16 rows. A luminous pixel shall consist of a LED pixel array. All display elements and modules shall be solid state. All characters, symbols, and digits shall be 12-inch nominal character size and shall be clearly visible and legible at a distance of 600 feet within a 30 degree cone of vision centered on the optical axis of the pixel. The signs shall be capable of displaying the following:

- A static message
- A flashing message
- Two alternating messages, either flashing or static

The changing from one message to another shall be instantaneous.

The total weight added to the sign structure for the Front Access, Full matrix, Color, NTCIP 1203 V2 DMS shall be no greater than 1250 pounds. The dimensions of the sign housing will not exceed 6'0" tall, 20'0" wide, and 1'4" deep and access to the electronics shall be achieved through the front display panels of the DMS. Larger signs may be submitted, but they will require additional review time to evaluate the structural adequacy of the Department's standard sign trusses.

The Contractor shall provide structure mounted service equipment to provide power to each sign. The cost of this shall be considered incidental to the unit price for the DMS. The Contractor shall be responsible to have a Licensed Structural Engineer in the State of Illinois design the sign attachments to the DMS sign truss and stamp the drawings. These drawings shall be submitted to the Engineer for approval before work can commence. These drawings will describe the mounting required to attach each of the DMS to the Structure. The contractor shall supply all mounting hardware necessary to attach the DMS to the structure. The cost of this work shall be included in the contract bid price for the item. No additional compensation will be allowed for any modifications that may be required to the structure.

Before starting work, the Contractor shall submit an erection plan to the Engineer for acceptance detailing the proposed methods of erection and the amount, location(s), and type(s) of equipment to be used.

The Contractor or sub-Contractor performing the erection of the DMS is herein referred to as the Erection Contractor.

All field equipment shall remain fully functional over an ambient temperature range of -40°F to $+149^{\circ}\text{F}$ with relative humidity of up to 95%. All field equipment enclosures shall be designed to and shall withstand the effects of sand, dust, and hose-directed water. All connections shall be watertight.

Working Sample Demonstration (Dynamic Message Sign)

To ensure timely delivery for installation, it is imperative that the DMS manufacturer be regularly engaged in the manufacture of the specified equipment and capable of immediately demonstrating a sample DMS that is in clear compliance with the key portions of the specifications. Delay from the specified timeline, and failure to present the sample in a timely manner may result in termination of the contract, at the discretion of the Engineer.

The DMS manufacturer shall provide a satisfactory, approvable demonstration of working samples for the DMS within 14 calendar days after contract execution. The sample shall be complete mock-ups of the working DMS based on the proposed equipment to be furnished under this contract and identified in the submittal material. The sample demonstration may utilize portable samples at the IDOT Traffic Systems Center, or it may be at the manufacturer's production facility if located within District 1. A demonstration of an identical installed unit for some other contract will be acceptable.

The sample demonstration will be for purposes of review and approval by the Engineer. The Engineer will issue review comments based on examination of each unit and its operation at the time of the demonstration, and the Engineer may require a subsequent revised sample demonstration if, in the Engineer's judgment, the comments warrant re-work of the sample unit. Delay in presenting the specified demonstration or delay in attaining "Approved" or "Approved as Noted" status will result in the assessment of liquidated damages in the amount of \$3,000 per calendar day until a satisfactory sample and demonstration are attained. For a demonstration to be held at the IDOT Traffic Systems Center, the manufacturer shall coordinate the exact date, time, demonstration location, and power requirements with the Traffic Systems Center Engineer. The sample unit shall be in substantial compliance with the contract requirements. The Engineer may elect to waive minor deviations for purposes of the demonstration or may waive minor deviations completely if alternative provisions are judged superior to specified requirements, but deviations from key specified requirements will not be accepted.

Handling, Storage, Shipment

The Contractor shall handle the DMS in such a manner as to prevent damage. Cracked or damaged materials shall be repaired or replaced at the Contractor's expense. Braces, trusses, chains, cables, or other devices used for handling, storing, and shipping shall be adequately padded at points in contact with the materials to prevent damage of the finished product.

DMS shall be handled, stored, shipped with supports and devices that maintain the product in an upright position.

Materials. All materials furnished, assembled, fabricated or installed under this item shall be new, corrosion resistant and in strict accordance with the details shown in the plans and as detailed in this specification. All details and functionality listed in this specification will be thoroughly inspected and tested by the department. Failure to meet all details and functionality detailed in this specification shall be grounds for rejection of the equipment.

Terminology

Due to the varying definitions used in Dynamic Message Sign technology, this section defines specific terms as they apply to this specification.

Sign: The sign housing and its contents.

Sign Controller: Located in a ground cabinet or in the sign (as detailed in this specification), the sign controller specifies the message to be displayed. Messages can be selected either remotely from the central controller, locally from a laptop computer or from the front panel of the sign controller.

Central Controller: The MS Windows Server computer system and related software, which operates the system from a remote-control site.

Workstation: This computer operates as a remote client to the central controller. A workstation operator may dial-in to the central controller and gain access to the functions of the central by using the appropriate access codes.

LED: Light Emitting Diode

Pixel: Any of the small discrete elements that, when arranged in a pixel matrix, create a character. A pixel contains a cluster of LEDs.

Pitch: Distance measured from center to center of adjacent pixels within a matrix. This distance is measured both horizontally and vertically.

Poll: The central controller and laptop computer are said to “poll” a sign when they request the sign’s status information. The term is derived from the periodic status polling, which a central can perform, but is loosely used to refer to any status request.

Message: Text; the information shown on the sign.

Display: The message seen by the motorist. A display may include more than one page of text (an alternating display). Any character or set of characters of a display may be flashed (a flashing display).

Neutral State: Sign is blank or displaying a predefined message that is displayed regularly.

WYSIWYG: What You See IS What You Get. In this specification, this is the functionality of the LED DMS system where the central, workstation or laptop display mimics the actual message that is visibly displayed on the sign on an individual pixel basis.

DMS Manufacture Requirements

The manufacturer of the full color/full matrix front access LED DMS shall be ISO 9001 certified or provide documentation and references, acceptable to the Engineer, to demonstrate the manufacturer has sufficient processes in place and produces a quality product.

The ISO 9001 certificate shall be provided with the bid. The name, phone number and address of both the Authorized ISO 9001 Registrar that certified this company and the Authorized ISO 9001 Accreditation Body that accredited this Registrar shall be provided with the bid. ISO 9002 and ISO 9003 certifications are not adequate and do not meet this requirement.

In lieu of ISO 9001 certification, the company shall submit documentation and references that will be reviewed and must be approved by the Engineer as an acceptable alternative. The documentation shall, at a minimum, include the following:

- Quality Control Procedures
- Manufacturing Process
- Location of the facility where the DMS signs are manufactured
- References from 3 transportation agencies that have used the product on Freeway applications within the last 5 years. Two of the references must be from other states.

Failure to fully comply with these requirements and to provide this information will cause this company's equipment and software to be rejected.

Experience Requirements:

The full color/full matrix front access LED DMS Manufacturer shall submit a minimum of three references from other transportation agencies, two of which must be from other states that have been successfully operating a highway **full color/full matrix front access** LED dynamic message sign systems that completely meets these specifications, manufactured and supplied by this manufacturer for a period of no less than five (5) years.

The LED DMS Signs and System shall be fabricated by an established DMS manufacturer having the minimum of:

- 10 years' experience, under the current corporate name, in the design and manufacturing of State Highway or Interstate Highway, permanently-mounted, overhead dynamic message signs and central control systems installed in freeway service. These 10 years of experience shall include the complete design and manufacturing of all aspects of the dynamic message signs, including the electronic hardware, software and sign housings.
- 100 State Highway or Interstate Highway, permanently-mounted, overhead dynamic message signs installed in freeway or toll road service, under the current corporate name.
- 50 State Highway or Interstate Highway, permanently-mounted, overhead LED dynamic message signs that completely meet this specification with three lines of 12-inch characters, and Walk-In or Front Access housings installed in freeway or toll road service, under the current corporate name.

The manufacturer of the LED DMS Signs and System shall submit documentary evidence and reference data for the above requirements. Reference data shall include the name and address of the organization, and the name and telephone number of an individual from the organization who can be contacted to verify the above requirements. The name of the DMS manufacturer that meets these experience requirements shall have the same corporate name as the DMS manufacturer that meets the ISO 9001 requirements stated elsewhere in this specification. This information shall be provided prior to documentation submittal. Failure to furnish the above references will be sufficient reason for rejection of the supplier's equipment.

The Contractor shall submit the information described in this section to the Engineer within 15 days of award of the contract. The Engineer will review the submitted information and provide comments and approval of the information to the Contractor within 15 calendar days after receipt. Review of the submittal information by the Engineer shall not relieve the Contractor of the contractor's obligation to furnish and install the work in accordance with the contract documents. No time extensions will be granted to the Contractor as a result of the need to resubmit various items to review.

- Shop drawings shall be submitted in accordance with Article 105.04 of the Standard Specifications and as specified in these special provisions.
- Prior to purchase or fabrication of any equipment or materials for use in this project, the Contractor shall submit, for review by the Engineer, appropriate catalog cuts sheets, and specifications for all standard, off-the-shelf items and shall submit shop drawings and other necessary data for all non-catalog or custom-made items.
- The Contractor shall furnish five sets of submittal data directly to the Engineer. Two copies of this information, with appropriate notations, will be returned to the Contractor after the review.
- If reprinted literature, such as catalog cut sheets, is used to satisfy the submittal data requirements, there shall be no statements on the literature which conflict with the requirements of the contract documents. Any such statements shall be crossed off and initialed by the Contractor. Explanation of how specifications shall be met pertaining to items changed from the literature shall be documented in writing and included with the submittal information.
- All items shall be submitted together.
- Each submittal shall contain sufficient information and details to permit full evaluation of each item, and its interrelationships among the various items shall be carefully addressed.
- The Contractor shall prepare and submit detailed shop drawings for each sign type indicating types of materials proposed for each component of each sign, parts lists, assembly techniques, layout of all display elements and wiring schematics. The shop drawings shall also illustrate in detail how the Contractor proposes to mount and connect the DMS sign case to the sign support structure (truss/cantilever). The DMS sign case shall include any support mechanism necessary for the installation of the DMS sign case that is not included in the truss. These drawings shall be submitted to the Engineer for review and approval prior to fabrication of any sign. Parts lists shall include circuit and board designation, part type and class, power rating, component manufacturer and mechanical part manufacturer.

- As part of the submittals for the DMS assembly, the Contractor shall submit an engineering drawing illustrating the DMS character set including 26 upper case letters, 10 numerals, a dash, a plus sign (+), and slash. The Contractor shall also submit complete technical information, shop drawings, photographs, graphs, circuit diagrams, instruction manuals, security provisions, and any other necessary documents to fully describe the Front Access DMS assembly and associated equipment.

Product Testing

The DMS manufacturer shall provide documentation indicating that the DMS products have been tested to the following standards. It shall be acceptable for the testing to be performed on scale-sized versions of the actual DMS provided that the test unit is functionally and structurally equivalent to the full size DMS.

Failure to conform to these testing requirements shall be grounds for rejection. Rejected equipment may be offered for test or retest provided all non-compliant items have been corrected and tested or retested by the DMS manufacturer. Any corrections deemed necessary by the Engineer shall be made by the DMS manufacturer, at no additional cost to the Department.

- (1) Third Party Testing. Third party test reports for the Walk-In and Front Access DMS shall be submitted for the following testing:
 - NEMA Standards Publication TS 4, Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements – Section 2, Environmental Requirements. Test report shall detail results of mechanical vibration and shock, electrical noise and immunity, temperature, and humidity.
 - Underwriters Laboratories (UL), UL 48 Standard for Electric Signs, UL 50 Enclosures for Electrical Equipment, and UL 1433 Standard for Control Centers for Changing Message Type Electric Signs. The UL report number(s) for all DMS and control equipment manufactured by the DMS manufacturer shall be submitted and the products shall bear the UL mark.
 - The supplier shall provide a record of each test performed including the results of each test. The report shall include a record of the 3rd party test laboratory and the test lab's representative that witnessed the tests, including the signature of the lab's representative. The test reports shall be provided to the Engineer for review as part of the technical submittal.

(2) Self Certification. The DMS manufacturer shall provide self-certification, including a statement of conformance and copies of test reports, indicating that the following tests have been performed and passed. Third party test reports shall be submitted for testing of the following National Transportation Communication for ITS Protocol (NTCIP) standards:

- NTCIP 1201:1996, NTCIP Global Object Definitions (including Amendment 1)
- NTCIP 1203:1997, Object Definitions for Dynamic Message Signs (including Amendment 1)
- NTCIP 2101:2001, Point to Multi-Point Protocol Using RS-232 Subnetwork Profile.
- NTCIP 2103 (Draft v1.13), Point-to-Point Protocol over RS-232 Subnetwork Profile.
- NTCIP 2104 V01.11 Ethernet Subnetwork Profile

The NTCIP testing shall have been completed using industry accepted test tools such as the NTCIP Exerciser, Trevilon's NTester, Intelligent Devices' Device Tester, and/or Frontline's FTS for NTCIP. The NTCIP test report(s) shall include testing of sub-network communications functionality, all mandatory objects in all mandatory conformance groups, and a subset of the remaining objects.

Physical Construction

(1) Wiring and Power Distribution

a. Power and Signal Entrances

Two 1-1/2" threaded conduit hubs shall be located on the rear or side wall of the DMS housing. One hub shall be for incoming AC power and the other shall be for incoming DMS signal cabling or a communications line.

b. Panel Board

The DMS shall contain a power panel board and circuit breakers that meet the following minimum requirements:

- Service entrance-rated
- Minimum of 20 circuit breaker mounting positions
- Short circuit ratings of 22,000 amps and 10,000 amps for the main and branch circuits, respectively
- UL listed panel board and circuit breakers

c. Internal Wiring

Wiring for LED display module control, environmental control circuits and other internal DMS components shall be installed in the DMS housing in a neat and professional manner. Wiring shall not impede the removal of display modules, power supplies, environmental control equipment, and other sign components. Wires shall not make contact with or bend around sharp metal edges. All wiring shall conform to the National Electrical Code.

(2) Earth Grounding

The DMS manufacturer shall provide one earth ground lug that is electrically bonded to the DMS housing. The lug shall be installed near the power entrance location on the DMS housing's rear wall. The DMS installation contractor shall provide the balance of materials and services needed to properly earth ground the DMS. All earth grounding shall conform to the National Electrical Code.

(3) DMS Enclosure

The LED DMS shall enable the display of text, consisting of a string of alphanumeric and other characters. The size of the sign shall be as shown in the plans, and elsewhere in the specification. Each character shall be formed by a matrix of luminous pixels. The matrix of a standard character shall consist of 150 pixels over 10 columns and 15 rows.

The equipment design and construction shall utilize the latest available techniques with a minimum number of different parts, subassemblies, circuits, cards and modules to maximize standardization and commonality. The equipment shall be designed for ease of maintenance. All component parts shall be readily accessible for inspection and maintenance. Test points shall be provided for checking essential voltages.

The signs shall be designed for a minimum life of 20 years.

The signs shall be designed and constructed to present a clean and neat appearance. Poor workmanship shall be cause for rejection of the sign.

All cables shall be securely clamped or tied in the sign housing. No adhesive attachments will be allowed.

The dynamic message signs, including the sign housings and all modules and assemblies, shall be designed and manufactured in the USA.

The complete sign housings shall be designed and manufactured in-house by the LED DMS Sign Manufacturer.

A registered structural engineer in the State of Illinois shall analyze the DMS structure for both type DMS and certify that the DMS will withstand the temporary effects of being lifted by the provided eye bolts, will comply with the applicable requirements of AASHTO Standard Specification for Structural Supports for Highway Signs, Luminaries and Traffic Signals, Fourth Draft, 2001, and will support a front face ice load of 4 lbs. per square foot. The equipment within the sign housings shall be protected from moisture, dust, dirt and corrosion. The sign shall be constructed of aluminum alloy 5052-H32 or 3003-H14 which shall not be less than 1/8" thick, unless otherwise specified in this document. Framing structural members shall be made of aluminum alloy 6061-T6 or 6063-T5.

All welding shall be by an inert gas process in accordance with the American Welding Society (AWS) Standards, ANSI/AWS D1.2-97. The LED DMS manufacturer's welders and welding procedures shall be certified by an ANSI/AWS Certified Welding Inspector to the 1997 ANSI/AWS D1.2-97 Structural Welding Code for Aluminum. Proof of certification of all the LED DMS manufacturer's welders and applicable welding procedures shall be supplied with the submittals. The name, phone number and address of the ANSI/AWS Certified Welding Inspector that certified the LED DMS manufacturer's welders and procedures shall also be provided with the submittals.

The DMS housing's right, left, and rear walls shall be vertical. The top and bottom sides shall be horizontal.

The sign housings shall be capable of withstanding a wind loading of 120 M.P.H. without permanent deformation or other damages.

All 120/240 VAC wiring located inside the sign housing shall be run in conduit pull-boxes, handy-boxes, power supply boxes, control cabinets, and circuit breaker boxes.

The performance of the sign shall not be impaired due to continuous vibration caused by wind, traffic or other factors. This includes the visibility and legibility of the display.

The presence of power transients or electromagnetic fields, including those created by any components of the system, shall have no deleterious effect on the performance of the system. The system shall not conduct or radiate signals which will adversely affect other electrical or electronic equipment including, but not limited to, other control systems, data processing equipment, audio, radio and industrial equipment.

All DMS structural hardware shall be stainless steel and appropriately sized for the application.

The DMS Manufacturer shall provide a signed and sealed copy of these certifications by the registered Structural Engineer as part of the catalog cut submittal.

a. Electronic Components

All electronic components, except printed circuit boards, shall be commercially available, easily accessible, replaceable and individually removable using conventional electronics repair methods.

All workmanship shall comply with ANSI/IPC-1-610B Class 2 titled "Acceptability of Electronic Assemblies", ANSI/IPC-7711 titled "Rework of Electronic Assemblies", and ANSI/IPC-7721 titled "Rework and Modification of Printed Boards and Electronic Assemblies".

All electronic components shall comply with Section Electronic Materials and Construction Methods, located in this document.

All Printed Circuit Boards (PCBs) shall be completely conformal coated with a 0.010 inch (10 MIL) minimum thickness silicone resin conformal coat. The LED mother boards shall be completely conformal coated, except at the pixels on the front of the PCB, with a 0.010 inch (10 MIL) minimum thickness silicone resin conformal coat. The material used to coat the PCBs shall meet the military specification: MIL-I-46058C Type SR.

b. Mechanical Components

All external screws, nuts, and locking washers shall be stainless steel. No self-tapping screws shall be used. All parts shall be made of corrosion resistant materials, such as plastic, stainless steel or aluminum. All materials used in construction shall be resistant to fungus growth and moisture deterioration. An inert dielectric material shall separate dissimilar metals.

c. Convenience Outlets

The Front Access DMS housing shall contain a utility outlet circuit consisting of a minimum of two (2) 15-A NEMA 15-R, 120 VAC duplex outlets, one with ground-fault circuit interrupters. This outlet shall be located near the panel board.

If the sign controller and communication equipment is to be mounted in the sign, a second outlet circuit shall be included consisting of a minimum of two (2) 15-A NEMA 15-R, 120 VAC duplex outlets, one with ground-fault circuit interrupters. These outlets shall be located near the controller and communication equipment mounting location.

(4) Front Face Construction

The DMS front face for the Front Access DMS shall be constructed with multiple vertically hinged rigid door panels, each of which contains a full-height section of the LED display matrix. The door panels shall be fabricated using aluminum sheeting on the exterior and polycarbonate sheeting on the interior of the panel.

a. Service Access

The DMS housing shall provide safe and convenient access to all modular assemblies, components, wiring and subsystems located within the DMS housing. All internal components shall be removable and replaceable by a single technician.

One (1) access door for Front Access DMS shall be provided for each 32 and 48 pixel wide section of the sign housing. These doors shall be vertically hinged and shall contain a section of the sign's front face. The doors shall swing out from the face to provide access to the cabinet interior. Each door shall extend the full height of the display matrix.

To prevent open doors from blowing in wind, they shall each have a retaining latch mechanism to hold the door open at a 90-degree angle.

Each door shall form the face panel for a section of the sign. The LED modules shall be mounted to the door and be removable from the door when in the open position. Other sign components, such as power supplies, wiring, etc. shall be located inside the sign cabinet and be accessible through the door opening. Each door shall cover an opening that is a minimum of 23-inches (584 mm) wide and the same height as the display pixel matrix.

Each door shall contain a minimum of two (2) screw-type latches to lock them in the closed position. These latches shall be captive to prevent them from falling off. They shall pull the door tight and compress a gasket located around the perimeter of each door. They shall also be capable of providing leverage to easily release the gasket seal when opening the doors. The gasket shall prevent water from entering the cabinet around the doors.

b. Face Panels

Front face panels shall provide a high-contrast background for the DMS display matrix. The aluminum mask of each door panel shall be painted black and shall contain an opening for each pixel. Openings shall be large enough to not block any portion of the viewing cones of the LEDs.

Each panel shall have a single polycarbonate sheet attached securely to the inside of the aluminum panel. The polycarbonate sheet shall cover all of the pixel openings. The polycarbonate shall be sealed to prevent water and other elements from entering the DMS. The polycarbonate shall contain UV inhibitors that protect the LED display matrix from the effects of ultraviolet light exposure and prevent premature aging of the polycarbonate itself. Polycarbonate sheets shall have the following characteristics:

- Tensile Strength, Ultimate: 10,000 PSI
- Tensile Strength, Yield: 9,300 PSI
- Tensile Strain at Break: 125%
- Tensile Modulus: 330,000 PSI
- Flexural Modulus: 330,000 PSI
- Impact Strength, Izod (1/8", notched): 17 ft-lbs/inch of notch
- Rockwell Hardness: M75, R118
- Heat Deflection Temperature Under Load: 264 PSI at 270F and 66 PSI at 288F
- Coefficient of Thermal Expansion: 3.9×10^{-5} in/in/F
- Specific Heat: 0.30 BTU/lb./F
- Initial Light Transmittance: 85% minimum
- Change in Light Transmittance, 3 years exposure in a Southern latitude: 3%
- Change in Yellowness Index, 3 years exposure in a Southern latitude: Less than 5%

LED display modules shall mount to the inside of the DMS front face panels. Common hand tools shall be used for removal and replacement.

DMS front face borders (top, bottom, left side, and right side), which surround the front face panels and LED display matrix, shall be painted black to maximize display contrast and legibility.

In the presence of wind, the DMS front face shall not distort in a manner that adversely affects LED message legibility.

c. Exterior Finish

DMS front face panels and front face border pieces shall be coated with semi-gloss black Kynar 500 resin or an equivalent brand of oven-fired fluoropolymer coating, which has an expected outdoor service life of 20 years. All other DMS housing surfaces, including the DMS mounting brackets, shall be natural mill-finish aluminum.

d. Heating

The lens panel shall use heated, forced air to prevent fogging and condensation. An eight watt-per-foot, self-regulating, heat tape shall be provided along the bottom of the message area, between the glazing and the display modules. The sign controller shall control the heat tape. All heat tape terminal blocks shall be covered for safety.

(5) Humidity Control

A humidity sensor shall be provided and sensed by the sign controller from zero percent to 100 percent relative humidity in one percent or fewer increments. The sensor shall operate and survive from 0 percent to 100 percent relative humidity.

The sensor shall have an accuracy that is better than +/- five percent relative humidity. The sign controller shall read the internal temperature sensors, external ambient temperature sensor and the humidity sensor. The sign controller shall use these readings in an algorithm that turns on the heat tape and/or the fans at the appropriate times to reduce both frost on the face of the sign and condensation on the display modules and other electronic circuitry.

(6) Drain Holes

The bottom panel of the housing shall contain small drain holes. The drain holes shall be screened to prevent the entrance of insects and small animals and shall be replaceable.

(7) Ventilation System

The DMS shall contain systems for cabinet ventilation and safe over-temperature shutdown.

The DMS shall contain an electronically controlled ventilation system and a failsafe thermostat designed to keep the internal DMS air temperature lower than +140°F (+60°C), when the outdoor ambient temperature is +115°F (+46°C) or less.

The ventilation system shall consist of two or more air intake ports. Intake ports shall be located near the bottom of the DMS rear wall. Each intake port shall be covered with a filter that removes airborne particles measuring 500 microns in diameter and larger. One or more ball bearing-type fans shall be mounted at each intake port. These fans shall positively pressure the DMS cabinet.

Fans and air filters shall be removable and replaceable from inside the DMS housing.

Each ventilation fan shall contain a sensor to monitor its rotational speed, measured in revolutions per minute. The fan speed shall be reported to the sign controller upon request.

The ventilation system shall move air across the rear of the LED modules in a manner such that heat is dissipated from the LED's. The airflow shall move from the bottom of the cabinet towards the top to work with natural convection to move heat away from the modules.

Each exhaust port shall be located near the top of the rear DMS wall. One exhaust port shall be provided for each air intake port. All exhaust port openings shall be screened to prevent the entrance of insects and small animals.

An aluminum hood attached to the rear wall of the DMS shall cover each air intake and exhaust port. All intakes and exhaust hoods shall be thoroughly sealed to prevent water from entering the DMS.

The DMS shall automatically shut down the LED modules to prevent damaging the LEDs if the measured internal cabinet air temperature exceeds a maximum threshold temperature. The threshold temperature shall be configurable and shall have a default factory setting of 140°F (+60°C). The factory default setting shall be overridden if the selected message priority is set above 200 or is selected as an emergency message.

Alternate sign ventilation systems can be submitted to the Engineer for approval. Extra time and additional demonstration testing and documentation of the proposed alternate system may be needed to secure the necessary approval from the Engineer. No extra compensation shall be awarded to the Contractor for the alternate design but if the alternate design is rejected, liquidated damages may apply.

LED Display Modules

The DMS shall contain LED display modules that include an LED pixel array, LED driver circuitry, and mounting hardware. These modules shall be mounted adjacently in a two-dimensional array to form a continuous LED pixel matrix. Each LED display module shall be constructed as follows:

- Each LED display module may consist of one or two circuit boards. If two boards are used, they shall be mounted physically to each other using durable corrosion resistant hardware. They shall be electrically connected via one or more header-type connectors. The header connectors shall be keyed such that the boards cannot be connected incorrectly.
- All LED modules shall be manufactured using laminated fiberglass printed circuit boards.
- Each LED display module shall be mounted to the rear of the display's front face panels using durable corrosion resistant hardware. No tools shall be required for module removal and replacement. The modules shall be mounted such that the LEDs emit light through the face panel's pixel holes and such that the face panel does not block any part of the viewing cone of any of the LEDs in any pixels.
- LED display module power and signal connections shall be a quick-disconnect locking connector type. Removal of a display module from the DMS, or a pixel board or driver circuit board from its display module, shall not require a soldering operation.
- All exposed metal on both sides of each printed circuit board, except connector contacts, shall be protected from water and humidity exposure by a thorough application of conformal coating. Bench level repair of individual components, including discrete LED replacement and conformal coating repair, shall be possible.
- Individual addressing of each LED display module shall be configured via the communication wiring harness and connector. No on-board addressing jumpers or switches shall be allowed.
- Removal or failure of any LED module shall not affect the operation of any other LED module or sign component. Removal of one or more LED modules shall not affect the structural integrity of any part of the sign.
- It shall not be possible to mount an LED display module upside-down or in an otherwise incorrect position within the DMS display matrix.
- All LED display modules, as well as the LED pixel boards and driver circuit boards, shall be identical and interchangeable throughout the DMS.

(1) LED Pixels

Each LED module shall contain a printed circuit board to which LED pixels are soldered. The LED pixel matrix shall conform to the following specifications:

- Each LED module shall contain a minimum of 256 LED pixels configured in a two-dimensional array. The pixel array shall be a minimum of sixteen (16) pixels high by sixteen (16) pixels wide.
- The distance from the center of one pixel to the center of all adjacent pixels, both horizontally and vertically, shall be 0.81-inches (20.6mm).
- Each pixel shall consist of a minimum of one (1) independent string of discrete LEDs for each color. All pixels shall contain an equal quantity of LED strings.
- The failure of an LED string or pixel shall not cause the failure of any other LED string or pixel in the DMS.
- Each pixel shall contain the quantity of discrete LEDs needed to output white colored light at a minimum luminous intensity of 12,400 candelas per square meter when operated within the forward current limits defined in these specifications.
- Each pixel shall also be capable of displaying amber colored light with a minimum luminous intensity of 7,440 candelas per square meter when operated within the forward current limits defined in these specifications.
- Each LED pixel shall not consume more than 1.5 watts.
- The circular base of the discrete LEDs shall be soldered so that they are flush and parallel to the surface of the printed circuit board. The longitudinal axis of the LEDs shall be perpendicular to the circuit board.

(2) Discrete LEDs

DMS pixels shall be constructed with discrete LEDs manufactured by Avago Technologies (formerly Agilent Technologies), Toshiba Corporation, Nichia Corporation, OSRAM, or equivalent. Discrete LEDs shall conform to the following specifications:

- All LEDs shall have a nominal viewing cone of 30 degrees with a half-power angle of 15 degrees measured from the longitudinal axis of the LED. Viewing cone tolerances shall be as specified in the LED manufacturer's product specifications and shall not exceed +/- 3 degrees.
- Red LEDs shall utilize AlInGaP semiconductor technology and shall emit red light that has a peak wavelength of 615 – 650 nm.
- Green LEDs shall utilize InGaN semiconductor technology and shall emit green light that has a peak wavelength of 525 – 535 nm.
- Blue LEDs shall utilize InGaN semiconductor technology and shall emit blue light that has a peak wavelength of 464 – 470 nm.

- The LED lenses shall be fabricated from UV light resistant epoxy.
- The LED manufacturer shall perform color sorting of the bins. Each color of LEDs shall be obtained from no more than two (2) consecutive color “bins” as defined by the LED manufacturer.
- The LED manufacturer shall perform intensity sorting of the bins. LEDs shall be obtained from no more than two (2) consecutive luminous intensity “bins” as defined by the LED manufacturer.
- The various LED color and intensity bins shall be distributed evenly throughout the sign and shall be consistent from pixel to pixel. Random distribution of the LED bins shall not be accepted.
- LED package style shall be either through-hole flush-mount or surface-mount. Through-hole LEDs with standoffs will not be accepted.
- All LEDs used in all DMS provided for this contract shall be from the same manufacturer and of the same part number, except for the variations in the part number due to the intensity and color bins.
- The LEDs shall be rated by the LED manufacturer to have a minimum lifetime of 100,000 hours of continuous operation while maintaining a minimum of 70% of the original brightness.

(3) Pixel Drive Circuitry

One (1) electronic driver circuit board shall be provided for each LED pixel module and shall individually control all pixels on that module. The driver circuit boards shall conform to the following specifications:

- Each LED driver board shall be microprocessor-controlled and shall communicate with the sign controller on a wire or fiber optic communication network using an addressable network protocol. The microprocessor shall process commands from the sign controller to display data, perform diagnostic tests, and report pixel and diagnostic status.
- Constant current LED driver ICs shall be used to prevent LED forward current from exceeding the LED manufacturer’s recommended forward current whenever a forward voltage is applied. To maximize LED service life, LED drive currents will not be allowed that exceed the manufacturer’s recommendations for the 100,000-hour lifetime requirement.
- The LED pixels shall be directly driven using pulse width modulation (PWM) of the drive current to control the display intensity. This LED driver circuitry shall vary the current pulse width to achieve the proper display intensity levels for all ambient light conditions. The drive current pulse shall be modulated at a frequency high enough to provide flicker-free operation and a minimum of 200 brightness levels.
- The LED driver circuitry shall receive updated display data at a minimum rate of ten (10) frames per second from the sign controller.

- Each LED driver circuit shall be powered by 24 VDC from external regulated DC power supplies. Each driver circuit shall receive power from a minimum of two (2) independent power supplies. Indicator LEDs shall be provided to indicate the status of each power source.
- Each LED driver circuit shall contain a microprocessor-controlled power regulation circuit that controls the voltage applied to the LED strings. The power circuit shall automatically adjust the voltage supplied to the LEDs to optimize power consumption efficiency as the temperature changes.
- The voltage of each power input shall be measured to the nearest tenth of a volt and reported to the sign controller upon request. Each driver circuit shall also contain one status LED for each power source that indicates if the power source is present or not.
- The LED driver circuitry shall be able to detect that individual LED strings or pixels are stuck off and shall report the pixel status to the sign controller upon request.
- The LED driver board shall contain a seven segment numeric LED display that indicates the functional status of the driver and pixel boards. At a minimum, it shall indicate error states of the LED pixels and communication network. The indicator shall be positioned such that a maintenance technician can easily view the status code for diagnostic purposes. The status codes shall also be reported to the sign controller upon request.

(4) Characters Displayed

The signs shall be capable of displaying ASCII characters 32 through 126 (including all upper and lower case letters and digits from 0 to 9) at any location in a message line. The display area shall be 64 pixels high by 288 pixels wide.

The sign shall normally display 12-inch characters using double-stroke (15 x 10) characters with three-column spacing between characters. The operator shall be able to change the default spacing between characters. The spacing options shall be one, two or three pixel columns. Font access privileges shall be assigned by the system supervisor.

The full matrix display shall be capable of displaying other sized character, graphics/symbols, and other number of lines depending on the height of the character utilized.

The separation between the last column of one module and the first column of the next shall be equal to the horizontal distance between the columns of a single display module. The separation between the last row of one module and the first row of the next shall be equal to the horizontal distance between the rows of a single display module.

12-inch characters shall be legible under all light conditions at a distance of 600 feet within a 30 degree cone of vision centered on the optical axis of the pixel. The cone perimeter shall be defined by its 50% intensity points.

The sign shall be the proper brightness in all lighting conditions for optimum legibility. It shall be bright enough to have a good target value, but not be the point where the pixels bloom, especially in low ambient light level conditions.

The brightness and color of each pixel shall be uniform over the entire face of the sign within the 30 degree cone of vision from 600 feet to 200 feet in all lighting conditions. Non-uniformity of brightness or color over the face of the sign under these conditions shall be cause for rejection of the sign.

(5) Display of Graphic Images

The DMS control software shall support the inclusion of graphics in messages. If the NTCIP 1203 v2 standard has not reached a "recommended" or "approved" state by the time of contract award, the vendor shall support graphics using manufacturer-specific objects and MULTI tags.

If a manufacturer-specific means of supporting graphics is used, the vendor shall commit to provide NTCIP 1203 v2 firmware updates at no cost to the customer. These updates will include all current requirements of these specifications and also standard graphics support. The vendor shall install the updates no later than six months after the NTCIP 1203 v2 standard reaches the "approved" state.

Regulated DC Power Supplies

The LED pixel display modules shall be powered with auto-ranging regulated switching power supplies that convert the incoming AC to DC at a nominal voltage of 24 volts DC. Power supplies shall be wired in a redundant parallel configuration that uses multiple supplies for the DMS display matrix.

Power supplies shall be redundant and rated such that if one supply fails, the remaining supply(s) shall be able to operate 100% of the pixels in that display region at 100% brightness when the internal DMS air temperature is +140°F (60°C) or less.

Each power supply shall receive 120VAC power from separate circuits on separate circuit breakers, such that a single tripped breaker will not disconnect power from more than one supply.

The power supplies shall be sufficient to maintain the appropriate LED display intensity throughout the entire operating input voltage range.

The output of each power supply shall be connected to multiple circuits that provide power to the LED modules. Each output circuit shall not exceed 15 amperes and shall be fused.

Each power supply shall be monitored by a microprocessor-controlled circuit. This circuit shall monitor the voltage of each power supply. The power supply voltages shall be reported to the sign controller upon request. The power supplies used to power the LED pixel modules shall be identical and interchangeable throughout the DMS.

Regulated DC power supplies shall conform to the following specifications:

- Nominal output voltage of 24 VDC +/- 10%
- Nominal maximum output power rating of 1000 watts
- Operating input voltage range shall be a minimum of 90 to 260 VAC
- Operating temperature range shall be a minimum of -30°F to +165°F (-34°C to +74°C)
- Maximum output power rating shall be maintained over a minimum temperature range of -30°F to +140°F (-34°C to +60°C)
- Power supply efficiency shall be a minimum of 80%
- Power factor rating shall be a minimum of 0.95
- Power supply input circuit shall be fused
- Automatic output shut down and restart if the power supply overheats or one of the following output faults occurs: over-voltage, short circuit, or over-current
- Power supplies shall be UL listed
- Printed circuit boards shall be protected by an acrylic conformal coating

Photoelectric Sensor Devices

Three (3) photocells shall be installed on the sign. These devices shall permit automatic light intensity measurement of light conditions at each sign location.

These photocells shall be mounted in a manner to measure front, rear and ambient light conditions.

Brightness Control

Automatic adjustment of the LED brightness shall occur in small enough increments so that the brightness of the sign changes smoothly, with no perceivable brightness change between adjacent levels. Provision shall be made to prevent perceivable brightening of the sign due to stray headlights shining upon the photo sensors at night.

Pixel brightness shall be controlled by pulse width modulation of the DC current. The pixel current waveform shall have a frequency of 100 +/-5 Hertz at nighttime brightness levels and 2400 ± 120 Hertz at daytime brightness levels with an adjustable duty cycle of 0.03 to 99.9% in 0.5% or finer increments. Brightness shall be manually settable from the front panel of the controller and remotely from the central computer in 1% increments. Brightness control shall be able to be returned to automatic from the sign controller front panel and the central computer.

Pixel Status Feedback

Two separate types of pixel status feedback shall be provided to the central controller from the local sign controller. These include a pixel test and a pixel read:

Pixel Test: The pixel test shall be performed from the central controller on command and automatically once a day. During a pixel test, the full operational status of each string of LEDs in each pixel shall be tested and then transmitted to the central controller or laptop computer. This pixel status test shall distinguish the difference between half out, full out, half stuck-on and fully stuck-on pixels. A list of defective pixels shall be provided, listing pixel status, line number, module number, column number and row number for each defective pixel. The pixel test may briefly disturb the displayed message for less than 0.5 seconds.

Pixel Read: The pixel read shall be performed during both message downloads and during every sign poll from the central controller or laptop computer. The pixel read shall perform a real-time read of the displayed message and shall return the state of each pixel to the central controller as it is currently displayed to the motorist, including any errors. This shall allow the central controller operator to see what is visibly displayed to the motorist on an individual pixel basis. During a pixel read, the state of each pixel (full-on, half-on or off) in the sign shall be read by the sign controller to allow the central controller or laptop computer to show the actual message, including static flashing and alternating messages, that is visibly displayed on the sign in a WYSIWYG format. This pixel reading shall take place while a message is displayed on the sign without disturbing the message in any way. Any flashing, flickering, blinking, dimming, or other disturbance of the message during this pixel read shall be cause for rejection of the sign.

The pixel read shall be an actual real-time read of the current flowing through each string of LEDs at the time of the associated sign poll or message download and shall not be accomplished by simulating errors based on the last pixel test.

Environmental Operating Parameters

All DMS components shall be capable of operating without any decrease in performance over a temperature range of -40°C (-40°F) to $+70^{\circ}\text{C}$ ($+158^{\circ}\text{F}$) with a relative humidity of up to 95% non-condensing, unless otherwise noted in this specification.

Sign Controller

(1) General Requirements

Each DMS shall be controlled and monitored by its own sign controller. The sign controller shall be a stand-alone microprocessor-based system, which does not require continuous communication with DMS control software in order to perform most DMS control functions.

The sign controller shall meet the following operational requirements:

- Communicate using the NTCIP protocol
- Contain memory for storing changeable and permanent messages, schedules, and other necessary files for controller operation
- Include a front panel user interface with LCD and keypad for direct operation and diagnostics as described herein
- Contain a minimum of three (3) NTCIP-compliant RS232 communication ports
- Contain a minimum of one (1) NTCIP-compliant Ethernet port with RJ45 connector
- Contain DMS-specific control firmware (embedded software) that shall monitor all external and internal sensors and communication inputs and control the display modules as directed by external control software and the front panel interface NTCIP shall be natively supported in the DMS controller. External protocol converter or translator devices shall not be allowed.

(2) Controller Location

The sign controller and associated communication equipment shall be installed inside the DMS housing.

(3) Environmental

The sign controller shall meet the following environmental requirements defined in NEMA Standards Publication TS 4, Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements.

(4) Mechanical and Electrical

The sign controller shall meet the following electrical and mechanical requirements:

- Mount in a standard EIA 19-inch (480 mm) equipment rack with a maximum 4U space requirement
- Weigh no more than 10 pounds, including its enclosure
- Consume no more than 30 watts of power
- Powered by an internal regulated DC power supply capable of operating on 120VAC or 240VAC at both 50Hz and 60Hz
- All printed circuit boards shall be sealed with an acrylic conformal coating

(5) Operational Requirements

Front Panel User Interface

The sign controller's front panel shall include a menu driven, 16 button keypad and a 280x472 graphical LCD. These devices shall be used to perform the following functions with the sign controller and DMS:

- Monitor the current status of the sign controller, including the status of all sensors and a RGB what-you-see-is-what-you-get (WYSIWYG) representation of the message visible on the display face
- Perform diagnostics testing of various system components, including pixels, power systems, sensors, and more
- Activate, create, preview and delete messages stored in memory
- Blank the sign.
- Start and stop the schedule.
- Configure display parameters, including display size and color technology
- Configure date and time.
- Configure communications port settings and NTCIP options
- Configure level of password protection per user.
- Select automatic or manual brightness mode of operation.

The front panel interface shall also include:

- Power switch to turn the controller on and off
- LED power "on" indicator
- Local/remote selection from LCD interfaces.
- LED to indicate when any of the NTCIP communication channels are active

(6) Memory

The sign controller shall have non-volatile electronically changeable memory. This memory shall be formed by flash or battery-backed static RAM integrated circuits that retain the data in memory for a minimum of 30 days following a power loss. This changeable memory shall be used to store messages and schedules. The controller memory shall be capable of storing a minimum of 500 changeable text based messages in non-volatile RAM. There shall be a minimum of 2 GB RAM and 8 GB of storage.

(7) Internal Clock

The DMS sign controller shall contain a computer-readable clock that has a battery backup circuit. The battery shall keep the clock operating properly for at least 5 years without external power, and the clock shall automatically adjust for daylight savings time and leap year using hardware, software, or a combination of both. The clock shall be set electronically by the sign controller microprocessor and shall be accurate to within one (1) minute per month.

(8) Communications

All remote communication ports shall be NTCIP-compatible as defined in the "Requirements for NTCIP Compatibility" section of these specifications.

(9) Communication Modes

The DMS sign controller shall be able to receive instructions from and provide information to a computer containing DMS control software using the following communication modes:

Remotely via direct or dial-up communications with a remotely located computer. The system communications backbone, as well as all field modems or signal converters, shall provide the DMS sign controller with an RS232 signal.

Locally via direct connection with a laptop computer that is connected directly to the sign controller using an RS232 null modem connection.

(10) Serial Communication Ports

The DMS sign controller shall contain a minimum of three (3) NTCIP-compatible RS232 communication ports. These ports shall support multiple communication interfaces, including, but not limited to, direct null-modem (for local laptop control), dial-up and leased-line modems, radio systems, cellular modems, and fiber optic modems. The RS232 ports shall all have standard DB9M connectors.

The baud rate, connection type, and NTCIP communication protocol shall be configurable. Each port must support all typical serial baud rates ranging from 1200 to 115,200 baud. All three ports shall be capable of supporting either of the following sub network profiles: NTCIP 2101 (PMPP) or NTCIP 2103 (PPP). They shall also be capable of supporting either NTCIP 2201 (Null) or NTCIP 2202 (Internet) transport profiles. Only one each of the transport and sub network profiles shall be active at any time on each port.

(11) Ethernet Port

The DMS sign controller shall contain a minimum of one (1) 10/100Base-T Ethernet communication port. This port shall be available for use for communicating from the central control system to the DMS sign controller when an Ethernet network is available. The Ethernet port shall have a standard RJ45 connector.

Communications on the Ethernet port shall be NTCIP-compatible using the NTCIP 2202 Internet transport profile and the NTCIP 2104 Ethernet sub network profile. This shall permit the controller to be operated on any typical Ethernet network using the TCP/IP and UDP/IP protocols.

(12) Controller Addressing

The DMS sign controller shall use whatever addressing scheme is appropriate for the NTCIP network types used for communications. The controller addressing shall be configurable through the front panel user interface.

NTCIP 2101 (PMPP) networks shall be configured with an address in the range 1 to 255 with a default address of 1. NTCIP 2104 (Ethernet) networks shall use a static IP address. Both the IP address and subnet shall be configurable. NTCIP 2103 (PPP) networks shall not require network addressing.

Transient Protection

The DMS and sign controller signal and power inputs shall be protected from electrical spikes and transients as follows:

(1) Sign AC Power

The AC power feed for all equipment in the sign cabinet shall be protected at the panel board by a parallel-connection surge suppresser rated for a minimum surge of 50 kA. This device shall conform to the following requirements:

- Withstand a peak 100,000-ampere surge current, 50kA L-N, 50kA L-G
- Designed, manufactured, & tested consistent with: ANSI/IEEE C62.41.1-2002, C62.42.2-2002, C62.45-2002, NEMA LS-1, NEC 285 and IEC 61643, CE
- Less than 1 nanosecond response time
- Temperature range of -15°F to +140°F (-26°C to +60°C)
- Approximate dimensions of 3-inches (76 mm) wide by 8-inches (203 mm) long by 3- inches (76 mm) high
- High Energy Parallel Design for Category C3 & C-High Application
- UL listed to: UL 1449 Third Edition 200kA & 100kA SCCR

(2) Control Equipment AC Power

- Withstand a peak 100,000-ampere surge current, 50kA L-N, 50kA L-G
- Designed, manufactured, & tested consistent with: ANSI/IEEE C62.41.1-2002, C62.42.2-2002, C62.45-2002, NEMA LS-1, NEC 285 and IEC 61643, CE
- Less than 1 nanosecond response time
- Temperature range of -15°F to +140°F (-26°C to +60°C)
- Approximate dimensions of 3-inches (76 mm) wide by 8-inches (203 mm) long by 3- inches (76 mm) high
- High Energy Parallel Design for Category C3 & C-High Application
- UL listed to: UL 1449 Third Edition 200kA & 100kA SCCR

(3) Communication Signals

Transient voltage surge suppressors shall protect all communication signals connecting to the control equipment from off-site sources using copper cables.

Transient voltage surge suppressors shall protect all copper communication lines used to pass data between the sign controller and sign.

(4) Protection

A series/parallel two-stage suppression device shall protect the modem communication port from over-voltage and over-current conditions. This surge protection shall be integrated internally within the controller.

Local User Auxiliary Interface

(1) Auxiliary Control Panel

The DMS shall include an auxiliary control panel that will provide a secondary user interface panel for DMS control, configuration, and maintenance. The auxiliary control panel shall meet the same electrical, mechanical, and environmental specifications as the DMS controller. It shall be powered independently from a 120 VAC outlet within the junction box. There also shall be a 120 VAC convenience outlet within the junction box for maintenance personnel lap top computers and a hinged shelf which folds from inside the cabinet and is suitable for the laptop computer to rest on.

(2) Interface Panel

The auxiliary control panel shall have an LCD panel and keypad identical to those found on the DMS controller. It shall also contain a local/remote control switch; reset switch, status LEDs, and one NTCIP compatible RS232 communication port that meet the same specifications as the DMS controller.

(3) DMS Control Interface

The auxiliary control panel shall include an identical menu system to the DMS controller with all of its features and functionality.

(4) Location

The Auxiliary Control Panel, receptacle, and hinged shelf shall be installed within a junction box attached to the DMS sign structure as shown in the plans. The junction box shall be measured and paid for separately as JUNCTION BOX, STAINLESS STEEL, ATTACHED TO STRUCTURE, 24" X 24" X 10"; modifications to the junction box required to install the equipment shall be included as part of this pay item.

(5) Controller Signal Interface

The auxiliary control panel shall interface to the DMS controller using outdoor-rated Category 5 copper cable or fiber. It shall be capable of operating up to 4000 feet from the DMS controller.

Sign Controller Functions

The sign controller shall be capable of being controlled from the central controller or the laptop computer.

The controller software shall be capable of performing the following functions: Display a message, including:

1. Static messages
2. Flashing messages
3. Alternating messages

Messages shall be capable of displaying text, graphics or a combination of both. The graphics area shall be downloaded from the central controller with each message.

It shall be possible to separately vary the flashing and alternating frequencies. Flashing messages shall have the following adjustable timing:

1. Message time on from 0.5 to 5.0 seconds in 0.1 second increments.
2. Message time off from 0.5 to 5.0 seconds in 0.1 second increments

It shall be possible to flash any character or set of characters in a static message. Alternating messages shall have the following adjustable timing:

1. Primary message time on from 0.5 to 5.0 seconds in 0.1 second increments.
2. Primary message time off from 0 to 5.0 seconds in 0.1 second increments.
3. Alternative message time on from 0.5 to 5.0 seconds in 0.1 second increments.
4. Alternate message time off from 0 to 5.0 seconds in 0.1 second increments.

It shall be possible to flash any character or set of characters in an alternating message at the adjustable frequencies listed above for flashing messages. The flashing period shall be a sub-multiple of the alternating on-time it is associated with.

Report errors and failures, including:

1. Power failure
2. Power recovery
3. Pixel string failure
4. Fan failure
5. Over a user selectable critical temperature
6. Power supply failure
7. Data transmission error
8. Receipt of invalid data
9. Communication failure recovery

Message and status monitoring:

The sign controller shall respond to the central controller whenever it receives a request for status (a poll). The return message shall be capable of providing the following information:

1. Actual message that is visibly displayed on the sign on an individual pixel basis (full-on, half-on or off)
2. Current sign illumination level
3. Local Control Panel switch position (central, local or local override mode)
4. Error and failure reports
5. Temperature readings
6. LED power supply voltage levels
7. Origin of display message transmission (laptop, manual or central)
8. Heater status
9. Address of sign controller
10. Uninterruptible power supply status
11. AC Surge protection status
12. Communication line protection status
13. Operational status of the following sensors
 - Each temperature sensor
 - Each photocell
 - Each airflow sensor
 - Humidity sensor
 - Each power supply sensor
 - Severe error condition response

Each time the sign controller is polled by the DMS Master Controller or laptop computer, the sign controller shall test the operation status of the sensors listed below and return this information to the DMS Master Controller. This operational status test shall determine if each of the following sensors are functioning properly.

1. Each temperature sensor
2. Each photocell
3. Humidity sensor
4. Each LED power supply

The sign controller shall provide a library with a minimum of 50 permanent messages, consisting of 30 or less characters per line, stored in PROM. The sign controller shall also be able to accept a downloaded library from the central or laptop computer of a minimum of 25 changeable messages stored in non-volatile RAM. These messages may be called for display on the sign from the keypad on the front panel of the DMS Controller.

The sign controller shall also be capable of displaying messages on the sign that are downloaded from the central controller or laptop computer, but are not located in the library stored in non-volatile memory of the sign controller.

The sign shall normally display double stroke (15 x 10) characters with three-column spacing between characters. The sign shall also be able to display single stroke (5 X 7), expanded (6 X 7) or double-stroke (7 X 7) nominal character fonts or change the default spacing between characters. The spacing options shall be one, two or three pixel columns. Each font may be edited and downloaded to the sign controller from the central controller or laptop computer at any time without any software or hardware modifications.

The full matrix display shall also be capable of displaying other sized characters, graphics/symbols, and other number of lines depending on the height of the character utilized. The interline spacing shall be variable.

The sign controller shall monitor the photo cell circuits in the sign and convert the measured light intensity into the desired pixel brightness. The photo circuit readings shall be correlated with a brightness table in the sign controller. The brightness table shall have a minimum of 255 brightness levels. Automatic adjustment of the LED driving waveform duty cycle shall occur in small enough increments so that brightness of the sign changes smoothly, with no perceivable brightness change between adjacent levels. The brightness table in each individual sign controller shall be adjustable from the central controller and can be customized according to the requirements of the installation site. Each sign shall have its own, independent brightness table.

Brightness shall be manually settable from the front panel of the controller and remotely from the central computer in one percent increments from one to 99%.

There shall be a means to adjust how rapidly the sign responds to changes in ambient light as measured by the photocells. This can be used, for example, to prevent the sign from changing its brightness due to a vehicle's headlight momentarily hitting the sign. The adjustment shall be made from the central controller or laptop computer and shall have two different settings, one for daytime control and one for nighttime control, with the day/night ambient light threshold also being an adjustable value. In addition, there shall be a means to specify different weighting factors for each photocell, to specify how prominently each photocell figures in the calculation of nighttime ambient light.

In the event of a power failure, the sign controller shall activate a programmable default message (which shall be a blank message) and shall report the AC power failure to the central controller.

The operational status of each pixel in the sign shall be automatically tested once a day and tested when a pixel test is requested from the central controller or laptop computer. A list of defective pixels shall then be transmitted to the central controller or laptop computer, listing pixel status test shall distinguish the difference between half-out, full-out, half-stuck on and fully stuck-on pixels. This test shall not affect the displayed message for more than 0.5 seconds.

When the sign controller is polled and when messages are downloaded from the central controller or laptop computer, each pixel in the sign shall be read and its current state (full-on, half-on or off), for the currently displayed message, shall be returned to the central controller. This will allow the central controller or laptop computer to show the actual message that is visibly displayed on the sign on an individual pixel basis in a WYSIWYG format. (This is different from the pixel test listed above.) This pixel status read shall not affect the displayed message in any way. The pixel read shall be an actual real-time read of the current flowing through each string of LEDs at the time of the associated sign poll or message download and shall not be accomplished by simulating errors based on the last pixel test.

The operational status of the fans shall be automatically tested once a day and tested on command from the central controller or laptop computer. Any failure will cause an error message to be sent to the central controller or laptop when the sign controller is polled by the central controller or laptop computer.

The sign controller shall read the internal temperature sensors, external ambient temperature sensor and the humidity sensor. The sign controller shall use these readings in an algorithm that turns on the heat tape and/or the fans at the appropriate times to reduce both frost on the face of the sign and condensation on the display modules and other electronic circuitry.

Temperature sensors shall be continuously measured and monitored by the sign controller. A temperature greater than a user selectable critical temperature shall cause the sign message to go to blank and the sign controller shall report this error message to the central controller. This user selectable critical temperature shall be capable of being changed by the central controller or laptop computer. The central controller and laptop computers shall have the ability to read all measurements from the sign controller.

All LED module power supply voltages shall be continuously measured by the sign controller. The sign controller shall provide these voltage readings to the central controller or laptop computer when the sign controller is polled by the central controller or laptop computer.

There shall be no perceivable blinking, flickering or ghosting of the pixels at any time, except during a pixel test as described above. The displayed message will not be affected in any way at any time for the pixel status read as described above.

In the event the central controller fails to communicate with the sign controller within a programmable time limit, the sign shall activate a programmable default message (which shall be a blank). This function shall apply only when the sign controller is in central control mode.

Failure of any sign shall not affect the operation of any other sign in the system.

The sign controller shall perform a consistency check of messages downloaded from the central controller or laptop computer to ensure that the message will fit in the display area of the sign. If any part of the message fails this check, the downloaded message shall not be displayed and an error message shall be displayed on the operator's GUI.

The sign controller internal time clock shall ensure that a message is taken down at the correct time, even in the event of a communications loss.

The sign controller shall allow a moving arrow to be displayed by the central controller or laptop computer. The moving arrow shall be on one line with a standard message on the other lines. The moving arrows shall be from the left or right and shall start from one end or in the middle of the sign and continue to the end of the sign.

The sign controller shall blank the sign in the event of a communication failure or power failure. The controller shall blank the sign if failure lasts greater than 5 minutes. Communication failures are either on the field transmit, field receive, or both.

The sign controller shall have a special function output to control an auxiliary blank-out sign. This shall be a contact closure to ground capable of sinking at least 10 mA. It shall be controlled from the central controller.

The sign controller shall be capable of being remotely reset from the central controller. The system power shall be protected by two stages of transient voltage suppression devices as required in the AC Power Section of this specification. Tripping of each stage (or both if tripped simultaneously) of the surge protection shall cause the sign controller to call central and report the error condition (for dial-up operation) or report the error condition to central on the next poll (for multi-drop operation). There shall be an option that is either enabled or disabled and is selected and downloaded from the central controller to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall prevent power from reaching any components of the sign until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

Communication lines shall be protected by two stages of transient voltage suppression devices as required in the Sign Controller Communication Interface Section of this specification. Tripping of each stage (or both if tripped simultaneously) of the surge protection shall cause the sign controller to call central and report the error condition (for dial-up operation) or report the error condition to central on the next poll (for multi-drop operation). There shall be an option that is either enabled or disabled and is selected and downloaded from the central controller to the sign controller. When this option is enabled, tripping of the second stage of surge protection shall disconnect the communication lines until the surge protection has been replaced. When this option is disabled, tripping of the second stage of surge protection shall disconnect the communication lines until the surge protection has been replaced. When this option is disabled, the sign will continue to function normally after the second stage of surge protection is tripped.

(1) Modes of Operation

The mode of operation determines which level of control governs the DMS message selection.

The three modes of operation are:

Central Mode: The local control panel switch is off and the central controller controls and monitors the sign

Local Mode: The local control panel switch is on and the laptop computer is used to locally control the sign. The central controller only monitors the sign (i.e. status poll).

Local Override: The local mode has been overridden by the central to allow the central to control the sign in case the local control panel switch was unintentionally left in local mode.

(2) AC Power

The signs and their sign controller shall be capable of operating with 120/240 VAC, 15 amp per leg, 60 hertz, single-phase power.

The signs shall have a 50 amp per leg, 120/240 VAC, two-pole load center with 20 circuit capability. Each circuit in the sign shall be powered from a separate circuit breaker.

The system shall be protected by two stages of transient voltage suppression devices including MOVs and spark gap arrestor. If enabled by the central controller, tripping of the second stage shall prevent power from reaching any components of the sign until the surge protection has been replaced. Tripping of each stage of the surge protection shall cause the sign controller to call central and report the error condition (for dial-up operation) or report the error condition to central on the next poll (for multi-drop operation).

(3) Transient Test Requirements

The sign housing electronics and the control cabinet shall be separately capable of withstanding a high-energy transient having the following characteristics repeatedly applied to the AC input terminals:

A ten microfarad oil filled capacitor charged to 1000 VDC \pm 5% shall be discharged into the power input terminals a minimum of three times for each polarity. Immediately following this test, the unit under test shall perform all of its defined functions upon the restoration of normal AC power.

Electronic Materials and Construction Methods

(1) Printed Circuit Boards

Printed Circuit Boards (PCB) design shall be such that components may be removed and replaced without damage to boards, traces or tracks.

Only FR-4 0.062 inch material shall be used. Inter-component wiring shall be copper clad track having a minimum weight of 2 ounces per square foot with adequate cross section for current to be carried. Jumper wires will not be permitted, except from plated-through holes to component. The maximum number of jumper wires allowed per circuit board is two.

All PCBs shall be finished with a solder mask and a component identifier silk screen.

(2) Components

All components shall be of such design, fabrication, nomenclature, or other identification so as to be purchased from a wholesale electronics distributor, or from the component manufacturer, except for printed circuit board assemblies:

Circuit design shall be such that all components of the same generic type, regardless of manufacturer, shall function equally in accordance with the specifications.

All discrete components, such as resistors, capacitors, diodes, transistors, and integrated circuits shall be individually replaceable. Components shall be arranged so they are easily accessible for testing and replacement.

DMS Controller Uninterruptible Power Supply

A UPS shall be provided to allow the sign controller to notify the central controller when an improper power condition at the DMS persists for longer than 30 seconds.

The UPS shall meet the following minimum specifications:

- 1) Line Transient Protection: Passes ANSI/IEEE C62.41 Category A testing
- 2) Safety Compliance: UL listed to UA1778
- 3) EMC Compliance: FCC Class B
- 4) Efficiency:>95% on line
- 5) Capacity VA/Watts @ 0.67P.F.: 425VA/285W
- 6) Voltage Nominal: 120 VAC
- 7) Voltage Range: 100-142 VAC
- 8) Typical run time (minutes): Full load: 3 minutes. Typical load: 5 minutes

- 9) Transfer time: 4 ms typical
- 10) Battery: Sealed, maintenance-free, valve regulated, UL 924 recognized.
- 11) Battery recharge time (to 95% of capacity): 8 hours with output fully loaded
- 12) Over current protection (on line): circuit breaker
- 13) Input fault current (maximum): 15A
- 14) Operating temperature: Range minimum -10°F -140°F (-23°C to 60°C)
- 15) Humidity: 5% - 95% RH (non-condensing)
- 16) Network Interface module

IP Relay

An IP relay and associated 12-28 VDC power supply shall be provided and installed within the sign housing to allow the sign controller and the Ethernet switch to be rebooted remotely. The IP relay shall meet the following minimum specifications:

- 1) Input voltage: 12-28 VDC
- 2) Power Dissipation: 5.8W Max (relays on) <2W idle
- 3) Power Fail Hold-Over: 150ms min. (24V, all relays on)
- 4) Max Switched Power: 8 x 10A at 125 VAC, Fused at 12A
- 5) Dry Contact relays: 8 min.
- 6) Operating temperature: -10°F -140°F (-23°C to 60°C)
- 7) Ethernet Interface: 10/100 autosensing, static IP, TCP port selectable, RJ-45 w/internal FCC filters
- 8) Switches and Controls: Relay select/on/off/cycle, defaults

Ethernet Switch

A Layer II Ethernet switch shall be installed within the sign housing. The Ethernet switch shall be measured and paid for separately as LAYER II (DATALINK) SWITCH.

Fiber Patch Panel

A fiber patch panel shall be provided and installed within the sign housing. The fiber patch panel shall be paid for separately as FIBER OPTIC INTERCONNECT CENTER, 48 PORT. Termination of fiber optic cable(s) as required by the DMS manufacturer for communication between the DMS controller, sign control board, and other sign components shall be incidental to this pay item (DYNAMIC MESSAGE SIGN, FULL MATRIX, COLOR, NTCIP 1203 V2), including additional splice cassettes, cable strain relief/management, and any other ancillary components as required.

CONSTRUCTION REQUIREMENTS

Technical Assistance

The DMS manufacturer's technical representative shall provide on-site technical assistance in following areas:

1. Sign to structure installation
2. Sign controller and junction box attached to sign structure installation
3. Sign to controller cabling

The initial powering up of the sign(s) shall not be executed without the permission of the DMS manufacturer's technical representative.

Installation

The Contractor shall install the DMS on the mounting structure, as noted on the Plans or as per the manufacture's 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 up to the DMS.
- The DMS shall be aligned such that the DMS message can be legible from a minimum of 600 feet.
- All associated conduit, wire, circuit breakers, brackets, etc. as shown on the 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.

Erection Plan

The Erection Contractor shall retain the services of an Illinois Licensed Structural Engineer, experienced in the analysis and preparation of erection plans, for the completion of a project-specific erection plan. The Structural Engineer shall sign and seal the erection plan, drawings, and calculations for the proposed erection.

The erection plan shall be complete in detail for all phases, stages, and conditions anticipated during erection. The erection plan shall include structural calculations and supporting documentation necessary to completely describe and document the means, methods, temporary support positions, and loads necessary to safely erect the structure in conformance with the contract documents and as outlined herein.

- (1) The erection plan and procedure shall provide complete details of the erection process including:
 - A. Falsework, struts, bracing, tie cables and other devices, material properties and specifications for temporary works, requirements prior to releasing the DMS from the cranes (if required), connection details and attachments to other structure components or objects;
 - B. Procedure and sequence of operations, including a schedule with completion times for work items that comply with the working hour limitations;
 - C. Minimum load chart lift capacity, outrigger size and reactions for each crane;
 - D. Locations of cranes, trucks delivering the DMS, and the location of cranes and outriggers relative to other structures, including retaining walls, wingwalls and utilities.
 - E. Calculated loads, lift points, lifting devices, spreaders, and angle of lifting cables.
 - F. Drawings, notes, catalog data showing the manufacturer's recommendations or performance tests, and calculations clearly showing the above listed details, assumptions, and dimensions.
 - G. Contingency plans detailing what measures the Contractor will take in case of inclement weather (forecast or actual), equipment failure, delivery interruption, and slower than planned production.
- (2) The erection plans and procedures shall be submitted to the Engineer for review and acceptance two (2) weeks prior to starting the work. Review and acceptance by the Engineer shall not be construed to guarantee the safety and acceptability of the work.
- (3) Any changes to the erection plan must be reviewed and accepted by the Engineer before implementation.
- (4) Pre-Erection Conference
 - A. A Pre-Erection meeting shall be held at least one week prior to the commencement of erection. The Engineer, Contractor, Erection Contractor, and the Contractor's Engineer shall attend the meeting. The intent of the meeting is to develop a mutual understanding of the proposed implementation of the Contractor's erection plan. Revisions or adjustments to the plan, and potential revisions or adjustment to the implementation of the erection plan shall be discussed.
 - B. Additional Pre-Erection meetings may be required for subsequent phases of construction, or for phases that differ from the original construction plan, as directed by the Engineer. Additional meetings may also be requested by the Contractor and approved by the Engineer.

Testing Requirements

The equipment covered by this specification shall be subjected to design approval tests (DAT), factory demonstration tests (FDT), stand-alone tests, systems tests and 72 hour and 90 day test periods to determine conformance with all the specification requirements. The Engineer may accept certification by an independent testing lab in lieu of the design approval tests to verify that the design approval tests have previously been satisfactorily completed. The DMS vendor shall arrange for and conduct the tests in accordance with the testing requirements stated herein. Unless otherwise specified, the DMS vendor is responsible for satisfying all inspection requirements prior to submission for the Engineer's inspection and acceptance. The contract periods will not be extended for time lost or delays caused by testing prior to final Department approval of any items. The Engineer reserves the right to have his representative witness any and all tests. The results of each test shall be compared with the requirements specified herein. Failure to conform to the requirements of any test shall be counted as a defect, and the equipment shall be subject to rejection by the Engineer. Rejected equipment may be offered again for a retest provided that all non-compliances have been corrected and retest by the DMS vendor and evidence thereof submitted to the Engineer.

Final inspection and acceptance of equipment shall be made after installation at the designated location as shown on the plans, unless otherwise specified herein.

(1) Test Procedures

The DMS vendor shall provide five (5) copies of all design approval, factory demonstration, stand-alone and system test procedures and data forms for the Engineer's approval at least sixty (60) days prior to the day the tests are to begin. The test procedures shall include the sequence in which the tests will be conducted. The test procedures shall have the Engineer's approval prior to submission of equipment for tests.

The DMS vendor shall furnish data forms containing all of the data taken, as well as quantitative results for all tests. The data forms shall be signed by an authorized representative (company official) of the equipment manufacturer. At least one copy of the data forms shall be sent to the Engineer.

The DMS vendor shall be responsible for providing the test fixtures and test instruments for all of the tests.

(2) Design Approval Tests

Design approval tests shall be conducted by the DMS vendor on one or more samples of equipment of each type, as approved by the Engineer, to determine if the design of the equipment meets the requirements of this Specification. The test shall be conducted in accordance with the approved test procedures as described in section 19.0.

If the design approval tests have not previously been satisfactorily completed by an independent testing lab and accepted by the Engineer, the Engineer shall be notified a minimum of thirty (30) calendar days in advance of the time these tests are to be conducted.

The design approval tests shall cover the following:

(3) Temperature and Condensation

The DMS sign system equipment shall successfully perform all the functionality requirements listed in this specification under the following conditions in the order specified below:

- a. The equipment shall be stabilized at -40°F (-40°C). After stabilization at this temperature, the equipment shall be operated without degradation for two (2) hours.
- b. Moisture shall be caused to condense on the equipment by allowing it to warm up to room temperature in an atmosphere having relative humidity of at least 40% and the equipment shall be satisfactorily operated for two (2) hours while wet.
- c. The equipment shall be stabilized at 149°F (65°C). After stabilization, the equipment shall be satisfactorily operated for two (2) hours without degradation or failure.

(4) Primary Power Variation

The equipment shall meet the specified performance requirements when the nominal input voltage is $115\text{ V} \pm 15\text{ V}$. The equipment shall be operated at the extreme limits for at least 15 minutes during which the operational test of the FDT shall be successfully performed.

(5) Power Service Transients

The equipment shall meet the performance requirements, specified in the parent specification, when subjected to the power service transient specified in 2.1.6 "Transient, Power Service", of the NEMA standard TS1. The equipment shall meet the performance requirements specified in the parent specification.

(6) Relative Humidity

The equipment shall meet its performance requirements when subjected to a temperature of 149°F (65°C) and a relative humidity of 90%. The equipment shall be maintained at the above condition for 48 hours. At the conclusion of the 48 hour soak, the equipment shall meet the requirements of the operational test of the FDT within 30 minutes of beginning the test.

(7) Vibration

The equipment (excluding cabinets) shall show no degradation of mechanical structure, soldered components, or plug-in components and shall operate in accordance with the manufacturer's equipment specifications after being subjected to the vibration tests as described in Section 2.2.5, "Vibration Test", of the NEMA standard TS1.

(8) Consequences of Design Approval Test Failure

If the unit fails the design approval test, the design fault shall be corrected and the entire design approval test shall be repeated. All deliverable units shall be modified without additional costs to the Department, to include design changes required to pass the design approval tests.

Factory Demonstration Tests

The DMS vendor shall be responsible for conducting Factory Demonstration Tests on all units at the DMS Vendor's Manufacturing Facility. These tests shall be performed on each unit supplied. The Engineer shall be notified a minimum of sixty (60) calendar days before the start of tests. The DMS Vendor shall pay for all travel expenses, including airfare, rental car, hotel, meals, etc., for up to three (3) department personnel or designated representatives for the Engineer to witness the Factory Demonstration Tests on the first unit at the vendor's manufacturing facility. All tests shall be conducted in accordance with the approved test procedures of Section 17.0. All equipment shall pass the following individual tests:

Examination Tests:

All equipment shall be examined carefully to verify that the materials, design, construction, markings and workmanship comply with the requirements of the Specification.

Continuity Tests:

The wiring shall be checked to determine that it meets the requirements of the appropriate paragraphs in the Specifications.

(1) Operational Test

All equipment shall be operated long enough to permit equipment temperature stabilization, and to check and record an adequate number of performance characteristics to ensure compliance with the requirements of this Specification.

(2) Consequences of Factory Test Failure

If any unit fails to pass its demonstration test, the unit shall be corrected, and another unit substituted in its place and the test successfully repeated.

If a unit has been modified as a result of a demonstration test failure, a report shall be prepared and delivered to the Engineer prior to shipment of the unit. The report shall describe the nature of the failure and the corrective action taken.

If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or extension of the contract period.

Stand-Alone Tests

The DMS vendor shall conduct an approved stand-alone test of the equipment installation at the field site. The test shall, as a minimum, exercise all stand-alone (non-network) functional operations of the field equipment with all of the equipment installed as per the plans, or as directed by the Engineer.

Approved data forms shall be completed and turned over to the Engineer as the basis for review and rejection or acceptance. At least thirty (30) working days' notice shall be given prior to all tests to permit the Engineer or his representative to observe each test.

(1) Consequences of Stand-Alone Test Failure

If any unit fails to pass its stand-alone test, the unit shall be corrected, or another unit substituted in its place and the test successfully repeated.

If a unit has been modified as a result of a stand-alone test failure, a report shall be prepared and delivered to the Engineer prior to the re-testing of the unit. The report shall describe the nature of the failure and the corrective action taken.

If a failure pattern develops, the Engineer may direct that design and construction modifications be made to all units without additional cost to the Department or extension of the contract period.

System Test

The DMS vendor shall conduct approved DMS system tests on the field equipment with the central equipment. The tests shall, as a minimum, exercise all remote control functions and display the return status codes from the controller.

Approved data forms shall be completed and turned over to the Engineer as the basis for review and for rejection or acceptance.

(1) Consequence of System Test Failure

If system tests fail because of any components(s) in the subsystem, the particular components(s) shall be corrected or substituted with other components(s) and the tests shall be repeated. If a component has been modified as a result of the system test failure, a report shall be prepared and delivered to the Engineer prior to retest.

72 Hours and 90 Days Test Failure

After the installation of the DMS system is completed and the successful completion of the System Test, the DMS vendor shall conduct one continuous 72-hour full operating test prior to conducting a 90-day test period. The type of test to be conducted shall be approved by the Engineer, and shall consist primarily of exercising all control, monitor and communications functions of the field equipment by the central equipment.

The 90-day test period shall commence on the first day after the successful completion of the approved 72-hour continuous full operating test period.

During the 90-day test period, downtime, due to mechanical, electrical and/or other malfunctions, shall not exceed five (5) working days. The Engineer may extend the 90-day test period by a number of days equal to the downtime in excess of five (5) working days.

The Engineer will furnish the DMS vendor with a letter of approval stating the first day of the 90-day test period.

Final System Acceptance

Final system acceptance shall be defined as when all work and materials provided for in this item have been furnished and completely installed, and all parts of the work have been approved and accepted by the Engineer and the Dynamic Message Sign System has been operated continuously and successfully for ninety (90) calendar days with no more than five (5) working days downtime due to mechanical, electrical and/or other malfunctions.

Center to Field Communications NTCIP Requirements

This section describes the minimum specifications for the NTCIP communication capabilities of the DMS controller and DMS control software. The contractor shall provide all the software, firmware, and services necessary to operate a dynamic message sign (DMS) system that fully complies with the NTCIP functional requirements specified herein, including incidental items that may have been inadvertently omitted.

References

These specifications reference standards through their NTCIP designated names. The following list provides the current versions of each of these standards.

Each NTCIP device covered by these project specifications shall implement the version of the standard that is specified in the following table. Refer to the NTCIP library at www.ntcip.org for information on the current status of NTCIP standards.

Document Number and Version	Document Title	Document Status
NTCIP 1101:1996 and Amendment 1	Simple Transportation Management Framework (STMF)	Approved Standard with Amendment
NTCIP 1102:2004	Octet Encoding Rules (OER) Base Protocol	Approved Standard
NTCIP 1103 v1.26a	Transportation Management Protocols	Recommended Standard
NTCIP 1201:1996 and Amendment 1	Global Object (GO) Definitions	Approved Standard
NTCIP 1203:1997 and Amendment 1	Object Definitions for Dynamic Message Signs	Approved Standard with Amendment
NTCIP 2001:1996 and Amendment 1	Class B Profile	Approved Standard
NTCIP 2101:2001	Point to Multi Point Protocol (PMPP) Using RS-232 Subnetwork Profile	Approved Standard
NTCIP 2103:2003	Point-to-Point Protocol Over RS-232 Subnetwork Profile	Approved Standard
NTCIP 2104:2003	Ethernet Subnetwork Profile	Approved Standard
NTCIP 2201:2003	Transportation Transport Profile	Approved Standard
NTCIP 2202:2001	Internet (TCP/IP and UDP/IP) Transport Profile	Approved Standard
NTCIP 2301:2001	Simple Transportation Management Framework (STMF) Application Profile	Approved Standard

Table 1: NTCIP Document References

(1) Subnetwork Profiles

Each serial or modem port on each NTCIP device shall be configurable to support both NTCIP 2101 and NTCIP 2103. Only one of these profiles shall be active at any given time. Serial ports shall support external dial-up modems.

Each Ethernet port on the NTCIP device shall comply with NTCIP 2104.

The NTCIP device(s) may support additional Subnet Profiles at the manufacturer's option. At any one time, only one subnet profile shall be active on a given port of the NTCIP device. All response datagram packets shall use the same transport profile used in the request. The NTCIP device shall be configurable to allow a field technician to activate the desired subnet profile and shall provide a visual indication of the currently selected subnet profile.

(2) Transport Profiles

Each serial or modem port on each NTCIP device shall be configurable to support both NTCIP 2201 and NTCIP 2202.

Each Ethernet port on the NTCIP device shall comply with NTCIP 2202.

The NTCIP device(s) may support additional transport profiles at the manufacturer's option. Response datagrams shall use the same transport profile used in the request. Each NTCIP device shall support the receipt of datagrams conforming to any of the supported transport profiles at any time.

(3) Application Profiles

Each NTCIP device shall comply with NTCIP 2301 and shall meet the requirements for Conformance Level 1. An NTCIP device may support additional application profiles at the manufacturer's option. Responses shall use the same application profile used by the request. Each NTCIP device shall support the receipt of application data packets at any time allowed by the subject standards.

(4) Object Support

Each NTCIP device shall support all mandatory objects of all mandatory conformance groups as defined in NTCIP 1201 and NTCIP 1203. Each NTCIP device shall support all mandatory objects in all optional conformance groups required herein. All optional objects listed in these specifications shall be supported. The NTCIP device(s) shall be required to support the following optional conformance groups.

Conformance Group	Reference
Time Management	NTCIP 1201
Timebase Event Schedule	NTCIP 1201
Report	NTCIP 1201
PMPP	NTCIP 1201
Font Configuration	NTCIP 1203
DMS Configuration	NTCIP 1203
MULTI Configuration	NTCIP 1203
MULTI Error Configuration	NTCIP 1203
Illumination/Brightness Control	NTCIP 1203
Scheduling	NTCIP 1203
Sign Status	NTCIP 1203
Status Error	NTCIP 1203
Pixel Error Status	NTCIP 1203

Table 2: Required Optional Conformance Groups

The following table indicates objects that are considered optional in the NTCIP standards but are required by this specification. It also indicates modified object value ranges for certain objects. Each NTCIP device shall provide the full, standardized object range support (FSORS) of all objects required by these specifications unless otherwise indicated below.

Object	Reference	Project Requirement
moduleTable	NTCIP 1201 Clause 2.2.3	Shall contain at least one row with module type equal to 3 (software).
maxTimeBaseScheduleEntries	NTCIP 1201 Clause 2.4.3.1	Shall be at least 28
maxDayPlans	NTCIP 1201 Clause 2.4.4.1	Shall be at least 20
maxDayPlanEvents	NTCIP 1201 Clause 2.4.4.2	Shall be at least 12
maxEventLogConfig	NTCIP 1201 Clause 2.5.1	Shall be at least 50
eventConfigMode	NTCIP 1201 Clause 2.4.3.1	The NTCIP Component shall support the following Event Configuration: onChange, greaterThanValue, smallerThanValue

eventConfigLogOID	NTCIP 1201 Clause 2.5.2.7	FSORS
eventConfigAction	NTCIP 1201 Clause 2.5.2.8	FSORS
maxEventLogSize	NTCIP 1201 Clause 2.5.3	Shall be at least 200
maxEventClasses	NTCIP 1201 Clause 2.5.5	Shall be at least 16
eventClassDescription	NTCIP 1201 Clause 2.5.6.4	FSORS
maxGroupAddresses	NTCIP 1201 Clause 2.7.1	Shall be at least 1
communityNamesMax	NTCIP 1201 Clause 2.8.2	Shall be at least 3
numFonts	NTCIP 1203 Clause 2.4.1.1.1.1	Shall be at least 12
maxFontCharacters	NTCIP 1203 Clause 2.4.1.1.3	Shall be at least 255
defaultFlashOn	NTCIP 1203 Clause 2.5.1.1.1.3	The DMS shall support flash "on" times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultFlashOff	NTCIP 1203 Clause 2.5.1.1.1.4	The DMS shall support flash "off" times ranging from 0.1 to 9.9 seconds in 0.1 second increments
defaultBackgroundColor	NTCIP 1203 Clause 2.5.1.1.1.1	The DMS shall support the black background color
defaultForegroundColor	NTCIP 1203 Clause 2.5.1.1.2	The DMS shall support the amber foreground color
defaultJustificationLine	NTCIP 1203 Clause 2.5.1.1.1.6	The DMS shall support the following forms of line justification: left, center, and right
defaultJustificationPage	NTCIP 1203 Clause 2.5.1.1.1.7	The DMS shall support the following forms of page justification: top, middle, and bottom
defaultPageOnTime	NTCIP 1203 Clause 2.5.1.1.1.8	The DMS shall support page "on" times ranging from 0.1 to 25.5 seconds in 0.1 second increments
defaultPageOffTime	NTCIP 1203 Clause 2.5.1.1.1.9	The DMS shall support page "off" times ranging from 0.1 to 25.5 seconds in 0.1 second increments
defaultCharacterSet	NTCIP 1203 Clause 2.5.1.1.1.10	The DMS shall support the eight bit character set
dmsMaxChangeableMsg	NTCIP 1203 Clause 2.6.1.1.1.4	Shall be at least 100.

dmsMessageMultiString	NTCIP 1203 Clause 2.6.1.1.1.8.3	The DMS shall support any valid MULTI string containing any subset of those MULTI tags listed in Table 3 (below)
dmsControlMode	NTCIP 1203 Clause 2.7.1.1.1.1	Shall support at least the following modes: local, central, and centralOverride
dmsSWReset	NTCIP 1203 Clause 2.7.1.1.1.2	FSORS
dmsMessageTimeRemaining	NTCIP 1203 Clause 2.7.1.1.1.4	FSORS
dmsShortPowerRecoveryMessage	NTCIP 1203 Clause 2.7.1.1.1.8	FSORS
dmsLongPowerRecoveryMessage	NTCIP 1203 Clause 2.7.1.1.1.19	FSORS
dmsShortPowerLossTime	NTCIP 1203 Clause 2.7.1.1.1.10	FSORS
dmsResetMessage	NTCIP 1203 Clause 2.7.1.1.1.12	FSORS
dmsCommunicationsLossMessage	NTCIP 1203 Clause 2.7.1.1.1.12	FSORS
dmsTimeCommLoss	NTCIP 1203 Clause 2.7.1.1.1.12	FSORS
dmsEndDurationMessage	NTCIP 1203 Clause 2.7.1.1.1.15	FSORS
dmsMemoryMgmt	NTCIP 1203 Clause 2.7.1.1.1.16	The DMS shall support the following Memory management Modes: normal andclear Changeable Messages
dmsMultiOtherErrorDescription	NTCIP 1203 Clause 2.4.1.1.1.20	If the vendor implements any vendor-specific MULTI tags, the DMS shall provide meaningful error messages within this object whenever one of these tags generates an error
dmsIllumControl	NTCIP 1203 Clause 2.8.1.1.1.1	The DMS shall support the following illumination control modes: Photocell, and Manual
dmsIllumNumBrightLevels	NTCIP 1203 Clause 2.8.1.1.1.4	Shall be at least 100
dmsIllumLightOutputStatus	NTCIP 1203 Clause 2.8.1.1.1.9	FSORS
numActionTableEntries	NTCIP 1203 Clause 2.9.1.1.1	Shall be at least 200
watcdogFailureCount	NTCIP 1203 Clause 2.11.1.1.1.5	FSORS
dmsStatDoorOpen	NTCIP 1203 Clause 2.11.1.1.1.6	FSORS

fanFailures	NTCIP 1203 Clause 2.11.2.1.1.8	FSORS
fanTestActivation	NTCIP 1203 Clause 2.11.2.1.1.9	FSORS
tempMinCtrlCabinet	NTCIP 1203 Clause 2.11.4.1.1.1	FSORS
tempMaxCtrlCabinet	NTCIP 1203 Clause 2.11.4.1.1.2	FSORS
tempMinSignHousing	NTCIP 1203 Clause 2.11.4.1.1.5	FSORS
tempMaxSignHousing	NTCIP 1203 Clause 2.11.4.1.1.6	FSORS

Table 3: Modified Object Ranges and Required Optional Objects

(5) Multi Tags

Each NTCIP device shall support the following message formatting MULTI tags. The manufacturer may choose to support additional standard or manufacturer-specific MULTI tags.

MULTI Tag	DESCRIPTION
f1	Field 1-time (12 hr)
f2	Field 1-time (24 hr)
f8	Field 8- day of month
f9	Field 9-month
f10	Field 10-2 digit year
f11	Field 11-4 digit year
fl (and /fl)	Flashing text on a line-by-line basis with flash rates controllable in 0.1-second increments.
Fo	Font
jl2	Justification- line-left
jl3	Justification- line-center
jl4	Justification- line- right
jp2	Justification- page- top
jp3	Justification- page- middle
jp4	Justification- page- bottom
mv	Moving text

nl	New line
np	New page up to 5 instances in a message (i.e. up to 6 pages/frame in a message counting first page)
pt	Page times controllable in 0.1-second increments

Table 4: Required MULTI Tags

(6) Documentation

NTCIP documentation shall be provided on a CD-ROM and will contain ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format:

- The relevant version of each official standard MIB modules referenced by the device functionality.
- If the device does not support the full range of any given object within a standard MIB Module, a manufacturer specific version of the official standard MIB Module with the supported range indicated in ASN.1 format in the SYNTAX and/or DESCRIPTION fields of the associated OBJECT TYPE macro. The filename of this file shall be identical to the standard MIB Module except that it will have the extension “man”.
- A MIB module in ASN.1 format containing any and all manufacturer specific objects supported by the device with accurate and meaningful DESCRIPTION fields and supported ranges indicated in the SYNTAX field of the OBJECT-TYPE macros.
- A MIB containing any other objects supported by the device

(7) Acceptance Testing

The vendor will provide certification of NTCIP-compliance as part of the vendor’s pre-build submittal documentation. This certification shall be in the form of a comprehensive test plan and completed test report as performed by either the vendor or a third-party testing agency. The testing shall have been completed using industry accepted test tools such as the NTCIP Exerciser, Trevilon’s NTester, Intelligent Devices’ Device Tester, and/or Frontline’s FTS for NTCIP. Data capture files from the FTS software during the performance of the above testing shall be furnished upon request of the Engineer.

The Engineer can elect to perform additional NTCIP testing if desired. This testing shall be conducted on a production DMS in the vendor’s facility during the factory acceptance test. The vendor shall provide a written NTCIP test procedure to the Engineer a minimum of 30 days prior to the NTCIP testing.

(8) Interpretation Resolution

If the Engineer or DMS manufacturer discovers an ambiguous statement in the standards referenced by this procurement specification, the issue shall be submitted to the NTCIP DMS Working Group for resolution. If the Working Group fails to respond within 90 days, the engineer shall provide an interpretation of the specification for use on the project.

As-Built Documentation

The Contractor shall provide to the Engineer the following documentation of the complete installed equipment prior to testing. Sufficient documentation shall be provided to reflect "as-built" conditions and to facilitate operation, maintenance, modification and expansion of the system or any of its individual components. Manufacturer supplied documentation which covers the intent of this requirement may be used, subject to the approval of the Engineer.

A. Operator's Manuals:

A manual containing a general description and detailed operating and installation instructions shall be provided for each different type or model of equipment. Five hard copies and one electronic copy of the manual shall include the following information:

1. A general description of the equipment including all information necessary to describe the basic use or function of the system components. This shall include a general block diagram presentation of the equipment. Where auxiliary equipment is required, tabular charts shall be included, list such equipment. These charts shall include the nomenclature physical and electrical characteristics and functions of the auxiliary equipment, unless such information is contained elsewhere in an associated manual. In the latter case, a reference shall be made to the location of the information pertaining to the auxiliary equipment.
2. The theory of operation of the system components in a clear, concise manner supported by simplified schematics, logic, data flow diagrams, one-function diagrams, etc. Timing and waveform diagrams and voltage levels shall be shown as required. A logical development shall be used starting with a system block level and proceeding to a circuit analysis. Circuit analysis shall be detailed whenever circuits are not normally found in standard text books. This application of new theoretical concepts shall be fully described. Where the design allows operation in a number of different modes, an operational description of each mode shall be included.
3. In simple, clear language, the routine of operation, from necessary preparations for placing the equipment into operation, to securing the equipment after operation. This section shall contain appropriate illustrations, with the sequence of operations presented in tabular form wherever feasible.
4. The manufacturer's recommended procedures and checks necessary for preventive maintenance. This shall be specified for pre-operation, weekly, monthly, quarterly, semi-annual, annual and "as required" checks as necessary to assure reliable equipment operation. Specification, including tolerances, for all electrical, mechanical, and other applicable measurement, adjustments, or both, shall be listed.

5. Data necessary for isolation and repair of failure or malfunctions, assuming the maintenance technicians to be capable of analytical reasoning using the information provided in the submittal information. Accuracies, limits, and tolerances for all electrical, physical or other applicable measurements shall be described. General instructions shall be included for disassembly, overhaul and reassembly, including shop specifications or performance requirements.
6. Detailed instructions shall be given only where failure to follow special procedures would result in damage to the equipment, improper operation, danger to operating or maintenance personnel. Consumption of excessive person hours, etc. Such instructions and specifications shall be included only for such maintenance as maybe accomplished by specialized technicians and engineers in a modern electromechanical shop. The instructions shall describe special test set-up, components fabrication, the use of special tools, jigs and test equipment.
7. A detailed physical description of size, weight, special mounting requirements, electrical connections, and all other pertinent information necessary for proper installation and use of the equipment shall be provided.
8. The parts list shall contain all information required to describe the characteristics of the individual parts, as required for identification. It shall include a list of all equipment within a group and list all assemblies, sub-assemblies and replacement parts of units. The tabular arrangement shall be an alphanumerical order of the schematic reference symbols and shall give the associated description, manufacturer's name and part number. A table of contents or some other convenient means shall be provided for the purpose of identifying major components, assemblies, etc.
9. Schematic diagrams shall be complete and accurate as required to supplement the text material and to allow the books to be a self-contained technical information source. Maximum size of these diagrams shall be limited to allow their use in close proximity to the equipment, in the class room, etc., part reference symbols, test voltages, waveforms and other aids to understanding of the circuits function shall be included on the diagrams. Test voltages, waveforms and other aids to understanding of the circuits function may be shown on either simplified schematics or other drawings (as required in the above sections) on theory of operation or maintenance or on the schematic diagrams required for this section. The overall scope of information shall not be less, however, than that stated for the schematic diagrams.

B. Software Manuals

The DMS vendor shall provide manuals and data for the computer software system and components thereof. These shall include the following:

1. Computer programmer's manuals and computer user's manuals (5 copies each). Include manuals for any CPU language used by the Contractor for this project. Include instructions for performing a back-up of all software and message libraries.
2. Two original copies of the computer's operating system manual and compiler and assembly language manuals and an instruction manual for translating source to object code.
3. Manufacturer's documentation (including schematics) for all plug-in circuit cards used in the microcomputer chassis.
4. Computer program logic in flow chart form (5 copies).
5. Narrative descriptions of programs and input output formats (5 copies).
6. Two copies of source programs, for master and sign controller software, shall be provided on CD-ROM. An unrestricted license for software use by the Department shall be provided to the Engineer.
7. DMS vendor shall provide the communication protocol used between the DMS master controller and the DMS sign controller for use by the Department without any restrictions.

C. Final Documentation

Final documentation shall reflect all field changes and software modifications and shall be provided before installation. Final documentation shall be approved prior to final system acceptance has begun. This document shall include drawings of conduit layouts, cable diagrams, wiring lists, cabinet layouts, wiring diagrams and schematics for all elements of the communications system. This shall also include detailed drawings identifying by cable type, color-coded function, the routing of all conductors (pairs) in the communications system. Upon completion of the installation, the Contractor shall submit these plans, maps, and/or drawings to reflect an as built condition, incorporating all changes made during installation, such as in pair identification and routing.

Spare Parts Requirements

The Contractor shall provide the following spare parts:

1. Additional parts to create two (2) additional character matrixes.
2. Two (2) load modules to drive a character module.
3. One (1) LED power supply.
4. One complete sign controller unit.
5. One fan for every 5 installed in sign.
6. One photoeye
7. One humidity sensor
8. One RPM sensor
9. One relay for every 10 of each type installed.
10. One fuse and circuit breaker for every size installed.

The cost of additional parts/equipment shall be considered incidental to the price for each DMS.

DMS Training

Operational and maintenance training for the entire system shall be provided to designated personnel during installation, testing and debugging. This training shall be provided through practical demonstrations and other related technical procedures. Training shall be limited to a maximum of 15 people and shall be provided at a time and location approved by the Engineer. The training shall include, but not be limited to, the following:

1. Hands-on operation of all sign control hardware
2. Explanation of all system commands, their function and usage.
3. Insertion of data
4. Required preventative maintenance
5. Servicing procedures
6. System trouble-shooting or problem identification procedures

A minimum of 24 hours of instruction shall be provided for the operational and maintenance procedures for the system. The DMS vendor shall submit an agenda for the training and one complete set of training materials along with the qualification of proposed instructors to the Engineer for approval at least 30 days before the training is to begin. The Engineer will review material and approve or request changes. After approval, the vendor shall provide a minimum of 5 copies of the training material that will become the property of the Department after training period is over.

The DMS vendor shall record the entire training and shall provide the recordings in both DVD and either MP4 or H.264 video format to the Engineer for later use. The training shall be conducted at District One Traffic Systems Center building, after the completion of all system integration tests. The schedule of training sessions shall be established by the DMS vendor, with the approval of the Engineer.

Warranty

The equipment and parts furnished for the DMS and DMS control system shall be new, of the latest model, fabricated under high quality standards.

Equipment and parts furnished for the DMS shall be warranted by the manufacturer to be free of defects in assembly or fabrication and materials for a minimum of five years from the date of acceptance and shall be warranted for quality of work for twelve months from the date of final acceptance. If component manufacturer's warranties are for a longer period, they shall apply. Any parts or equipment found to be defective during the warranty period shall, upon the concurrence of the defect by the manufacturer, be replaced free of charge.

The Engineer shall be furnished with a certification stating that the equipment, parts and material furnished for the DMS and DMS control system complies with all the provisions of this special provision. If there are any items which do not comply with this special provision, then a list of those exceptions shall be detailed on the certification. All manufacturer's warranties and guarantees for the dynamic message sign system shall be transferred to the Department on the date of final acceptance.

Method of Measurement

The DMS FRONT ACCESS, FULL MATRIX, COLOR, NTCIP 1203 V2 shall be paid for at the contract unit price as each which cost shall include the cost of furnishing all labor, materials, documentation, warranties, tools and equipment to install, test, and make the location operational.

Basis of Payment

This work shall be paid for at the contract unit price each for DMS FRONT ACCESS, FULL MATRIX, COLOR, NTCIP 1203 V2 which price shall include furnishing and installing the DMS sign, documentation, warranties, spare parts, training, and diagnostic software as directed by the Engineer.

EXPOSED RACEWAYS (D-1)

Effective: January 1, 2012

Revise the first paragraph of Article 811.03(a) of the Standard Specifications to read:

“General. Rigid metal conduit installation shall be according to Article 810.05(a). Conduits terminating in junction and pull boxes shall be terminated with insulated and gasketed watertight threaded NEMA 4X conduit hubs. The hubs shall be Listed under UL 514B. The insulated throat shall be rated up to 105° C. When PVC coated conduit is utilized, the aforementioned hubs shall also be PVC coated.”

Add the following to Article 811.03(b) of the Standard Specifications:

“Where PVC coated conduit is utilized, all conduit fittings, couplings and clamps shall be PVC coated. All other mounting hardware and appurtenances shall be stainless steel.”
“The personnel installing the PVC coated conduit must be trained and certified by the PVC coated conduit Manufacturer or Manufacturer’s representative to install PVC coated conduit. Documentation demonstrating this requirement must be submitted for review and approval.”

Add the following to Article 1088.01(a) of the Standard Specifications:

“All iron and steel products, which are to be incorporated into the work, including conduit and all conduit fittings, shall be domestically manufactured or produced and fabricated as specified in Article 106.”

Revise Article 1088.01(a)(3) of the Standard Specifications to read:

- a. PVC Coated Steel Conduit. The PVC coated rigid metal conduit shall be UL Listed (UL 6). The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations shall be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to plastic coating shall be UL listed.
- b. The PVC coating shall have the following characteristics:
- c. The exterior and interior galvanized conduit surface shall be chemically treated to enhance PVC coating adhesion and shall also be coated with a primer before the PVC coating to ensure a bond between the zinc substrate and the PVC coating. The bond strength created shall be greater than the tensile strength of the plastic coating.
- d. The nominal thickness of the PVC coating shall be 1 mm (40 mils). The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above -1°C (30°F).

- e. An interior urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2 mil thickness. The interior coating shall be applied in a manner so there are no runs, drips, or pinholes at any point. The coating shall not peel, flake, or chip off after a cut is made in the conduit or a scratch is made in the coating.
- f. Conduit bodies shall have a tongue-in-groove gasket for maximum sealing capability. The design shall incorporate a positive placement feature to assure proper installation. Certified test results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be submitted for review when requested by the Engineer.
- g. The PVC conduit shall pass the following tests:

Exterior PVC Bond test RN1:

Two parallel cuts 13 mm (1/2 inch) apart and 40 mm (1 1/2 inches) in length shall be made with a sharp knife along the longitudinal axis. A third cut shall be made perpendicular to and crossing the longitudinal cuts at one end. The knife shall then be worked under the PVC coating for 13 mm (1/2 inch) to free the coating from the metal.

Using pliers, the freed PVC tab shall be pulled with a force applied vertically and away from the conduit. The PVC tab shall tear rather than cause any additional PVC coating to separate from the substrate.

Boil Test:

Acceptable conduit coating bonds (exterior and interior) shall be confirmed if there is no disbondment after a minimum average of 200 hours in boiling water or exposure to steam vapor at one atmosphere. Certified test results from a national recognized independent testing laboratory shall be submitted for review and approval. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D870, a 6" length of conduit test specimen shall be placed in boiling water. The specimen shall be periodically removed, cooled to ambient temperature and immediately tested according to the bond test (RN1). When the PVC coating separates from the substrate, the boil time to failure in hours shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, a 6" conduit test specimen shall be cut in half longitudinally and placed in boiling water or directly above boiling water with the urethane surface facing down. The specimen shall be periodically removed, cooled to ambient temperature and tested in accordance with the Standard Method of Adhesion by Tape Test (ASTM D3359). When the coating disbonds, the time to failure in hours shall be recorded.

Heat/Humidity Test:

Acceptable conduit coating bonds shall be confirmed by a minimum average of 30 days in the Heat and Humidity Test. The RN1 Bond Test and the Standard Method for Measuring Adhesion by Tape Test shall be utilized.

Exterior Adhesion. In accordance with ASTM D1151, D1735, D2247 and D4585, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. The specimens shall be periodically removed and a bond test (RN1) performed. When the PVC coating separates from the substrate, the exposure time to failure in days shall be recorded.

Interior Adhesion. In accordance with ASTM D3359, conduit specimens shall be placed in a heat and humidity environment where the temperature is maintained at 150°F (66°C) and 95% relative humidity. When the coating disbonds, the time to failure in hours shall be recorded.

Add the following to Article 1088.01(a)(4) of the Standard Specifications:

“All liquid tight flexible metal conduit fittings shall have an insulated throat to prevent abrasion of the conductors and shall have a captive sealing O-ring gasket. The fittings shall be Listed under UL 514B. The insulated throat shall be rated up to 105° C.”

Revise the second paragraph of Article 811.04 of the Standard Specifications to read:

“Expansion fittings and LFNC will not be measured for payment.”

Revise Article 811.05 of the Standard Specifications to read:

“811.05 Basis of Payment. This work will be paid for at the contract unit price per foot for CONDUIT ATTACHED TO STRUCTURE, PVC-COATED GALVANIZED STEEL, of the diameter specified.”

FIBER OPTIC CABLE, SINGLE MODE

Description

This work shall consist of furnishing and installing loose-tube, single-mode, fiber optic cable of the number of fibers shown in the Plans and as directed by the Engineer. The cable shall be capable of being installed via jetting in a conduit system. Trunk and Distribution cables shall be micro-fiber cables capable of being installed in micro-ducts and Lateral cables shall be standard outdoor rated fiber optic cables as specified herein.

Other ancillary components, required to complete the fiber optic cable plant, including but not limited to, moisture and water sealants, cable caps, delineator post, etc., shall be included in the cost of fiber optic cable and will not be paid for separately.

Materials

The single-mode, fiber optic cable shall incorporate a loose, buffer-tube design. The cable shall be an accepted product of the United States Department of Agriculture Rural Utilities Service (RUS) 7 CFR 1755.900 and meet the requirements of ANSI/ICEA Standard for Fiber Optic Outside Plant Communications Cable, ANSI/ICEA S-87-640-1999 for a single sheathed, non-armored cable, and shall be new, unused and of current design and manufacture.

Fibers

The cables shall use dispersion unshifted fibers. The optical and physical characteristics of the un-cabled fibers shall include:

The single-mode fiber shall meet EIA/TIA-492CAAA, "Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers," and ITU recommendation G.652.D, "Characteristics of a single-mode optical fiber cable."

Optical Characteristics				
Requirement			Units	Value
Cabled Fiber Attenuation		1310 nm	dB/km	< 0.4
		1550 nm		< 0.3
Point Discontinuity		1310 nm	dB	< 0.1
		1550 nm		< 0.1
Macrobend Attenuation	Turns	Mandrel OD	dB	
	1	32 ± 2 mm		< 0.05 at 1550 nm
	100	50 ± 2 mm		< 0.05 at 1310 nm
	100	50 ± 2 mm		< 0.10 at 1550 nm
	100	60 ± 2 mm		< 0.05 at 1550 nm
	100	60 ± 2 mm		< 0.05 at 1625 nm
Cable Cutoff Wavelength (X_{cutoff})			nm	< 1260
Zero Dispersion Wavelength (X_0)			nm	1302 < X_0 < 1322
Zero Dispersion Slope (S_0)			ps/(nm ² ·km)	< 0.089
Total Dispersion		1550 nm	ps/(nm·km)	< 3.5
		1285-1330 nm		< 17.5
		1625 nm		< 21.5
Cabled Polarization Mode Dispersion			ps/km ²	< 0.2
IEEE 802.3 GbE – 1300 nm Laser Distance			m	up to 5000
Water Peak Attenuation: 1383 ± 3 nm			dB/km	< 0.4

Cable Construction

Physical Construction			
Requirement	Units	Value	
		144F (Micro)	24F
Cable Diameter	mm	8.6	10.5
Buffer Tube Diameter	mm	1.5	2.5
Minimum Bending Radius (Installation)	mm	170	210
Colored Fiber Nominal Diameter	µm	253 – 259	
Mode Field Diameter (1310 nm)	µm	9.2 ± 0.4	
Mode Field Diameter (1550 nm)	µm	10.4 ± 0.5	

The number of fibers in each cable shall be as specified in the Plans.

Optical fibers shall be placed inside a loose buffer tube. Each buffer tube shall contain up to 12 fibers. The fibers shall not adhere to the inside of the buffer tube.

Each fiber shall be distinguishable by means of color coding in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding." The fibers shall be colored with ultraviolet (UV) curable inks.

Buffer tubes containing fibers shall be color coded with distinct and recognizable colors in accordance with TIA/EIA-598-B, "Optical Fiber Cable Color Coding."

In buffer tubes containing multiple fibers, the colors shall be stable across the specified storage and operating temperature range and shall not be subject to fading or smearing onto each other. Colors shall not cause fibers to stick together.

The buffer tubes shall be resistant to external forces and shall meet the buffer tube cold bend and shrinkback requirements of 7 CFR 1755.900.

Fillers may be included in the cable core to lend symmetry to the cable cross-section where needed. Fillers shall be placed so that they do not interrupt the consecutive positioning of the buffer tubes. In dual layer cables, any fillers shall be placed in the inner layer. Fillers shall be nominally 1.5 mm in outer diameter.

The central member shall consist of a dielectric, glass reinforced plastic (GRP) rod (optional steel central member). The purpose of the central member is to provide tensile strength and prevent buckling. The central member shall be overcoated with a thermoplastic when required to achieve dimensional sizing to accommodate buffer tubes/fillers.

Each buffer tube shall contain a water-swellable yarn for water-blocking protection, or other approved equivalent. The water-swellable yarn shall be non-nutritive to fungus, electrically non-conductive, and homogeneous. It shall also be free from dirt or foreign matter. This yarn will preclude the need for other water-blocking material; the buffer-tube shall be gel-free. The optical fibers shall not require cleaning before placement into a splice tray or fan-out kit.

Buffer tubes shall be stranded around the dielectric central member using the reverse oscillation, or "S-Z", stranding process.

The 24 strand cables shall contain one ripcord under the sheath for easy sheath removal.

Tensile strength shall be provided by the central member, and additional dielectric yarns as required.

The cables shall be sheathed with medium density polyethylene (MDPE). Jacketing material shall be applied directly over the tensile strength members (as required). The polyethylene shall contain carbon black to provide ultraviolet light protection and shall not promote the growth of fungus.

The MDPE jacket material shall be as defined by ASTM D1248, Type II, Class C, Category 4 and Grades J4, E7 and E8.

The jacket or sheath shall be free of holes, splits, and blisters.

The cable jacket shall contain no metal elements and shall be of a consistent thickness.

Cable jackets shall be marked with the manufacturer's name, month and year of manufacture, sequential meter or foot markings, a telecommunication handset symbol as required by Section 350G of the National Electrical Safety Code (NEC), fiber count, and fiber type. The actual length of the cable shall be within -0/+1% of the length markings. The print color shall be white, with the exception that cable jackets containing one or more co-extruded white stripes, which shall be printed in light blue. The height of the marking shall be approximately 2.5 mm.

The maximum pulling tension shall be 1335 N (300 lbf) during installation (short term) and 400 N (90 lbf) long term installed.

The shipping, storage, and operating temperature range of the cable shall be -40°C to +70°C. The installation temperature range of the cable shall be -15°C to +60°C.

General Cable Performance Specifications

The fiber optic cable manufacturer shall provide documentation and certify that the fiber optic cable complies with the following EIA-455-x Fiber Optic Test Procedures (FOTP):

When tested in accordance with FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components," the change in attenuation at extreme operational temperatures (-40°C and +70°C) shall not exceed 0.15 dB/km at 1550 nm for single-mode fiber and 0.3 dB/km at 1300 nm for multimode fiber.

When tested in accordance with FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable," a one meter length of unaged cable shall withstand a one meter static head or equivalent continuous pressure of water for one hour without leakage through the open cable end.

When tested in accordance with FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable," the cable shall exhibit no flow (drip or leak) of filling and/or flooding material at 70°C.

When tested in accordance with FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables," the cable shall withstand a minimum compressive load of 220 N/cm (125 lbf/in) applied uniformly over the length of the sample. The 220 N/cm (125 lbf/in) load shall be applied at a rate of 2.5 mm (0.1 in) per minute. The load shall be maintained for a period of 1 minute. The load shall then be decreased to 110 N/cm (63 lbf/in). Alternatively, it is acceptable to remove the 220 N/cm (125 lbf/in) load entirely and apply the 110 N/cm (63 lbf/in) load within five minutes at a rate of 2.5 mm (0.1 in) per minute. The 110 N/cm (63 lbf/in) load shall be maintained for a period of 10 minutes. Attenuation measurements shall be performed before release of the 110 N/cm (63 lbf/in) load. The change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fibers and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-104, "Fiber Optic Cable Cyclic Flexing Test," the cable shall withstand 25 mechanical flexing cycles around a sheave diameter not greater than 20 times the cable diameter. The change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies," except that the number of cycles shall be two at three locations along a one meter cable length and the impact energy shall be at least 4.4 Nm (in accordance with ICEA S-87-640)", the change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test," using a maximum mandrel and sheave diameter of 560 mm, the cable shall withstand a rated tensile load of 2670N (601 lbf) and residual load of 30% of the rated installation load. The axial fiber strain shall be $\leq 60\%$ of the fiber proof level after completion of 60 minute conditioning and while the cable is under the rated installation load. The axial fiber strain shall be $\leq 20\%$ of the fiber proof level after completion of 10 minute conditioning and while the cable is under the residual load. The change in attenuation at residual load and after load removal shall not exceed 0.15 dB at 1550 nm for single mode fiber and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-85, "Fiber Optic Cable Twist Test," a length of cable no greater than 2 meters shall withstand 10 cycles of mechanical twisting. The change in attenuation shall not exceed 0.15 dB at 1550 nm for single-mode fiber and 0.30 dB at 1300 nm for multimode fiber.

When tested in accordance with FOTP-37, "Low or High Temperature Bend Test for Fiber Optic Cable," the cable shall withstand four full turns around a mandrel of ≤ 20 times the cable diameter after conditioning for four hours at test temperatures of -30°C and $+60^{\circ}\text{C}$. Neither the inner or outer surfaces of the jacket shall exhibit visible cracks, splits, tears, or other openings. The change in attenuation shall not exceed 0.30 dB at 1550 nm for single mode fiber and 0.50 dB at 1300 nm for multimode fiber.

Quality Assurance Provision

All cabled optical fibers > 1000 meters in length shall be 100% attenuation tested. The attenuation of each fiber shall be provided with each cable reel. The cable manufacturer shall be TL 9000 registered.

Packaging

Top and bottom ends of the cable shall be available for testing. Both ends of the cable shall be sealed to prevent the ingress of moisture. Each reel shall have a weather resistant reel tag attached identifying the reel and cable.

The reel tag shall include the following information:

- Cable Number
- Gross Weight
- Shipped Cable Length in Meters
- Job Order Number
- Product Number
- Customer Order Number
- Date Cable was Tested
- Manufacturer Order Number
- Cable Length Markings
 - Top (inside end of cable)
 - Bottom (outside end of cable)

The reel (one flange) marking shall include:

- Manufacturer
- Country of origin
- An arrow indicating proper direction of roll when handling
- Fork lift-handling illustration
- Handling Warnings

Each cable shall be accompanied by a cable data sheet. The cable data sheet shall include the following information:

- Manufacturer Cable Number
- Manufacturer Product Number
- Manufacturer Factory Order Number
- Customer Name
- Customer Cable Number
- Customer Purchase Order Number
- Mark for Information
- Ordered Length

- Maximum Billable Length
- Actual Shipped Length
- Measured Attenuation of Each Fiber

The cable shall be capable of withstanding a minimum-bending radius of 20 times its outer diameter during installation and 10 times its outer diameter during operation without changing the characteristics of the optical fibers.

The cable shall meet all of specified requirements under the following conditions:

- Shipping/storage temperature: -58° F to +158° F (-50° C to +70° C)
- Installation temperature: -22° F to +158° F (-30° C to +70° C)
- Operating temperature: -40° F to +158° F (-40° C to +70° C)
- Relative humidity from 0% to 95%, non-condensing

Optical Connectors

Optical Connectors shall comply with the following:

- Telcordia GR-326-CORE
- Connectors shall be type LC unless noted otherwise in the Plans or as directed by the Engineer
- Maximum attenuation 0.4dB, typical 0.2dB.
- No more than 0.2dB increase in attenuation after 1000 insertions.

Optical Pigtails

Fiber optic pigtails shall comply with the following:

- The pigtails shall consist of a section of single fiber, jacketed cable equipped with a factory installed optical connector on one end and bare on the other.
- The factory installed connector furnished as part of the pigtail shall meet or exceed the requirements for approved connectors specified herein.
- Attenuation of all pigtails will be checked and recorded at the time of installation with an insertion test minimum 5 times checked with an OTDR.
- Pigtails shall be one meter in length.

Optical Jumpers

The optical jumpers shall comply with the following:

- The jumpers shall consist of a section of single fiber, jacketed cable equipped with optical connectors on both ends.
- The factory installed connectors furnished as part of the jumper shall meet or exceed the requirements for approved connectors specified herein.
- Attenuation of all jumpers will be checked and recorded at the time of installation with an insertion test minimum 5 times checked with an OTDR.
- Jumpers shall be 6.5 ft (2 m) in length.

Fiber Optic Splice Closures

Splice closures shall be designed for use under the most severe conditions such as moisture, vibration, impact, cable stress and flex temperature extremes as demonstrated by successfully passing the factory test procedures and minimum specifications listed below:

Physical Requirements. The closures shall provide ingress for up to four cables in a butt configuration. The closure shall prevent the intrusion of water without the use of encapsulates.

The closure shall be capable of accommodating splice organizer trays that accept mechanical or fusion splices. The splice closure shall have provisions for storing fiber splices in an orderly manner, mountings for splice organizer assemblies, and space for excess or unspliced fiber. Splice organizers shall be re-enterable. The splice case shall be UL rated.

Closure re-entry and subsequent reassembly shall not require specialized tools or equipment. Further, these operations shall not require the use of additional parts.

The splice closure shall have provisions for controlling the bend radius of individual fibers to a minimum of 1.5 in.

Splice closures shall be required to pass the following tests:

- Compression Test. The closure shall not deform more than 10% in its largest cross-sectional dimension when subjected to a uniformly distributed load of 1335 N at temperatures of 0 and 100 degrees Fahrenheit. The test shall be performed after stabilizing at the required temperature for a minimum of two hours. It shall consist of placing an assembled closure between two flat parallel surfaces, with the longest closure dimension parallel to the surfaces. The weight shall be placed on the upper surface for a minimum of 15 minutes. The measurement shall then be taken with weight in place.
- Impact Test. The assembled closure shall be capable of withstanding an impact of 28 N-M at temperatures of 0 and 100 degrees Fahrenheit. The test shall be performed after stabilizing the closure at the required temperature for a minimum of 2 hours. The test fixture shall consist of 20 lbs. cylindrical steel impacting head with a 2 in. spherical radius at the point where it contacts the closure. It shall be dropped from a height of 12 in. The closure shall not exhibit any cracks or fractures to the housing that would preclude it from passing the water immersion test. There shall be no permanent deformation to the original diameter or characteristic vertical dimension by more than 5%.

- Cable gripping and sealing testing. The cable gripping and sealing hardware shall not cause an increase in fiber attenuation in excess of 0.05 dB/fiber @ 1550 nm when attached to the cables and the closure assembly. The test shall consist of measurements from six fibers, one from each buffer tube or channel, or randomly selected in the case of a single fiber bundle. The measurements shall be taken from the test fibers before and after assembly to determine the effects of the cable gripping and sealing hardware on the optical transmission of the fiber.
- Vibration Test. The splice organizers shall securely hold the fiber splices and store the excess fiber. The fiber splice organizers and splice retaining hardware shall be tested per EIA Standard FOTP-II, Test Condition 1. The individual fibers shall not show an increase in attenuation in excess of 0.1 dB/fiber.
- Water Immersion Test. The closure shall be capable of preventing a 10 ft. water head from intruding into the splice compartment for a period of 7 days. Testing of the splice closure is to be accomplished by the placing of the closure into a pressure vessel and filling the vessel with tap water to cover the closure. Apply continuous pressure to the vessel to maintain a hydrostatic head equivalent to 10 ft. on the closure and cable. This process shall be continued for 30 days. Remove the closure and open to check for the presence of water. Any intrusion of water in the compartment containing the splices constitutes a failure.
- Certification. It is the responsibility of the Contractor to ensure that either the manufacturer or an independent testing laboratory has performed all of the above tests, and the appropriate documentation has been submitted to the Department. Manufacturer certification is required for the model(s) of closure supplied. *It is not necessary to subject each supplied closure to the actual tests described herein.*

Cable Delineator Post

Cable Delineator post shall be furnished in orange color and incorporate a premium UV inhibitor package to resist harmful effects to the sun. The post shall be capable of withstanding multiple directional impacts and provide a long lasting and extremely durable product requiring little field maintenance. The post shall have a minimum 0.20" wall thickness and shall stand up straight in all weather conditions and self-right to straight upon impact. Top of post shall be permanently sealed, partially flattened, and transition to round to afford 360-degree visibility. The post materials shall include an anchor, a non-mechanical flexible joint, and a round delineator post.

Construction Requirements

Experience Requirements

Personnel involved in the installation, splicing and testing of the fiber optic cables shall meet the following requirements:

- A minimum of three (3) years' experience in the installation of fiber optic cables, including fusion splicing, terminating and testing single mode fibers.
- Install two systems where fiber optic cables are outdoors in conduit and where the systems have been in continuous satisfactory operation for at least two years. The Contractor shall submit as proof, photographs or other supporting documents, and the names, addresses and telephone numbers of the operating personnel who can be contacted regarding the installed fiber optic systems.
- One fiber optic cable system (which may be one of the two in the preceding paragraph), which the Contractor can arrange for demonstration to the Department representatives and the Engineer.

Installers shall be familiar with the cable manufacturer's recommended procedures for installing the cable in micro-duct systems and conduit. This shall include knowledge of splicing procedures for the fusion splicer being used on this project and knowledge of all hardware such as breakout (furcation) kits and splice closures. The Contractor shall be capable of installing fiber optic cable in microduct systems using jetting techniques. The Contractor shall submit documented procedures to the Engineer for approval and to be used by Construction inspectors.

Personnel involved in testing shall have been trained by the manufacturer of the fiber optic cable test equipment to be used, in fiber optic cable testing procedures. Proof of this training shall be submitted to the Engineer for approval. In addition, the Contractor shall submit documentation of the testing procedures and a copy of the test equipment operation manual for approval by the Engineer.

Installation in Raceways

Prior to installation, the Contractor shall provide a Cable-Pulling Plan. The plan shall include the following information:

- Identify where each cable will enter the underground system and the direction each pull or jet.
- Identify locations where the cable is pulled out of a handhole, coiled in a figure eight, and pulled back into the hand-hole.
- The plan shall address the physical protection of the cable during installation and during periods of downtime.
- Identify the location of slack storage locations
- Identify the locations of splices.
- Identify distances between fiber access points and crossings.

The Cable-Pulling Plan shall be provided to the Engineer for approval a minimum of 15 working days prior to the start of installation. The Engineer's approval shall be for the operation on the freeway and does not include an endorsement of the proposed procedures. The Contractor is the technical adequacy of the proposed procedures.

During cable pulling or jetting operations, the Contractor shall ensure that the minimum bending of the cable is maintained during the unreeling and pulling operations. Unless specified otherwise by the fiber optic cable manufacturer, the outside bend radius of the cable during installation shall be no less than 20 times the outside diameter of the fiber optic cable. Entry guide chutes shall be used to guide the cable into the handhole conduit ports. Lubricating compound shall be used to minimize friction. Corner rollers (wheels), if used, shall not have radii less than the minimum installation-bending radius of the cable. A series array of smaller wheels can be used for accomplishing the bend if the cable manufacturers specifically approve the array.

If figure-eight techniques are used during cable installation, the cable shall be handled manually and stored on the ground. The cable shall be placed on tarps to prevent damage from gravel, rocks, or other abrasive surfaces. Tarps should also be used in muddy conditions to keep the cable clean. Enough area to accommodate cable length to be stored and sufficient personnel to maintain the required minimum-bending diameter as well as avoid kinking or otherwise damaging the cable shall be provided. If the cable has been placed in a figure-eight pattern in preparation for a forward feed, the figure-eight must be flipped over to access the outside cable end. Provide sufficient personnel to avoid kinking the cable as the figure-eight is flipped over. When removing the cable from the figure-eight, use care to avoid kinking the cable and violating the minimum-bending diameter.

Power assisted or figure-eight eliminator equipment, which is used to eliminate manual figure-eight procedures, shall not be used unless specifically allowed by the cable manufacturer in writing.

The pulling tension shall be continuously measured and shall not be allowed to exceed the maximum tension specified by the manufacturer of the cable. A dynamometer or in-line tensiometer shall be used to monitor tension in the pull-line near the winch. This device must be visible to the winch operator or used to control the winch. The pulling system shall have an audible alarm that sounds whenever a pre-selected tension level is reached. Tension levels shall be recorded continuously and shall be given to the engineer as well as included in the record drawing package.

The use of a breakaway link (swivel) may be used to ensure that the maximum tension of the cable is not exceeded. Breakaway links react to tension at the pulling eye and shall not be used in lieu of tension measuring devices. All pulling equipment and hardware which will contact the cable during installation must maintain the cable's minimum bend radius. Equipment including sheaves, capstans, bending shoes, and quadrant blocks shall be designed for use with fiber optic cable.

The cable shall be pulled into the conduit as a single component, absorbing the pulling force in all tension elements. The central strength member and Aramid yarn shall be attached directly to the pulling eye during cable pulling. "Basket grip" type attachments, which only attach to the cable's outer jacket, shall not be permitted. A breakaway swivel, rated at 95% of the cable manufacturer's approved maximum tensile loading, shall be used on all pulls. When simultaneously pulling fiber optic cable with other cables, separate grooved rollers shall be used for each cable.

To minimize the exposure of the backbone cable and to facilitate the longer lengths of fiber optic cable, the Contractor shall use a "blown cable" (pneumatically assisted) technique to place the fiber optic cable. A Compressed air cooler shall be used when ambient air temperatures reach 90°F or more.

Where cable is to be pulled through existing conduit which contains existing cables, optical or other, the existing cables shall be removed and reinstalled with the fiber optic cable as indicated in the Plans. The removal of the cable(s) shall be paid for separately. Reinstallation of the existing cables, if indicated in the Plans, along with the fiber optic cable shall be included in this item for payment.

Tracer Wire

A tracer wire shall be installed with all fiber optic cable runs when cable is not placed in a micro-duct system. One tracer wire shall be installed along with the fiber optic cable in each raceway. If a raceway has more than one fiber optic cable, only one tracer wire per raceway is required. If there are parallel raceways, a tracer wire is required in each raceway that contains a fiber optic cable. Tracer wire shall be installed in raceway segments which are metallic to provide a continuous tracer wire system.

The tracer wire shall be a direct burial rated, number 12 AWG (minimum) solid (.0808" diameter), steel core soft drawn high strength tracer wire. The wire shall have a minimum 380 pound average tensile break strength. The wire shall have a 30 mil high density yellow polyethylene (HDPE) jacket complying with ASTM-D-1248, and a 30 volt rating.

Connection devices used shall be as approved by the tracer wire manufacturer, except wire nuts of any type are not acceptable and shall not be used.

The cost of the tracer wire shall be included in the cost of the fiber optic cable and not paid for separately.

Construction Documentation Requirements

The Contractor shall examine the proposed cable plant design. At least one month prior to starting installation of the fiber optic cable plant, the Contractor shall prepare and submit to the Engineer for review and approval, ten (10) copies of the Contractor's "Installation Practices for Outdoor Fiber Optic Cable Systems" manual. This manual shall address the Contractor's proposed practices covering all aspects of the fiber optic cable plant. This submittal shall include all proposed procedures, list of installation equipment, and splicing and test equipment. Test and quality control procedures shall be detailed as well as procedures for corrective action.

Operations and Maintenance Documentation

After the fiber optic cable plant has been installed, ten (10) complete sets of Operation and Maintenance Documentation shall be provided. The documentation shall, as a minimum, include the following:

- Complete and accurate as-built diagrams showing the entire fiber optic cable plant including locations of all splices.
- Final copies of all approved test procedures
- Complete performance data of the cable plant showing the losses at each splice location and each terminal connector.
- Complete parts list including names of vendors.

Testing Requirements

The Contractor shall submit detailed test procedures for approval by the Engineer. All fibers (terminated and un-terminated) shall be tested bi-directionally at both 1310 nm and 1550 nm with both an Optical Time Domain Reflectometer (OTDR) and a power meter with an optical source. For testing, intermediate breakout fibers may be concatenated and tested end-to-end. Any discrepancies between the measured results and these specifications will be resolved to the satisfaction of the Engineer.

Fibers which are not to be terminated shall be tested with a temporary fusion spliced pigtail fiber. **Mechanical splice or bare fiber adapters are not acceptable.**

The Contractor shall provide the date, time and location of any tests required by this specification to the Engineer at least 5 working (7 calendar) days before performing the test. Included with the notification shall be a record drawing of the installed fiber optic cable system. The drawings shall indicate actual installed routing of the cable, the locations of splices, and locations of cable slack with slack quantities identified.

Upon completion of the cable installation, splicing, and termination, the Contractor shall test all fibers for continuity, events above 0.1 dB, and total attenuation of the cable. The test procedure shall be as follows:

A Certified Technician utilizing an Optical Time Domain Reflectometer (OTDR) and Optical Source/Power Meter shall conduct the installation test. The test equipment used shall have been calibrated within the last two years. Documentation shall be provided. The Technician is directed to conduct the test using the standard operating procedures defined by the manufacturer of the test equipment. All fibers installed shall be tested in both directions.

A fiber ring or fiber box shall be used to connect the OTDR to the fiber optic cable under test at both the launch and receive ends. The tests shall be conducted at 1310 and 1550 nm for all fibers.

All testing shall be witnessed by the Engineer and a copy of the test results (CD ROM or USB Drive) shall be submitted on the same day of the test. Hardcopies shall be submitted as herein with copies on CD ROM.

At the completion of the test, the Contractor shall provide copies of the documentation of the test results to the Project Engineer. The test documentation shall be submitted as two bound copies and three CD ROM copies, and shall include the following:

Cable & Fiber Identification:

- Cable ID
- Operator Name
- Cable Location - beginning and end point
- Date & Time
- Fiber ID, including tube and fiber color
- Setup Parameters
- Wavelength
- Range (OTDR)
- Pulse width (OTDR)
- Scale (OTDR)
- Refractory index (OTDR)
- Setup Option chosen to pass OTDR “dead zone”

Test Results shall include:

- OTDR Test results
- Measured Length (Cable Marking)
- Total Fiber Trace
- Total Length (OTDR)
- Splice Loss/Gain
- Optical Source/Power Meter Total Attenuation (dB/km)
- Events > 0.10 dB

Sample Power Meter Tabulation:

Power Meter Measurements (dB)									
Location		Fiber No.	Cable Length (km)	A to B		B to A		Bidirectional Average	
A	B			1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm
		1							
		2							
Maximum Loss									
Minimum Loss									

The OTDR test results file format must be Bellcore/Telcordia compliant according to GR196-CORE Issue 2, OTDR Data Standard, GR 196, Revision 1.0, GR 196, Revision 1.1, GR 196, Revision 2.0 (SR-4731) in a “.SOR” file format. A copy of the test equipment manufacture’s software to read the test files, OTDR and power, shall be provided to the Department.

These results shall also be provided in tabular form, see sample below:

OTDR Summary					
Cable Designation:	TCF-NO-000	OTDR Location:	Pump Sta. 03	Date:	10/11/17
Fiber Number	Event Type	Event Location	Event Loss (dB)		
			1310 nm	1550 nm	
1	Splice	23500 ft.	.082	.078	
1	Splice	25000 ft.	.075	.063	
2	Splice	25000 ft.	.091	.082	
3	Splice	26000 ft.	.072	.061	
3	Bend	27000 ft.	.010	.009	

The following shall be the criteria for the acceptance of the cable:

The test results shall show that the dB/km loss does not exceed +3% of the factory test or 1% of the cable's published production loss. However, no event shall exceed 0.10 dB. If any event is detected above 0.10 dB, the Contractor shall replace or repair the fiber including that event point.

The total loss of the cable (dB), less events, shall not exceed the manufacturer's production specifications as follows: 0.5 dB/km at both 1310 and 1550 nm.

If the total loss exceeds these specifications, the Contractor shall replace or repair the cable run at the no additional cost to the state, both labor and materials. Elevated attenuation due to exceeding the pulling tension, or any other installation operation, during installation shall require the replacement of the cable run at no additional cost to the State, including labor and materials.

Splicing Requirements

All fiber optic cable splices shall be performed using a fusion splicer. Mechanical splicing of fiber optics strands shall not be permitted. After completing a fusion splice, the Contractor shall recoat the fused fibers and install mechanical protection over them. All spliced fibers shall be neatly trained in splice trays housed in splice closures, splice enclosures, or termination panels.

Splicing shall be performed only at locations shown in the approved Cable-Pulling Plan. Any other splices shall be permitted only with the approval of the Engineer. Fiber optic splices at locations shown on the Plans will be paid for under separate pay items. Fiber optic splices and underground splice closures required for end-of-reel splices will not be paid for separately but shall be included cost of FIBER OPTIC CABLE. All splice locations shall be identified in the Record Drawings. **Cable runs which dead-end at a handhole or communications vault shall be dead ended in an underground splice closure.**

Underground splice closures shall be installed according to the manufacturer's recommended guidelines. The Contractor shall prepare the cables and fibers in accordance with the closure and cable manufacturers' installation practices. A copy of these practices shall be provided to the Engineer 21 days prior to splicing operations.

After completing all fusion splices, the Contractor shall secure the splice closure to the side of the communications vault using cable support brackets. All cables shall be properly dressed and secured to rails or racks within the manhole. No cables or enclosures will be permitted to lie on the floor of the splice facility.

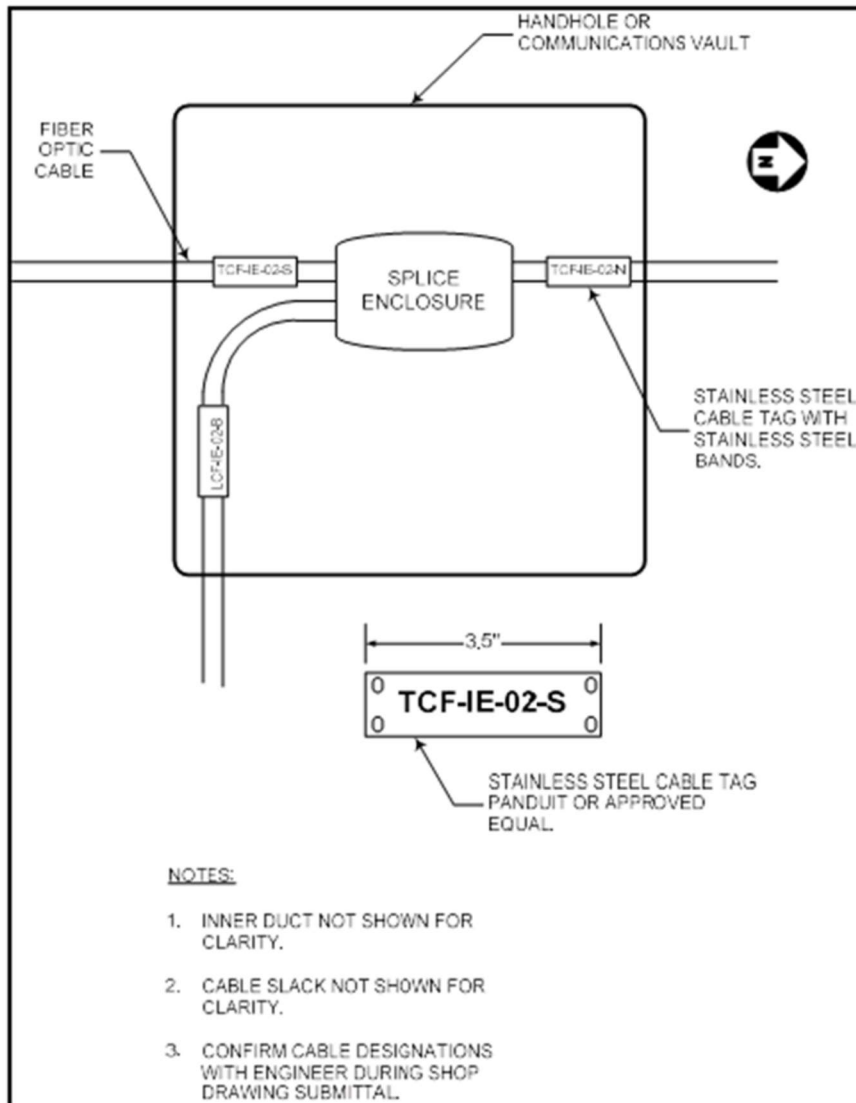
All work shall be neat and in a workmanlike manner. Particular care shall be taken as to not crush or kink the fiber optic cable. If in the opinion of the Engineer the cable has been crushed or kinked, the entire cable span shall be removed and replaced at no additional cost to the Department.

Slack Storage of Fiber Optic Cables

Included as a part of this item, slack fiber shall be supplied as necessary to allow splicing the fiber optic cables in a controlled environment, such as a splicing van or tent. After splicing has been completed, the slack fiber shall be stored underground in handholes or in the raised base adapters of ground mounted cabinets in accordance with the fiber optic cable manufacturer's guidelines. Fiber optic cable slack shall be 100 feet for each cable at each splice location or communication vault, above or below ground. Fiber optic cable slack shall be 50 feet for each cable heavy duty handholes and access points, above or below ground, where splicing is not involved. If the innerduct is cut, the ends of the innerduct should extend beyond the first vertical rack so they can be secured at that point. This slack shall be measured for payment.

Fiber optic cable shall be tagged inside handholes with yellow tape containing the text: "CAUTION - FIBER OPTIC CABLE." In addition, permanent tags, as approved by the Engineer, shall be attached to all cable in a hand-hole or other break-out environment. These tags shall be stainless steel, nominally 0.75" by 1.72", and permanently embossed. These tags shall be attached with stainless steel straps, and shall identify the cable number, the number of fibers, and the specific fiber count. Tags and straps shall be Panduit or approved equal. The Contractor shall label the destination of each trunk cable onto the cable in each handhole, vault, or cable termination panel.

See figure below for labeling diagram:



Delineator Posts

Delineator posts shall be installed to provide warning of the presence of underground fiber optic cable. The post shall be installed at the following locations:

- Device Cabinets
- Communications Vaults
- Conduit bends greater than 30 degrees
- On both ends of a bored run under roadway
- Every 500'

The Contractor shall take care not to drive post through conduit or other utilities that may be in the vicinity. The installation of the post is included as part of the installation of the fiber optic cable and will not be paid for separately.

Method of Measurement

This work will be measured for payment in feet in place. Cable will be measured horizontally and vertically between the changes in direction, including the cable in the vertical conduit riser and any extra cable as specified in this special provision. The cable length in the foundations of a controller cabinet and a vertical pole will be accounted as 3 ft (1 m) each.

Basis of Payment

This work will be paid for at the contract unit price per foot for FIBER OPTIC CABLE of the type and number of fibers and type specified.

FIBER OPTIC INNERDUCT 1 ¼” DIA.

Description

This work shall consist of furnishing, installing, splicing, connecting and demonstrating continuity of fiber optic cable innerduct of sizes specified herein and as shown in the Plans. The innerduct shall be High Density Polyethylene.

Materials

General

The duct shall be a spiral ribbed plastic duct which is intended for underground use and which can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance. The ribbed duct shall have internally designed longitudinal ribs for reduced pulling frictions and increased lubrication effectiveness.

The duct shall be made of high-density polyethylene which shall meet the requirements of ASTM D 3035. The innerduct material shall be composed of high-density polyethylene meeting the requirements of PE334470E/C as defined in ASTM D3350.

Submittal information shall demonstrate compliance with the details of these requirements.

Dimensions

Duct dimensions shall conform to the standards listed in ASTM D3035, SDR-11. Submittal information shall demonstrate compliance with these requirements.

Nominal Size (diameter)	Inside Diameter (minimum)	Outside Diameter (Average)	Wall Thickness (Min.)	Bend Radius (minimum)	Pull Strength	Weight Average (lbs/100ft.)
1.25”	1.313”	1.660”	0.151”	17”	750	31

Marking

As specified in NEMA Standard Publication No. TC-7, the duct shall be clearly and durably marked at least every 10 feet with the material designation (HDPE for high density polyethylene), nominal size of the duct, and the name and/or trademark of the manufacturer.

Color

Innerduct shall be colored as follows or as directed by the Engineer.

Installation

Installation of Fiber Optic Innerduct shall be in accordance with Article 810.04 of the Standard Specifications and as specified herein.

Pulling Tension

Pulling tension of the duct shall be monitored throughout the pull and pulling tension shall not exceed those listed in the table or the specific manufacturer maximum pulling tensions as indicated in the catalog cut submittals. Failure to monitor the pulling tension will result in non-payment of that particular duct span and the span may be reinstalled with new duct at no additional cost to the State. Lubricants used shall be compatible with the duct.

Junction Boxes

Where duct passes through junction and/or pull boxes, the duct shall be cut cleanly and rough edges removed to prevent damage to cable being coiled and stored in the box.

Handholes/Communications Vaults

Where duct passes through handholes or vaults, the duct shall be cut cleanly and rough edges removed to prevent damage to cable being coiled and stored in the handhole or vault.

Bends

Minimum bending radius shall be in accordance with the above table or the manufacturer's recommended radius, whichever is larger. Bends shall be made so that the duct will not be damaged and the internal diameter of the duct will not be effectively reduced. The degrees of bend in one duct run shall not exceed 360° between termination points.

In Trench

The trench shall be closed and the site restored to match the surrounding conditions after all loose stones have been removed and all protruding stones have been removed or covered with backfill material as directed by the Engineer.

Where duct is shown to be installed in trench, it shall be installed at a depth not less than 30 inches unless otherwise indicated in the Plans or specifically directed by the Engineer.

Plowing is allowed in lieu of trench and backfill. Unless otherwise indicated or specifically approved by the Engineer, plowing of inner duct shall lay the duct in place and shall not pull the duct through the length of the cut behind a bullet-nose mandrel or similar apparatus. In all cases, plowing operations shall be non-injurious to the duct. The disturbed surface shall be restored to match the surrounding conditions after completion of conduit installation.

In Raceway

Where duct is installed in raceways, lubricating compounds shall be used where necessary to assure smooth installation.

Post Installation Testing

Innerduct shall be proofed after installation to ensure that the duct is air-tight and can be pressurized to allow future installation of cable via jetting. The Contractor shall conduct the test in the presence of the Engineer and provide a test report upon completion.

Joints

All HDPE duct to HDPE duct joints shall be made with an approved duct fusion splicing device.

HDPE coilable non-metallic conduit to non-HDPE coilable non-metallic conduit joints shall be either made with an approved mechanical connector or with a chemical compound. Both methods must be specifically designed for joining HDPE coilable non-metallic conduit. Minimum pullout force for the chemical compound shall be as listed in the following table.

Nominal Size		Pullout Force	
mm	in	N	Lbs
31.75	1.25	2400	540
38.1	1.50	2535	570
50.8	2.0	3335	750
63.5	2.5	4445	1000
76.2	3.0	6225	1400
101.6	4.0	8890	2000

Method of Measurement

This work will be measured for payment in feet in place. Measurements will be made in straight lines along the centerline of the conduit between ends and changes in direction.

Vertical measurement of the duct shall be as follows:

For runs terminating at junction boxes and/or control cabinets, the vertical measurement will be made from the bottom of the trench, or horizontal raceway, to a point 18 inches beyond the center of the junction box or control cabinet.

For runs terminating at poles, the vertical measurement will be taken from the bottom of the trench, or horizontal raceway, to a point 18 inches beyond the center of the pole handhole.

Basis of Payment

This item will be paid for at the contract unit price per foot for FIBER OPTIC INNERDUCT 1 ¼” DIA.

FIBER OPTIC INTERCONNECT CENTER, 48 PORT

Description

This work shall consist of removal of existing fiber optic interconnect center (FOIC) and replacement with a new FOIC wall-mount or rack-mount in a traffic signal cabinet, as shown on the plans and/or as directed by the Traffic Engineer.

Material

Furnish and install a Corning WCH-02P or CCH-02U interconnect center (or approved equivalent) at locations shown on the plans. Interconnect centers shall be provided with fiber cassettes and blank panels as shown on the plans.

Construction Requirements

The existing FOIC shall be removed and disposed of by the Contractor. Install the FOIC in the cabinet such that it can be re-accessed for future maintenance. Install fiber cassettes and terminate fibers using pre-connectorized pigtails as shown on the plans and according to the “*Terminate fiber in Cabinet*” specification. Mechanical terminations are not acceptable.

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

Basis of Payment

This work will be paid for at the contract unit price per each for FIBER OPTIC INTERCONNECT CENTER, 48 PORT.

FIBER OPTIC SPLICE – LATERAL

Description

This work shall consist of making all fiber optic fusion splices in a communications vault using fiber optic splice closures as shown in the Plans.

Materials

All equipment and ancillary materials needed to make fiber optic fusion splices shall be included in this work. Splice closures shall meet the requirements described in the “*Fiber Optic Cable, Single mode*” specification.

Construction Requirements

The Contractor shall splice fiber optic strands from a lateral cable to a mainline cable as shown in the Plans. Fiber optic splices shall be per the Splicing Requirement section of the “*Fiber Optic Cable, Single Mode*” specification. Upon completing all splicing operations at a location, the Contractor shall test all links per the Testing Requirements section of the “*Fiber Optic Cable, Single Mode*” specification. As directed by the Engineer, the Contractor at no additional cost to the Department shall replace any cable splice not satisfying the required objectives.

All spliced fibers shall be trained in splice trays securely fastened inside of a splice closure. Uncut fibers and buffer tubes shall be coiled neatly in the splice closure. The Contractor shall secure the splice closure to the side of the communication vault using cable support brackets. All cables shall be properly dressed and secured to rails or racks within the communications vault.

Basis of Payment

This work will be paid for at the contract unit price per each for FIBER OPTIC SPLICE – LATERAL.

FIBER OPTIC TRACER CABLE

Effective: May 22, 2002

Revised: July 1, 2015

817.02TS

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

Add the following to Article 817.03 of the Standard Specifications:

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

Add the following to Article 817.05 of the Standard Specifications:

Basis of Payment.

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

GATEWAY INTEGRATION

Description. This work shall consist of software modification to the Gateway Server Interface from the ATMS XML feed, and any modifications required to broadcast this information to the GATEWAY web page and media.

To distribute the DMS sign legends to the media, traffic engineers and the GATEWAY web page, the ATMS data must be integrated into the GATEWAY. The integration software shall utilize the five-minute feeds from the ATMS and translate the data into a format compatible with the existing user interface and distribution processes. The data shall appear to all users in a format identical to existing stations. No operator intervention shall be required to incorporate the data into the GATEWAY.

CONSTRUCTION REQUIREMENTS

Gateway Provider Coordination: The Contractor shall contact and coordinate both the work required and timing of the integration with the Gateway Provider listed below.

John Dillenburg
University of Illinois at Chicago Department of Computer Science (312) 996-5598
dillenbu@uic.edu

This work shall be performed by Gateway Provider.

All software developed for this process shall become the property of the Illinois Department of Transportation.

Basis of Payment. Any charges by the Gateway Provider to integrate the proposed ATMS XML feed into the existing Gateway system will be paid for according to Article 109.05 once final acceptance has been granted as determined by the Engineer.

GROUNDING OF ITS SUBSYSTEMS (TSC T 420#8)

Effective: March 12, 2009

The grounding of ITS subsystems shall meet the requirements of Section 806 of the Standard Specifications. In addition, amend Article 806.03 of the Standard Specifications to include:

General. All ITS subsystems (ramp metering system, dynamic message sign system, system detector stations, etc.), associated equipment, and appurtenances shall be properly grounded in strict conformance with the NEC and as shown on the Plans.

Testing shall be according to Section 801. 13(a)(5) of the Standard Specifications:

The grounded conductor (neutral conductor) shall be white color-coded. This conductor shall be bonded to the equipment-grounding conductor only at the Electric Service installation. All power cables shall include one neutral conductor of the same size as the phase (hot) conductors.

The equipment-grounding conductor shall be green color-coded. The following is in addition to Section 801.04 of the Standard Specifications.

Equipment grounding conductors shall be XLP insulated No. 6, unless otherwise noted on the Plans, and bonded to the grounded conductor (neutral conductor) only at the Electric Service Installation. The equipment-grounding conductor is paid for separately and shall be continuous. The Earth shall not be used as the equipment-grounding conductor.

Equipment grounding connectors shall be bonded, using a listed grounding conductor, to all ramp meters, DMS, and detector cabinets, handholes, and other metallic enclosures throughout the ITS subsystems, except where noted herein. A listed electrical joint compound shall be applied to all conductor terminations, connector threads, and contact points.

All metallic and non-metallic raceways containing ITS circuit runs shall have a continuous equipment grounding conductor, except raceways containing only detector loop lead-in circuits, circuits under 50 volts and/or fiber optic cable will not be required to include an equipment grounding conductor.

The grounding electrode conductor shall be similar to the equipment grounding conductor in color-coding (green) and size. The grounding electrode conductor is used to connect the ground rod to the equipment grounding conductor and is bonded to ground rods via exothermic welding, listed pressure connectors, listed clamps or other approved listed means.

Basis of Payment. Payment shall be included in the various items associated with ITS.

IDOT COMMUNICATIONS NODE

Description

This work shall consist of furnishing, installing, and testing a Communications Node site per the Plans. The Communications Node site shall consist of a concrete foundation and two Model 334 cabinets. One cabinet shall house fiber optic termination equipment and environmentally hardened layer III network switches (Network Cabinet) and one cabinet shall house a power panel and UPS with batteries (Power Cabinet).

The work shall include installing any necessary hardware (entering conduits, bolts, anchor rods, grounding, etc.), network equipment, and power equipment as shown in the Plans. This work shall also include any topsoil, fertilizing, seeding, and mulching of the disturbed areas in accordance with Sections 211, 250, and 251 of the Standard Specifications as well as sidewalk repair.

Materials

Concrete Foundation

Concrete foundations shall be according to materials defined in Article 836.02 of Section 836 of the Standard Specifications. All anchor bolts shall be in accordance with Section 1006.09 of the Standard Specifications except that all anchor bolts shall be hot dipped galvanized the full length of the anchor bolt including the hooks. Anchor bolts shall provide bolt spacing as shown in the Plans and as required by the cabinet manufacturer.

The Concrete foundations shall also be fabricated in accordance with Section 1070 of the Standard Specifications. These concrete foundations shall be fabricated from material new and unused in any previous application. The manufacturer shall provide a Certificate of Compliance that the materials are new and meet the specified requirements in accordance with the Standard Specifications and as shown in the Plans.

Model 334 Cabinets

Cabinet, Model 334 shall be a durable, weatherproof enclosure, constructed of 3/16 in. (4.75mm) thick aluminum or 1/8 inch (3.175 mm) thick aluminum lined with bullet resistant fiberglass panels that shall be UL listed and tested for UL752 Level 3 with a nominal thickness of 1/2 inch (12.7mm) maximum, and a nominal weight of 5.0 lbs. per square foot (24.5 kg per square meter) maximum. The cabinet shall have a nominal outside dimension of 66 in. (1.7m) height x 24 inches (600mm) wide X 30 inches (762mm) deep. Cabinet, Model 334 shall consist of the following components: double door each equipped with a Corbin # 2 Brass lock or equal for front and rear cabinet entry, housing, mounting cage, power distribution assembly, service panel, thermostatically controlled fan, and all necessary mounting hardware and wiring, and other equipment, as shown in the Plans and specified in these special provisions.

All bolts, nuts, washers, screws, hinges, and hinge pins that are subject to corrosion shall be stainless steel unless otherwise specified. All equipment under this item shall be in accordance with Section 1074.03 of the Standard Specifications except as modified herein.

Cabinet Components

The housing and the mounting cage assembly shall conform to those of the Model 334 cabinet provisions of the "Traffic Signal Control Equipment Specifications" (TSCES) issued by the State of California, Department of Transportation, and to all addenda thereto current at the time of project advertising. The housing shall be rainproof with the top of the enclosure crowned to prevent standing water. All exterior seams for the enclosure and doors shall be continuously welded and shall be smooth. The housing shall have no provisions for a police panel or door.

The cabinet shall have single front and rear doors, each equipped with a Corbin # 2 lock. The enclosure door frames shall be double flanged out on all 4 sides and shall have strikers to hold tension on and form a firm seal between the door gasketing and the frame. The front and rear doors shall be provided with catches to hold the door open at both 90 and 180 +/- 10 degrees. Gasketing shall be provided on all door openings and shall be dust-tight. For horizontal support and bolt attachment, cage bottom support mounting angles shall be provided on either side, level with the bottom edge of the door.

The latching handles on the doors shall have provisions for padlocking in the closed position. When the door is closed and latched, the door shall be locked. The locks and handles shall be on the right side of the front door and the left side of the rear door. The lock and lock support shall be rigidly mounted to the door. The locks shall be Corbin #2 and two keys shall be supplied to the Department with each lock. The keys shall be removable in the locked position only.

The front and rear doors shall be provided with louvered vents. A removable and reusable air filter shall be housed behind the door vents. The filter filtration area shall cover the vent opening area, and the filter shell shall be provided that fits over the filter providing mechanical support for the filter. The shell shall be louvered to direct the incoming air downward.

The intake (including filter with shell) and exhaust areas shall pass a minimum of 60 cubic feet (1.7 cubic meters) of air per minute for housing #1 and 26 cubic feet (0.74 cubic meters) of air per minute for housing #2. The thermostatically controlled fan with ball or roller bearings shall be mounted within the housing and vented. The fan shall provide a capacity of at least 150 cubic feet (4.25 cubic meters) of free air delivery per minute of ventilation. The fan shall be thermostatically controlled and activated when the temperature inside the cabinet exceeds 75° F (24° Celsius) and shut off when the temperature is less than 64° F (18° Celsius). In addition, the fan shall be manually adjustable for automatic turn on and off. The fan circuit shall be protected at 125% of the fan motor ampacity.

All subassemblies shall be mounted in removable 19 in. (482 mm) EIA self-standing rack assemblies. The EIA rack portion of the cage shall consist of 2 pairs of continuous, adjustable equipment mounting angles that comply with Standard EIA RS-310-B. The cage shall be centered within the cabinet and bolted to the cabinet at 4 points.

Each cabinet shall be equipped with 2 shelves. Shelves shall be the full width of the rack and 12 in. (300mm) deep. The shelves shall be designed to support a minimum of 50 lbs. (23 kg).

The power distribution assembly shall be as shown in Plans and shall consist of input files that are common to both Model 332 and 336 type cabinets and provides 9 AC outputs and up to 28 isolated inputs. The power distribution assembly shall consist of the following: one 30A, 120V main circuit breaker; three 15A, 120V single pole secondary circuit breakers; eight standard 117 VAC controller and equipment receptacles; and one duplex, 3-prong, NEMA GF1 Type 5-15R grounded utility type outlet.

Rating of breakers shall be shown on face of breaker or handle. Breaker function shall also be labeled below breakers on front panel. The first equipment receptacle in the circuit shall have ground-fault circuit interruption as defined in the NEC. Circuit interruption shall occur on 6 mA of ground-fault current. All conductors from the power distribution assembly routed to the cabinet wiring shall be connected to the terminal block on the common side, except for the AC power conductor between the service terminal block and main circuit breaker. All internal conductors terminating at the blocks shall be connected to the other side of the blocks.

Two side panels shall be provided and mounted on the cabinet sidewalls. In viewing from the front door, the left side panel shall be designated as the "Input/Communications" and the right side panel shall be designated as the "Service Panel". The panel shall be drilled and tapped, as necessary, to mount the terminal blocks and other attachments described herein, as well as to mount the panel to the cabinet wall.

The terminal blocks shall be barrier type rated at 20 A 600 V RMS minimum. The terminal screws shall be nickel-plated brass binder head type with screw inserts of same material. The terminals of the power line service terminal block shall be labeled "AC+, AC-, and AC GND", and shall be covered with a clear insulating material to prevent inadvertent contact. Terminating lugs large enough to accommodate No. 2 conductors shall be furnished for the service terminal block. The terminal block shall be rated for 50 A at 600 V peak, minimum.

The power distribution assembly shall also protect the equipment powered by the assembly from power transients. Over voltage protection shall be provided for the power distribution assembly and shall contain, as a minimum, a surge arrestor, which shall reduce the effect of power line voltage transients and be mounted to the service panel. The arrestor shall have the following minimum features:

Recurrent Peak Voltage:	184 V
Energy Rating (Minimum):	50 J
Power Dissipation, Average:	0.85 W
Peak Current for pulses less than 7 microseconds	1250 A
Stand-by Current for 60 Hz Sinusoidal:	1mA or less

Each cabinet shall be equipped with one LED lighting fixture mounted to the inside top front portion of the cabinet. The fixture shall have an cool white color. A door-activated switch shall be installed to turn the cabinet light on when the front door is opened. The door switch shall be on a separate circuit by itself and used only to turn on the cabinet light.

Each cabinet shall be supplied with a heavy-duty plastic envelope to store plans, wiring diagrams, schematics, etc. This envelope shall have metal grommets so that it hangs from the door hooks. The envelope shall have minimum dimensions of 10 in. (250mm) x 15 in. (381mm).

Disconnect Switch

The power cabinets shall be provided with a disconnect switch to allow for the ability to cut off power to the cabinet and associated devices without having to open the cabinet. Disconnect switches shall be:

- 1) 30A, 2-Pole, 120/240V rated for cabinets not at DMS locations.
- 2) NEMA 4X rated
- 3) Non-fusible
- 4) Lockable

Identification

The IDOT Communications Node shall be identified and labeled with external markings as specified in Article 1069.06 of the Standard Specifications and as shown in the Plans.

UPS

The UPS shall be internal to the Model 334 cabinet and shall be specified herein. UPS shall have the capacity to operate the Ethernet switches for 8 hours. The UPS shall have a network interface module for communicating UPS status to the Ethernet switch described below. The UPS shall meet the following minimum specifications:

1. Safety Compliance: UL listed to UL1778
2. Efficiency: >95% on line
3. Voltage Nominal: 120 VAC
4. Voltage Range: 100-142 VAC
5. Typical Run Time (minutes): Full load: 8 hours
6. Transfer Time: 4 ms, typical
7. Battery: Sealed, maintenance-free, valve-regulated.
8. Battery Recharge Time (to 95% of capacity): 8 hours with output fully loaded
9. Over-Current Protection (Online): circuit breaker
10. Operating Temperature Range: -10°F to +140°F
11. Humidity: 5% to 95% RH (non-condensing)

The UPS and its batteries shall be rack-mountable..

The Contractor shall submit calculation sheets, accompanied by manufacturer's data sheet listing the power requirements of critical components, as support materials for justifying the UPS sizing choices. The Contractor shall use worst-case power-load data for the calculations.

Layer III (Network) Switch

The Contractor shall provide two (2) Layer III Ethernet switches with all necessary hardware and software to make the switches operational and be compatible with IDOT's existing network. The switches shall meet the material requirements set for in the *Layer III Network Switch* specification.

The Contractor shall also furnish matching 10G transceivers for installation at IDOT network switches outside the project limits at the Hillside Tower Hub and Nordic Tower Hub as shown on the Plans.

Fiber Optic Interconnect Center

The Contractor shall provide up to four (4) rack mountable fiber optic interconnect centers capable of terminating a 144 strand fiber optic cable. The number per location shall be as shown on the plans. The fiber optic interconnect center shall:

- (a) Have the capacity to accommodate all fibers from the entering fiber optic cables.
- (b) be capable of being installed in TIA standard 19" racks.
- (c) be aluminum material per ATSM B209, powder coated, and modular design.
- (d) be supplied with splice cassettes capable of terminating 12 fibers per cassette.
- (e) have the tray capacity to accommodate immediate fusion splices and future splices of the
- (f) have provisions for cable strain-relief
- (g) have pull out labels for administrative documentation

An additional fiber optic interconnect center capable of terminating 48 strands of fiber optic cable shall be provided at locations shown on the plans. This interconnect center shall meet the requirement of the "*Fiber Optic Interconnect Center, 48 Port*" specification.

Construction Requirements

Concrete Foundation

The dimensions of the foundation shall be per the node cabinet details shown in the Plans.

The Engineer will determine the final placement of the concrete foundations. Concrete foundation dimensions shall be in accordance with those dimensions shown on the Plans. The foundation shall be located as required in order to avoid existing and relocated utilities. The top of the foundation shall be finished level. Shimming of the appurtenance to be attached will not be permitted.

Prior to pouring the foundation, the Contractor shall check the Plans for the specific number, size, and direction of conduit entrances required at the given location. All conduit in the foundation shall be installed rigidly in place before concrete is deposited in the form. Bushings shall be provided at the ends of the conduit. Anchor rods and ground rod shall be set in place before the concrete is deposited by means of a template constructed to space the anchor rods according to the pattern of the bolt holes in the base of the appurtenance to be attached. The appurtenance shall not be erected on the foundation until the bases have cured for at least (7) days. The Concrete shall cure according to Article 1020.13 of the Standard Specifications.

The Contractor shall restore areas that have been disturbed or temporarily graded to their original condition. The cost of seeding the restored areas is included in this pay item.

Model 334 Cabinets

The cabinets shall be installed on a cabinet riser as shown in the Plans. The two cabinets shall be connected by two (2) 4-inch galvanized steel conduits that will allow fiber jumpers to pass between cabinet. The conduit entries shall be sealed against water and animal entry. The Contractor shall submit shop drawings of the proposed cabinet, cabinet riser, and foundation attachment details to the Engineer for approval prior to installation.

The Contractor shall deliver the Cabinet Model 334 mounted on a plyboard-shipping pallet that is bolted to the cabinet base. The cabinet shall be enclosed in a slipcover cardboard packaging shell. The housing doors shall be blocked to prevent movement during transportation to the site.

The Contractor shall securely fasten the Cabinet Model 334 on the new concrete foundation at the locations shown in the Plans. The Contractor shall confirm the orientation of the Cabinet Model 334 installation and its front door side with the Engineer prior to installation. Stainless steel bolted connections shall be provided with lock-washers, locking nuts, or other approved means to prevent the connection nuts from backing off. Dissimilar materials shall be isolated from one another by stainless steel fittings.

The Contractor shall make all power connections to the cabinet in accordance with the Plans and as required. The neutral bus shall be isolated from the cabinet and equipment ground. It shall terminate at the neutral lug ultimately attached to the meter pedestal. All conductors used in cabinet wiring shall terminate with properly sized non-insulated (if used, for DC logic only) or clear insulated spring-spade type terminals except when soldered to a through-panel solder lug on the rear side of the terminal block or as specified otherwise. All conductors, except those which can be readily traced, shall be labeled. Labels attached to each end of the conductor shall identify the destination of the other end of the conductor. Cabling shall be routed to prevent conductors from being in contact with metal edges. Cabling shall be arranged so that any removable assembly may be removed without disturbing conductors not associated with that assembly.

All equipment in the cabinet, when required, shall be clearly and permanently labeled using marker strips. The marker strips shall be made of material that can be easily and legibly written on using a pencil or ballpoint pen. Marker strips shall be located immediately below the item that they are to identify and must be clearly visible with the items installed.

Testing

Cabinet Acceptance Test – in addition to the environmental and design approval tests specified in the FHWA Type 170 Traffic Signal control System Hardware Specification, the following water spray test shall be performed for each type of cabinet:

Spray water from a point directly overhead at an angle of 60° from the vertical axis of the cabinet. Repeat for each of eight equally spaced positions around the cabinet for a period of five minutes in each position. The water shall be sprayed using a domestic type sprinkling nozzle at a rate of not less than 10 gal./min (40 liters/min) per square foot (0.1 meters) of surface area. The cabinet shall then be inspected for leakage. Evidence of water leakage shall be cause for rejection.

Operational Standalone Test: The operational standalone test for each Cabinet, Model 334 installed shall consist of the following:

Visual inspection of the cabinet and its contents for workmanship

Verification of the cabinet grounding in accordance with Article 1074.03 (a)(4) of the Standard Specifications

Measurement of the voltage at the input panel

Documentation

Shop drawings and wiring lists showing the proposed layout of each type of cabinet shall be submitted to the Engineer for approval prior to the start of fabrication. Wiring lists for the internal manufacturer cut sheets for all electrical equipment included in each type of cabinet shall be included in the submission.

Four copies of drawings showing the wiring for each cabinet shall be provided. One copy shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

For each cabinet, four copies of a configuration of the equipment reporting to that cabinet shall be provided. The sheet shall also list field settable options for the equipment contained in the cabinet. This shall include device addresses and output voltage settings for power supplies. One of these copies shall be placed in the clear plastic envelope furnished as part of the cabinet. The other three copies shall be delivered to the Engineer.

Warranty

The Contractor shall warranty all materials and workmanship including labor for a period of two years after the completion and acceptance of the installation, unless other warranty requirements prevail. The warranty period shall begin when the Contractor completes all construction obligations related to this item and when the components for this item have been accepted, which shall be documented as the final completion date in the construction status report. The warranty shall warrant and guarantee repair of the component parts of the Cabinet Model 334 furnished by the Contractor that prove to be defective in workmanship and materials during the first two years of operation as defined and noted above at no additional cost to the Department.

The Engineer will notify the Contractor that a warranted item needs repair. The Contractor shall acknowledge the notification within 24 hours and replace or correct any part or parts of materials and equipment that are found defective within the two-year in-service warranty period. All items needing repair shall be returned to the Department in two weeks from the date of receipt at the Contractor's facility or replaced in-kind by the Contractor, and the Contractor shall be responsible for any return shipping costs. No compensation will be made to the Contractor for such replacements or corrections.

The Contractor shall provide a warranty certificate for this item and its related components to the Department. The Department reserves the right to transfer this service to other parties who may be contracted with in order to provide overall maintenance of this item.

Node Equipment

Installation

The Contractor shall install the UPS, batteries, and power panel equipment in the Power Cabinet as shown in the Plans and as directed by the Engineer. UPS shall be connected inline between the Ethernet switches and cabinet power supply in order to provide clean power that is backed up by a battery system.

Network switches, interconnect centers, patch cords, connectors, power cables, and other ancillary materials required shall be installed in the Network Cabinet as shown in the Plans, relevant equipment specifications, or as approved by the Engineer. All fiber optic cable strands entering the cabinet shall be terminated on patch panels per the construction section of the "*Fiber Optic Cable, Single Mode*" specification. The Contractor shall create a backplane connection between the network switches using a manufactured recommend stacking cable to ensure the switches operate as a single unit.

Configuration Design Document

A configuration design document shall be submitted within 60 days after contract award. It shall be prepared by a designer with a minimum of CCNP certification – and shall include proof of currently active CCNP credentials. The document shall contain actual configuration files for each switch to be delivered under this Contract.

The configuration design document is required to be accepted the Engineer prior to beginning any physical device configuration. High level guidance (IP Scheme / VLANs / routing protocols, etc.) will be provided by IDOT. Contractor shall coordinate with IDOT Electric Maintenance Contractor's Network Administrator for proper set up and IP configuration.

Integration

The Layer III switches shall be integrated by the Contractor into the IDOT D1 field network per the approved configuration document. Configuration, integration, functionality, and compatibility with the existing network are the responsibility of the Contractor.

Basis of Payment

This work will be paid for at the contract unit price per each for ILLINOIS DEPARTMENT OF TRANSPORTATION COMMUNICATIONS NODE.

LAYER II DATALINK SWITCH

Description

This work shall consist of furnishing and installing a Layer II Ethernet switch in traffic signal controller cabinets or ITS device cabinets.

Materials

The Layer II switch shall be environmentally hardened with a minimum of (2) 1-Gbps SFP ports and (8) 100-Mbps copper RJ-45 ports. Two SFP ports shall be populated with environmentally hardened optical modules of the type indicated on the plans and specified herein. An environmentally hardened power supply with input of 120 VAC and sufficient wattage for the switch shall be provided.

The switch shall conform to the following minimum specifications:

- Forwarding Bandwidth 3.8Gbps
- Switching Bandwidth 7.6Gbps
- Forwarding rate: 5.66Mpps with 64-byte packets (Line-rate at all packet sizes)
- Egress buffer: 2 MB
- Unicast MAC addresses: 8000
- Internet Group Management Protocol (IGMP) multicast groups: 255
- Virtual LANs (VLANs): 1005
- IPv4 MAC security ACEs: 384 (default Ternary Content-Addressable Memory [TCAM] template)
- Bidirectional, 128 NAT translation entries
- IPv4 routing: 3500 routes, IPv6 routing: 1750 routes
- Layer 2 switching: IEEE 802.1, 802.3, 802.3at, 802.3af standard (see Table 8), VTPv2, NTP, UDLD, CDP, LLDP, Unicast MAC filter, Resilient Ethernet Protocol (REP), Media Redundancy Protocol (MRP) Ring (IEC 62439-2)
- Security: SCP, SSH, SNMPv3, TACACS+, RADIUS Server/Client, MAC Address Notification, BPDU Guard, SPAN session
- Multicast: IGMPv1, v2, v3 Snooping, IGMP filtering, IGMP Querier

- Safety certifications:
 - UL/CSA 60950-1
 - EN 60950-1
 - CB to IEC 60950-1 (with country deviations)
 - NOM to NOM-019-SCF1 (through partners and distributors)
 - CE Marking
- Hazard location:
 - ANSI/ISA 12.12.01 (Class1, Div2 A-D)
 - EN 60079-0, -15 ATEX Certificate (Class 1, Zone2 A-D)
- EMC emissions and immunity compliance:
 - FCC 47 CFR Part 15 Class A
 - EN 55022A Class A
 - VCCI Class A
 - RoHS compliance
 - AS/NZS CISPR 22 Class A, AS/NZS CISPR 24
 - CISPR11 Class A, CISPR22 Class A
 - ICES 003 Class A
 - CE Marking
 - IEC/EN/EN61000-4-2 (Electro Static Discharge), 15kV air/8kV contact
 - IEC/EN 61000-4-3 (Radiated Immunity, 10 and 20 V/m)
 - IEC/EN 61000-4-4 (Fast Transients - 4kV power line, 4kV data line)
 - IEC/EN 61000-4-5 (Surge 2 kV/1 kV)
 - IEC/EN 61000-4-6 (Conducted Immunity, 10 V/emf)
 - IEC/EN 61000-4-8 (Power Frequency Magnetic Field Immunity)
 - IEC/EN 61000-4-9 (Pulse Magnetic Field Immunity)
 - IEC/EN 61000-4-10 (Oscillatory Magnetic Field Immunity)
 - IEC/EN 61000-4-11 (AC power Voltage Immunity)
 - IEC/EN 61000-4-29 (Voltage Dips Immunity)
 - IEC/EN 61000-6-1 (Immunity for Light Industrial Environments)
 - IEC/EN 61000-6-2 (Immunity for Industrial Environments)
 - IEC/EN 61000-6-4 Class A
 - EN 61326
- Shock and vibration:
 - IEC 60068-2-27 (Operational Shock: 30G 11ms, half sine)
 - IEC 60068-2-27 (Non-Operational Shock 55-70G, trapezoidal)
 - IEC 60068-2-6, IEC 60068-2-64, EN 61373 (Operational Vibration)
 - IEC 60068-2-6, IEC 60068-2-64, EN 61373 (Non-operational Vibration)

- Industry standards:
 - UL508
 - CSA C22.2 No. 142
 - EN 61131-2 (EMC/EMI, environmental, mechanical)
 - Substation KEMA (IEEE 1613, IEC 61850-3)
 - EN50121-3-2
 - EN50121-4
 - NEMA TS-2 (EMC, environmental, mechanical)
 - ABB Industrial IT certification
 - IP30
 - ODVA Industrial Ethernet/IP support
- Corrosive testing:
 - ISO-12944-6
 - IEC-60068-2-60
- Humidity:
 - IEC 60068-2-52 (salt fog mist, test Kb) marine environments
 - IEC 60068 -2-3
 - IEC 60068-2-30
 - Relative humidity: 5% to 95% non-condensing
- Operating temperature:
 - -40C to +70C (vented enclosure - 40 LFM Air Flow)
 - -40C to +60C (sealed enclosure – 0 LFM Air Flow)
 - -34C to +75C (fan or blower-equipped enclosure – 200 LFM Air Flow)
 - -40C to +85C (IEC 60068-2-2 Environmental Type Testing – 16 hours)
- Operational altitude: Up to 15,000 ft
- Storage temperature:
 - -40 C to +85 C (storage temperature)
 - IEC 60068-2-14
- Storage altitude: Up to 15,000 ft
- Mean time between failure: 374,052 hours (42.7 years)
- Warranty: Five-year

The Cisco IE-2000-8TC-G-B Industrial Ethernet Switch is compliant with this specification. Other manufacturers that comply with this specification are allowed with Department approval. The fiber optic transceivers installed in the switch shall be from the same manufacturer as the switch. Fiber optic transceiver types shall be as called out on the plans and shall be the following models or approved equal.

- GLC-LX-SM-RGD [1 Gbps single mode duplex transceivers for links under 10 km)
- GLC-ZX-SM-RGD [1 Gbps single mode duplex transceivers for links over 10 km)

Construction Requirements

Installation

The Layer II switch and its power supply shall be mounted to either a standard DIN rail or an equipment mounting channel in the cabinet. The power supply shall be hard-wired to the cabinet power, not plugged into one of the traffic signal cabinet power outlets. The Contractor shall submit a shop drawing showing the location where the switch will be installed in the cabinet and the means of mounting for approval by the Engineer.

Configuration Design Document

A configuration design document shall be submitted within 60 days after contract award. It shall be prepared by a designer with a minimum of CCNP certification – and shall include proof of currently active CCNP credentials. The document shall contain actual configuration files for each switch to be delivered under this Contract.

The configuration design document is required to be accepted the Engineer prior to beginning any physical device configuration. High level guidance (IP Scheme / VLANs / routing protocols, etc.) will be provided by IDOT. Contractor shall coordinate with IDOT Electric Maintenance Contractor's Network Administrator for proper set up and IP configuration.

Integration

The Layer II switch shall be integrated by the Contractor into the IDOT D1 field network per the approved configuration document. Configuration, integration, functionality, and compatibility with the existing network are the responsibility of the Contractor.

Basis of Payment

This work will be paid for at the contract unit price per each for LAYER II (DATA LINK) SWITCH, the price of which shall include all equipment, materials, and labor required to furnish, configure and install the switch, including all necessary connectors, cables, fiber optic jumpers, hardware, software, and other peripheral equipment required to place the switch in operation to the satisfaction of the Engineer.

LAYER III NETWORK SWITCH

Description

This work shall consist of furnishing and installing a Layer III Ethernet switch in traffic signal controller cabinets or ITS device cabinets.

Materials

The Layer III switch shall be environmentally hardened with a minimum of (12) 1 Gbps SFP ports, and (12) 1 Gbps copper RJ-45 ports, and (4) 10 Gbps SFP ports. SFP ports shall be populated with environmentally hardened optical modules of the type indicated on the plans and specified herein. An environmentally hardened power supply with input of 120 VAC and sufficient wattage for the switch shall be provided.

The switch shall conform to the following minimum specifications:

- (A) Management Capabilities
 - (1) Switches shall support full-duplex Ethernet
 - (2) Switches shall be capable Layer 2 LAN Base services
 - (3) Switches shall have American Standard Code for Information Interchange (ASCII) based configuration files for offline editing and bulk configuration
 - (4) Switches shall be managed using Simple Network Management Protocol (SNMP) Version 3.
 - (5) Switches must be able to use Secure File Transfer Protocol (SFTP) to transfer configuration file to and from a central server.
 - (6) Switches shall be compliant with IEEE 802.1 and 802.3. Specifically, the switch must comply with the following IEEE 802.1 standards:
 - (a) IEEE 802.1D - Media Access Control (MAC) Bridges, including Rapid Spanning Tree Protocol (RSTP).
 - (b) IEEE 802.1Q - Virtual Local Area Network (VLAN) tagging and Multiple Spanning Tree Protocol (MSTP).
 - (c) IEEE 802.1X (Port Based Network Access Protocol).
 - (7) Switches shall perform multicast filtering using Internet Group Management Protocol (IGMP) snooping.
 - (8) Switches shall support Address Resolution Protocol (ARP)
 - (9) Switches shall support the following Layer 3 capabilities:
 - (a) Internet Protocol Version 4 (IPv4);
 - (b) Internet Protocol Version 6 (IPv6);
 - (c) Open Shortest Path First (OSPF);
 - (d) Generic Routing Encapsulation (GRE);
 - (e) Inter-VLAN Internet Protocol (IP) routing for full Layer 3 routing between two or more VLANs;
 - (f) Virtual Router Redundancy Protocol (VRRP);

- (g) IP multicast routing utilizing Protocol Independent Multicast (PIM) and Internet Group Management Protocol, Version 2 (IGMPv2). Support for PIM sparse mode (PIM-SM) and PIM dense mode (PIM-DM);
 - (h) Quality of Service (QoS);
 - (i) Security utilizing Access Control Lists (ACLs).
- (B) Power Requirements
- (1) Input Voltage to Power Supply Modules: 100 to 240 VAC
 - (2) Redundant Power Supplies
- (C) Environmental Requirements
- (1) Operating Temperature: -40° to +75°C
 - (2) Humidity: 0 to 95% (non-condensing)
 - (3) Resistant to electromagnetic interference (EMI)
- (D) Network Port Requirements
- (1) Switches shall have the following minimum port configurations:
 - (a) (12) 10/100/1000 Mbps copper Ethernet ports, RJ-45 connector
 - (b) (12) FE/GE SFP ports
 - (c) (4) 10G SFP ports with SM transceivers, LC connector
 - (2) Contractor shall ensure the launch power of the optical ports is great enough such that when coupled with the receiver sensitivity of the connecting device, the optical budget of the link is not exceeded. The Contractor shall furnish GE transceivers and 10G transceivers to accommodate the number of links shown in the Plans. Provide the following transceivers or approved equivalent.
 - (a) GLC-LX-SM-RGD [1 Gbps single mode duplex transceivers for links under 10 km)
 - (b) GLC-ZX-SM-RGD [1 Gbps single mode duplex transceivers for links over 10 km)
 - (c) SFP-10G-BX40U-I [10 Gbps single mode simplex transceivers)
 - (3) All ports shall have Diagnostic light-emitting diodes (LED). These indicators shall include link, activity, and power LEDs.
- (E) Warranty
- (1) 5 years on all components

The Cisco IE-5000-12S12P-10G Industrial Ethernet Switch is compliant with this specification. Other manufacturers that comply with this specification are allowed with Department approval. The fiber optic transceivers installed in the switch shall be from the same manufacturer as the switch.

Construction Requirements

Installation

The Layer III switch and its power supply shall be mounted in a 19" TIA rack in the cabinet. The power supply shall be hard-wired to the cabinet power, not plugged into one of the traffic signal cabinet power outlets. The Contractor shall submit a shop drawing showing the location where the switch will be installed in the cabinet and the means of mounting for approval by the Engineer.

Configuration Design Document

A configuration design document shall be submitted within 60 days after contract award. It shall be prepared by a designer with a minimum of CCNP certification – and shall include proof of currently active CCNP credentials. The document shall contain actual configuration files for each switch to be delivered under this Contract.

The configuration design document is required to be accepted the Engineer prior to beginning any physical device configuration. High level guidance (IP Scheme / VLANs / routing protocols, etc.) will be provided by IDOT. Contractor shall coordinate with IDOT Electric Maintenance Contractor's Network Administrator for proper set up and IP configuration.

Integration

The Layer III switch shall be integrated by the Contractor into the IDOT D1 field network per the approved configuration document. Configuration, integration, functionality, and compatibility with the existing network are the responsibility of the Contractor.

Basis of Payment

This work not be paid for separately and is included in ILLINOIS DEPARTMENT OF TRANSPORTATION COMMUNICATIONS NODE.

OUTDOOR RATED NETWORK CABLE

Effective: November 1, 2023
887.04TS

Description.

This work shall consist of furnishing and installing a network cable from the traffic signal cabinet to the associated field device as shown on the plans

Materials.

The outdoor rated network cable shall be a black Category 5e cable, meeting the TIA/EIA 568-B.2 telecommunication standards. The cable shall be composed of 24 AWG solid bare copper conductors, twisted pairs, polyolefin insulation, inner LLPE jacket, overall shield (100% coverage), 24 AWG stranded TC drain wire, industrial grade sunlight- and oil-resistant LLPE jacket. The cable shall be capable of performing from -40 °F to 160 °F.

Each end of the cable shall be terminated with an RJ-45 connector installed according to the TIA/EIA 568B standard. The drain wire at the cabinet end shall be terminated with a ring lug and attached to a suitable ground point.

The work shall be performed according to the applicable portions of Section 873 of the "Standard Specifications", and details as shown on the plans.

Basis of Payment.

This work will be paid for at the contract unit price per foot for OUTDOOR RATED NETWORK CABLE, the unit price shall include all equipment, materials and labor required to furnish and install the cable and making all connections necessary for proper operation. The unit price shall also include furnishing and installing the RJ-45 connectors, ring terminals and grounding the cable.

REMOVE FIBER OPTIC CABLE FROM CONDUIT

Description.

This work shall consist of the removal of fiber optic interconnect cable from existing conduit locations shown on plans.

General

The Contractor shall investigate the existing conduit runs to determine the feasibility of removing existing cable and pulling/installing new cable in the existing conduit. If it is determined to be feasible, the existing fiber optic cable shall be removed, as directed by the Engineer, from the conduit. The conduit shall be cleaned and swabbed prior to installation of new fiber optic cable.

Method of Measurement.

The work will be measured for payment in feet. If two or more cable in the conduit are to be removed, each cable will be measured for payment separately.

Basis of Payment.

This work will be paid for at the contract unit price per foot for REMOVE FIBER OPTIC CABLE FROM CONDUIT.

TERMINATE FIBER IN CABINET

Description

This work shall consist of terminating fibers in cabinets as indicated in the Plans. Termination shall consist of splicing a single strand from a fiber optic cable to an optical pigtail in a splice cassette.

Materials

Pigtails and jumpers shall be per the Optical Pigtail section of the "*Fiber Optic Cable, Single Mode*" specification. All equipment and ancillary materials needed to make fiber optic fusion splices between fiber strands and pigtails shall be included in this work.

Construction Requirements

The Contractor shall splice together a fiber optic strand and pigtail as shown in the Plans. Fiber optic splices shall be per the Splicing Requirement section of the "*Fiber Optic Cable, Single Mode*" specification. Upon completing all splicing operations at a location, the Contractor shall test all links per the Testing Requirements section of the "*Fiber Optic Cable, Single Mode*" specification. As directed by the Engineer, the Contractor at no additional cost to the Department shall replace any splice not satisfying the required objectives.

All spliced fibers and pigtails shall be trained in splice cassettes securely fastened inside of a fiber optic interconnect center. Fibers and buffer tubes not terminated shall be coiled neatly in the interconnect center. The ferrule end of the pigtail shall be connected to a patch panel module as shown in the Plans.

Method of Measurement

This work will be paid for at the contract unit price for each fiber terminated and tested in a cabinet.

Basis of Payment

This work will be paid for at the contract unit price each for TERMINATE FIBER IN CABINET.
UNDERGROUND CONDUIT, MULTI-DUCT, 7-18MM MICRODUCTS

Description

This work shall consist of furnishing, installing, splicing, connecting, and demonstrating continuity a of fiber optic micro-duct system of the size specified herein and as shown in the Plans.

Materials

The micro-duct and fittings shall meet the requirements of Article 1088.01(c) of the Standard Specifications, except as modified herein. The conduit system shall consist of 7, 18mm outside diameter (O.D.) 14mm inside diameter (I.D.) micro-ducts contained inside a HDPE or MDPE protective outer sheath with a minimum thickness of 0.07" inch. The conduit system shall be designed for direct burial.

The overall conduit shall have a nominal 2.27" inches outside diameter with a supported bend radius of 30" inches, an unsupported bend radius of 52" inches, and a safe working load of 3,500 lbs.

The anticipated product life shall be a minimum of fifteen years after installation, allowing for jetting (blowing) operations for cable installations and replacements.

Micro-duct shall be free from holes, blisters, inclusions, cracks, or other imperfections that would affect the performance or serviceability of the product.

Micro-duct shall be constructed of polymeric materials, which are lightweight, flexible, corrosion resistant and nonconductive. The base material shall be clean virgin grade high-density polyethylene (HDPE), which conforms to ASTM D3350-98a, Type III, Category 5, Class B or C and Grade P- 34 per ASTM D1248-84 or equivalent.

The base HDPE material shall conform to the following minimum mechanical properties:

Description Property	ASTM Standard	Value
Density	D1505	0.940-0.950 g/cm ³
Melt Index (E)	D1238	0.10 - 0.35 g/10 Minutes
Environmental Stress Crack Resistance (ESCR)	D1693	192.0 hrs (per ASTM D3350)
Tensile @ Yield (min)	D638	2500 - 3200 psi (1,700 - 2,200 N/cm ²)
Elongation	D638	300%
Flexural Modulus (min)	D790	115,000 psi (790,000 kPa)
Hardness	D2240	60 Shore D
VICAT Softening Point	D1525	248°F (120°C)
Brittleness Temperature	D746	-94°F (-70°C)

Micro-ducts shall be smooth on the outside and ribbed on the inside. The inside shall have a co-extruded permanent layer of silicone (or approved equivalent) to provide a permanent low friction boundary layer between the microduct and the fiber optic cable for the anticipated service life of the micro-duct.

Standard available micro-duct colors shall be blue, orange, green, brown, grey, white, and red, or other colors as approved. Micro-Ducts shall be individually colored and be sequentially numbered every two feet. Colors shall be protected from ultra-violet (UV) degradation by the incorporation of Hindered Amine Light Stabilizers (HALS) to allow for two years of outside storage UV protection. The duct material shall be compounded with antioxidant additives to prevent thermal degradation.

All 18/14 mm micro-ducts shall have a minimum safe pull strength of 3500 lbs., a minimum sustained air pressure of 300 PSI, and a minimum burst pressure of 475 PSI.

The micro-duct system shall be equipped with an integrated cable 20 AWG. (minimum) copper wire, insulated, and within the oversheath that is designed to be used for underground utility locating purposes. Continuity of the tracer wire must be maintained at all points. Submittal information shall demonstrate how the tracer wire continuity will be maintained throughout the micro-duct run. Connection devices used shall be as approved by the tracer wire manufacturer, except wire nuts of any type are not acceptable and shall not be used.

The Contractor shall perform a locate or conductivity test as a part of the final documentation.

Micro-duct shall be supplied on 3,500'-foot reels (or larger as equipment and installation techniques permit) in order to minimize the number of conduit splices. Fittings shall be mechanical or glued splices that preserve the smooth, seamless surface on the inside of the conduit. Fittings shall be capable of developing a minimum of 75% of the rated tensile (pull) strength of the conduit.

Construction Requirements

Micro-duct shall be installed according to Section 810 of the Standard Specifications, in accordance with manufacturer's specifications, and as specified herein. All earth disturbed due to trenching, plowing, or direction drilling shall be replaced to match existing conditions prior to conduit installation.

Micro-duct shall be buried 42" inches ($\pm 3"$) below final grade throughout its entire length. Micro-duct shall be installed in straight runs as much as possible with a minimum number of bends according to Section 816 of the Standard Specifications. Any bend in the conduit shall be limited to a bend radius of not less than 20 times the inside diameter of the conduit.

The micro-duct system shall be sealed at all times during construction to eliminate the ingress of dirt and moisture. The Contractor shall utilize caps that are approved for use by the duct manufacturer. All empty micro-ducts shall be capped within communications vaults.

The Contractor shall perform post installation testing on all micro ducts prior to installing fiber optic cable. As a minimum, tests shall include: an air test, a foam sponge test, a plastic sphere test and a pressure test.

The Contractor shall perform acceptance testing of the micro-ducts in accordance with the manufacturer's recommended practices. Testing, at a minimum shall demonstrate that the microducts are installed and assembled correctly and are air-tight. Each microduct shall be pressurized to check for leaks and other problems that would prevent the installation of fiber optic cable in the future. All testing shall be performed in the presence of the Resident Engineer. The Contractor shall submit testing results to the Department. The Contractor shall correct deficiencies to the satisfaction of the Engineer.

The Contractor shall submit testing information to the Department for review and approval prior to ordering material.

A cable marking tape shall be installed above the conduit system according to Article 810 of the Standard Specifications. The color of the tape shall be red with large black lettering which reads "WARNING – FIBER OPTIC CABLE BELOW" or similar.

The Contractor shall locate the micro-duct system every 100' feet using a GIS locating device that is accurate to the nearest foot. The Contractor shall provide a GIS based map of the conduit route (including all communication vaults, junction boxes and splice points) and a complete listing of all of map coordinates in an electronic format. The format shall be compatible for viewing and importing into ArcGIS and Google Earth (kml or kmz). Each communication vault and fiber optic cable splice shall be numbered and clearly labeled when displayed in both software programs.

The Contractor shall submit catalog cut sheets for the communications duct, microducts, splice kits, and all installation and testing documents to the Department for review prior to ordering.

Method of Measurement

This work will be measured for payment in feet in place. Measurements will be made in straight lines along the centerline of the conduit between ends and changes in direction.

Vertical measurement of the duct shall be as follows:

For runs terminating at junction boxes, the vertical measurement will be made from the bottom of the trench, or horizontal raceway, to a point 18 inches beyond the center of the junction box or control cabinet.

Basis of Payment

This work will be paid for at the contract unit price per foot for UNDERGROUND CONDUIT, MULTI-DUCT, 7-18MM MICRODUCTS.

UNDERGROUND RACEWAYS (D-1)

Effective: March 1, 2015

Revise Article 810.04 of the Standard Specifications to read:

“Installation. All underground conduits shall have a minimum depth of 30-inches (700 mm) below the finished grade.”

Add the following to Article 810.04 of the Standard Specifications:

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

Add the following to Article 810.04 of the Standard Specifications:

“All raceways which extend outside of a structure or duct bank but are not terminated in a cabinet, junction box, pull box, handhole, post, pole, or pedestal shall extend a minimum of 300 mm (12”) or the length shown in the Plans beyond the structure or duct bank. The end of this extension shall be capped and sealed with a cap designed for the conduit to be capped.

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

The ends of rigid nonmetallic conduit and coilable nonmetallic conduit shall be capped with a rigid PVC cap of not less than 3 mm (0.125”) thick. The cap shall be sealed to the conduit using a room-temperature-vulcanizing (RTV) sealant compatible with the material of both the cap and the conduit. A washer or similar metal ring shall be glued to the inside center of the cap with epoxy, and the pull cord shall be tied to this ring.”

UNIT DUCT (D-1)

Effective: January 1, 2012

Revise the first paragraph of Article 810.04 to read:

“The unit duct shall be installed at a minimum depth of 30-inches (760 mm) unless otherwise directed by the Engineer.”

Revise Article 1088.01(c) to read:

“(c) Coilable Nonmetallic Conduit.

General:

The duct shall be a plastic duct which is intended for underground use and which can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance. The duct shall be a plastic duct which is intended for underground use and can be manufactured and coiled or reeled in continuous transportable lengths and uncoiled for further processing and/or installation without adversely affecting its properties of performance.

The duct shall be made of high density polyethylene which shall meet the requirements of ASTM D 2447, for schedule 40. The duct shall be composed of black high density polyethylene meeting the requirements of ASTM D 3350, Class C, Grade P33. The wall thickness shall be in accordance with Table 2 for ASTM D 2447.

The duct shall be UL Listed per 651-B for continuous length HDPE coiled conduit. The duct shall also comply with NEC Article 354.100 and 354.120.

Submittal information shall demonstrate compliance with the details of these requirements.

Dimensions:

Duct dimensions shall conform to the standards listed in ASTM D2447. Submittal information shall demonstrate compliance with these requirements.

Nominal Size		Nominal I.D.		Nominal O.D.		Minimum Wall	
mm	in	Mm	in	mm	in	mm	in
31.75	1.25	35.05	1.380	42.16	1.660	3.556 +0.51	0.140 +0.020
38.1	1.50	40.89	1.610	48.26	1.900	3.683 +0.51	0.145 +0.020

Nominal Size		Pulled Tensile	
mm	in	N	lbs
31.75	1.25	3322	747
38.1	1.50	3972	893

Marking:

As specified in NEMA Standard Publication No. TC-7, the duct shall be clearly and durably marked at least every 3.05 meters (10 feet) with the material designation (HDPE for high density polyethylene), nominal size of the duct and the name and/or trademark of the manufacturer.

Performance Tests:

Polyethylene Duct testing procedures and test results shall meet the requirements of UL 651. Certified copies of the test report shall be submitted to the Engineer prior to the installation of the duct. Duct crush test results shall meet or exceed the following requirements:

Duct Diameter		Min. force required to deform sample 50%	
mm	in	N	lbs
35	1.25	4937	1110
41	1.5	4559	1025

CONTRACTOR COOPERATION

It is anticipated that this contract will be constructed concurrently with another project in the same area. The project that may be constructed concurrently with this project is as follows:

***IL 64 at Railroad Avenue – Intersection Improvements
 Cook County Department of Transportation and Highways & Local Roads***

***IL 64 at 19th Avenue – Traffic Signal Modifications
 The Village of Melrose Park***

***IL 64 at 5th Avenue – Traffic Signal Modifications
 The Village of Melrose Park***

***IL 64 between 25th Avenue and 5th Avenue – Street Lighting Improvement
 The Village of Melrose Park***

It is anticipated that a potential source of conflict or inconvenience may result with the possible presence of another contractor working in the same general vicinity.

The Contractor shall schedule their work in order to minimize any conflicts that may arise between contracts as specified in Article 105.08 of the Standard Specifications. No additional compensation will be allowed for delays or inconveniences resulting from activities of other contractors.

COMPLETION DATE PLUS WORKING DAYS (D1)

Effective: September 30, 1985

Revised: January 1, 2007

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

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

The Contractor will be allowed to complete all clean-up work and punch list items within **five (5)** working days after the completion date for opening the roadway to traffic. Under extenuating circumstances the Engineer may direct that certain items of work, not affecting the safe opening of the roadway to traffic, may be completed within the working days allowed for clean up work and punch list items. Temporary lane closures for this work may be allowed at the discretion of the Engineer.

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

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

Effective: December 1, 2011

Revised: May 1, 2013

Revise the first paragraph of Article 670.02 to read:

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

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

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

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

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

Revise the fifth paragraph of Article 670.02 to read:

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

Revise subparagraph (a) of Article 670.02 to read:

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

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

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

Revise subparagraph (d) of Article 670.02 to read:

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

Revise subparagraph (e) of Article 670.02 to read:

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

Revise subparagraph (h) of Article 670.02 to read:

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

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

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

Revise subparagraph (j) of Article 670.02 to read:

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

Revise subparagraph (k) of Article 670.02 to read:

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

Revise subparagraph (l) of Article 670.02 to read:

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

Revise subparagraph (m) of Article 670.02 to read:

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

Add the following subparagraphs to Article 670.02:

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

Add the following to Article 670.07 Basis of Payment.

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

FAILURE TO COMPLETE THE WORK ON TIME (D1)

Effective: September 30, 1985

Revised: January 1, 2007

Should the Contractor fail to complete the work on or before the completion date as specified in the Special Provision for "Completion Date Plus Working Days", or within such extended time as may have been allowed by the Department, the Contractor shall be liable to the Department in the amount of \$2,300, not as a penalty but as liquidated damages, for each calendar day or a portion thereof of overrun in the contract time or such extended time as may have been allowed.

In fixing the damages as set out herein, the desire is to establish a certain mode of calculation for the work since the Department's actual loss, in the event of delay, cannot be predetermined, would be difficult of ascertainment, and a matter of argument and unprofitable litigation. This said mode is an equitable rule for measurement of the Department's actual loss and fairly takes into account the loss of use of the roadway if the project is delayed in completion. The Department shall not be required to provide any actual loss in order to recover these liquidated damages provided herein, as said damages are very difficult to ascertain. Furthermore, no provision of this clause shall be construed as a penalty, as such is not the intention of the parties.

A calendar day is every day shown on the calendar and starts at 12:00 midnight and ends at the following 12:00 midnight, twenty-four hours later.

PUBLIC CONVENIENCE AND SAFETY (D1)

Effective: May 1, 2012

Revised: July 15, 2012

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

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

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

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

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

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

RAILROAD PROTECTIVE LIABILITY INSURANCE (BDE)

Effective: December 1, 1986

Revised: January 1, 2022

Description. Railroad Protective Liability and Property Damage Liability Insurance shall be carried according to Article 107.11 of the Standard Specifications. A separate policy is required for each railroad unless otherwise noted.

NAMED INSURED & ADDRESS	NUMBER & SPEED OF PASSENGER TRAINS	NUMBER & SPEED OF FREIGHT TRAINS
Indiana Harbor Belt RR Co 2721 161st Street Hammond, IN 46323	0	1 trains/day @ 5 mph
Class 1 RR (Y or N): Y DOT/AAR No.: 326 745S RR Division: IHB-SYSTEM	RR Mile Post: 36.50 RR Sub-Division: NORPAUL	
For Freight/Passenger Information Contact:	Eduardo Garcia	Phone: (219) 989 4910
For Insurance Information Contact:	Eduardo Garcia	Phone: (219) 989 4910

NAMED INSURED & ADDRESS	NUMBER & SPEED OF PASSENGER TRAINS	NUMBER & SPEED OF FREIGHT TRAINS
Union Pacific Railroad Company Finance/Insurance Mail Stop 1870 1400 Douglas St. Omaha, NE 68179	0 trains/day	18 trains/day @ 20mph
Class 1 RR (Y or N): Y DOT/AAR No.: 174 047B RR Division: GREAT LAKES	RR Mile Post: 14.82 RR Sub-Division: PROVISO YARD	
For Freight/Passenger Information Contact:	Dave LaPlante	Phone: 402-544-8563
For Insurance Information Contact:	Connie Prokupek	Phone: 402-544-2215

NAMED INSURED & ADDRESS	NUMBER & SPEED OF PASSENGER TRAINS	NUMBER & SPEED OF FREIGHT TRAINS
Wisconsin Central, Ltd And its Parents Finance / Insurance Mail 17641 S. Ashland Avenue Homewood, IL 60430	0	6 trains/day @ 60 mph
Class 1 RR (Y or N): Y DOT/AAR No.: 689 629F RR Division: CHICAGO	RR Mile Post: 13.25	RR Sub-Division: WAUKESHA
For Freight/Passenger Information Contact: Thomas Brasseur For Insurance Information Contact: Rob Glass	Phone: 248-452-4854	Phone: 708-332-6673

Basis of Payment. Providing Railroad Protective Liability and Property Damage Liability Insurance will be paid for at the contract unit price per Lump Sum for RAILROAD PROTECTIVE LIABILITY INSURANCE.

3426I

CN UTILITY CROSSING/ENCROACHMENT APPLICATION PACKET



Utility Crossing/Encroachment Application Packet

Revised: 12/04/2018

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1. Initial Notification of Intent to Construct Utility Crossing/Encroachment
 - a. Requirements and Instructions
 - b. Forms
2. CN Insurance Requirements
3. Example Certificate of Insurance
4. Flagging/Cable Locate Specifications and Form

**INITIAL NOTIFICATION OF INTENT TO CONSTRUCT UTILITY CROSSING/ENCROACHMENT
REQUIREMENTS AND INSTRUCTIONS**

The Applicant shall submit a completed application for utility crossing engineering review to the appropriate contact shown in the "Pipeline/Wireline Crossing Contacts" Section (Section I). The application can be downloaded from Railroad's website but the application and all supporting documentation must be submitted to the Railroad via certified mail to the address shown on the application. Any application transmitted to Railroad other than by certified mail, or that does not include all requested information or required documentation will be considered incomplete. Railroad shall notify the applicant when Railroad receives an incomplete application but under no circumstances shall Railroad review an incomplete application. Repeat: no application will be reviewed until the application is complete. Unless otherwise advised by Railroad, all submittals necessary to complete a previously submitted incomplete application must also be submitted via certified mail. Any application which remains incomplete one (1) year after the date of the first notification of an incomplete submittal from Railroad will be discarded and a new application must be submitted, including a new application fee. All information and documentation contained in any application must meet the approval of the Railroad, in its sole discretion. Unless otherwise required by law, Railroad will respond to all applications in the order in which they are received. In no event shall any construction related activities be scheduled or conducted on Railroad's property until Railroad has issued its final approval of the application, a written agreement outlining the legal terms of the installation has been signed and flaggers have been secured.

An application shall include the following documents:

- A completed and signed application form also known as Initial Notification of Intent Form.
- A map with an aerial image of the location of where work will be performed, showing the work site as well as nearby streets or other landmarks close to the work location(s).
- A certificate of insurance meeting the requirements set forth in this packet (unless lower coverage requirements are prescribed by local law and signed off by CN Legal Department).
- Six (6) copies of complete **stamped** engineering plans which shall conform to the guidelines established by the American Railway Engineering and Maintenance of Way Association (AREMA), all applicable federal, state and local legal and professional requirements, CN standards and any additional requirements set forth in this packet. In the event of any conflict or inconsistency between the aforesaid guidelines, requirements and standards, the most stringent shall apply.
- The non-refundable application fee. Unless otherwise specified by law, the non-refundable application fee shall be **\$1,350.00, which is intended** to cover the cost of Railroad's review of the application and all required documentation and information. The Applicant will be charged an additional fee of **\$200** for each review after the initial review of the completed application due to inadequate or missing information or other failure by the Applicant to meet the requirements of Railroad. This fee shall be included with any revision sent. Any revision sent without the accompanying fee will be considered incomplete and will not be reviewed.

**INITIAL NOTIFICATION OF INTENT TO CONSTRUCT UTILITY CROSSING/ENCROACHMENT
REQUIREMENTS AND INSTRUCTIONS**

I. Pipeline/Wireline Utility Contacts

Utilities

Name: Joseph Wojcik
Address: CN
17641 S. Ashland Avenue
Homewood, IL 60430
Phone: (708) 332-4739
Email: Josephs.Wojcik@cn.ca

FLAGGING AND/OR CABLE LOCATES

Address: CN Flagging - US
17641 South Ashland Avenue
Homewood, IL 60430
Email: Flagging_US@cn.ca

**INITIAL NOTIFICATION OF INTENT TO CONSTRUCT UTILITY CROSSING/ENCROACHMENT
REQUIREMENTS AND INSTRUCTIONS**

II. Scope

1. These specifications cover minimum requirements for utilities installed within or adjacent to railway rights-of-way. Railroad reserves the right to increase the specifications based on physical conditions or other factors specific to the installation point, including but not limited to:
 - a. Track speed
 - b. Traffic density
 - c. Traffic sensitivity
 - d. Terrain conditions
 - e. Curvature and grade
 - f. Bridges and other structures
 - g. Pipe size, capacity and material carried
 - h. Environmental risks/damages

**INITIAL NOTIFICATION OF INTENT TO CONSTRUCT UTILITY CROSSING/ENCROACHMENT
REQUIREMENTS AND INSTRUCTIONS**

III. Engineering Plan Requirements

1. A cover page including:
 - a. Include caption stating "Construction and maintenance to be in accordance with all applicable regulatory requirements and standards"
 - b. Contact name, address and phone number of Utility Owner
 - c. Professional Engineer's stamp, signature, and date
2. A plan view or site plan displaying:
 - a. A north arrow
 - b. Any tracks and railroad facilities
 - c. Railroad/roadway crossings
 - d. Railroad mileposts
 - e. Proposed utility crossing location
 - f. Location of proposed utility crossing in relation to a legal description or road allowance
 - g. Public Land Survey System (PLSS) Information (sections, quarter sections, etc.)
 - h. Right of way lines of railroad and labeled street or highway, if involved
 - i. Warning, utility markers that are proposed for the site in accordance with this document.
 - j. Indicate direction of flow and location of nearest shut off valves, if shutoff valves are required.
 - k. Indicate location and distance of nearest excavation from centerline of nearest track.
 - l. Location and methods of storage and disposal of excavated material. Excavated material should be stored to the back side of excavation with respect to the tracks unless this position creates an unsafe condition or a better location can be justified. All excavated material should be treated as contaminated with details provided for review unless known otherwise.
 - m. Excavation protection methods shall be shown for review. All excavations must be protected at all times and fenced in with reflective material or illuminated if left unattended.
3. A profile along the proposed crossing of actual situations showing:
 - a. Any tracks
 - b. The existing ground surface
 - c. The proposed utility
 - d. Exact depth of burial below base of rail, roadway surface, ditch bottom, and other points of interest to the top of utility (depth measured to casing pipe, if used)
 - e. Method of installation (i.e. boring, dry jack and bore, dry directional bore, etc.)
 - f. Indicate type and details of utility protection.
4. Show a detailed spec and cross-section of the pipe including:
 - a. Note and show if carrier pipe will be held clear of the casing pipe by supports. CN requires carrier & casing to be designed for cooper E-80 loading.
 - b. The type, wall thickness, and maximum test pressures of carrier and casing pipes must be listed on the plans. CN requires the AREMA standard listed in *Table 1-5-1*. Minimum Wall Thickness for Steel Casing Pipe for E80 Loading also found in Section A-2 of this document.
 - c. Indicate type of cathodic protection, if required for the type of construction. (See AREMA Section 5.2.3.3 *Cathodic Protection* for more information)
 - d. The ends of the casing shall be suitably sealed to the outside of the carrier pipe or casing vents shall be required.
 - e. Provide hoop stress calculation. See AREMA Sections 5.2.3 *Carrier Pipe* for more information.
 - f. Cross sections of the utility shall be perpendicular to the center line of the railroads tracks.

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- g. The location of the cross sections will be at:
 - i. Bore pit
 - ii. Receiving pit
 - iii. Intersection of utility and center line of any tracks
 - iv. Any other points of interest along the utility line
- 5. A detail of the proposed utility marker to be used on site showing all information to be displayed as well as all dimensions and materials.
- 6. Drawings must be to scale and have all dimensions shown. This includes but is not limited to:
 - a. Distance from each utility (encroachment) to the centerline of track, nearest road, crossing, bridge or other Railroad structures
 - b. Dimension width of CN right-of-way
 - c. Number of tracks proposed utility crossing will cross
 - d. Angle of proposed utility crossing
 - e. All existing and proposed signals and facilities with dimensions showing horizontal distance and depth to the proposed utility
- 7. All information regarding all seeding/surface restoration work shall be provided with the plans and conform to the local DOT specs.
- 8. Revised drawings shall be marked as revised (with revision date included) and state reason for revision. Each individual revision shall be called out in this manner. In addition, each page shall have a section near the title block with a list of revisions, where the revision version and date shall be marked in for any revision to that page.
- 9. **Professional Engineer's stamp, signature and date is required on all plans and submittals.**
- 10. Attachments to the plans as required in the following sections of this document may include but are not limited to:
 - a. Soil Boring Logs
 - b. Geotechnical Report
 - c. De-Watering Plan
 - d. Induction Interference Study
 - e. Vibration Monitoring Plan
 - f. Shoring Plan
 - g. Site Safety Action Plan
 - h. Emergency Action Plan
 - i. An estimated construction schedule and Gantt chart with field contact name and phone number.
 - j. Detailed Work Plan
 - k. Settlement Monitoring Plan
 - l. Construction Monitoring Plan

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IV. Above Ground Utility Requirements

1. General Above Ground Utility Requirements

- a. CN's operations are not to be impaired or affected by any utility work.
 - i. Flagging protection during construction will be required and may be expanded by local supervisors to include any work on, under, over, or near Railroad property.
- b. All employees of contractors not hired by CN that will work on, over, under or near CN property are required to have, at a minimum, safety certification with www.contractororientation.com and the railroad representative will be responsible for verifying and documenting said certifications.
 - i. Applicant must compile an Emergency Action Plan per OSHA which incorporates the proper Railroad contact information. Identify and list an adequate amount of properly trained employees to be able to enter CN property to respond to an emergency situation.
- c. On projects which have the potential to encroach or effect the operations to CN's property, it is required of the contractor to post informational documents at the jobsite for the benefit of the construction workers, CN personal, and the general public. The following required information is to be posted on a bulletin board. The bulletin board shall be weatherproof and watertight and be located in an area readily accessible to both CN and the general public.
 - i. Project overview: Including a general work description, job site location address, and approximate duration of the project
 - ii. Owner / Applicants Information
 - iii. Contractor's Designated points of contact: Including the Safety Officer, Superintendent, and 24 hour contact number
 - iv. Copies of reviewed drawings by CN
 - v. Copies of the Safety Action Plan
 - vi. Copies of approved permits
- d. All utilities must be a minimum of 15 ft horizontally away from any existing or planned CN signals and facilities, when practicable. Minimum distance in any direction from a vertical road crossing gate shall be no less than 4 ft.
- e. Utilities shall not be placed within a culvert, under railroad bridges, nor closer than 300 feet to any portion of any railroad bridge, building, or other structure, except in special cases and be of special design as approved by the CN Chief Engineer or the designated representative.
- f. Must not be attached to a CN pole line or pole lines licensed to others except where specifically authorized.
- g. All poles extending in height above ground equal to or greater than the distance from pole to the edge of ties on the nearest track will be anchored and guyed against tipping toward track.
 - i. Guys will be guarded to a distance of 8' above ground line and the guards shall be orange in color.
- h. All clearances and safety provisions are subject to the National Electric Safety Code (American National Standard Institute) as well as any applicable National, State, and local codes, whichever is more restrictive.
- i. All overhead electrical utilities will require an induction interference study.
- j. During construction, the Applicant shall maintain positive drainage of Railroad property. After construction is completed, the Railroad's right-of-way shall be restored to its original condition

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and to the satisfaction of the Railroad. Any fencing removed to facilitate construction shall be restored.

- k. All piers or poles shall be located off of CN right-of-way.
- l. Warning, utility markers shall be installed at any intersection of any utility and CN right-of-way, and on any pole on CN right-of-way.

2. Above Ground Utility Crossing Requirements

- a. Utilities crossing over any railroad track must have a minimum height measured at the lowest point of the utility to the top of rail:
 - i. Pipe/Pipe Bridge = 25 ft Min
 - a. Cable Supported Pipe Bridge = 50 ft
 - ii. Conveyors = 25 ft Min
 - iii. Fiber/Coaxial Cable = See Section A-3
 - iv. Electric Wire = See Section A-3
- b. Utilities shall be located, where practicable, to cross tracks at approximately right angles but must not cross at an angle less than 45 degrees.
 - i. Any utility crossing that is less than 45 degrees will be considered a longitudinal utility and may be subject to higher requirements as required by the CN Chief Engineer or the designated representative.
- c. If any new utilities are attached onto an existing structure, the existing structure must be analyzed to ensure it can withstand the new loading. If a re-design of the existing structure is required, this must be included with the plans.

3. Above Ground Longitudinal Utility Requirements

- a. All longitudinal utilities shall be placed towards the outer edge of the railroad right-of-way, except in special cases and be of special design as approved by the CN Chief Engineer or the designated representative.

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V. Underground Utility Requirements

If underground utility is greater in diameter than 10" including any casing protection, the requirements in the Section VI (immediately following this section) are required.

1. **General Underground Utilities Requirements**

- a. CN's operations are not to be impaired or affected by any utility work.
 - i. Flagging protection during construction will be required and may be expanded by local supervisors to include any work on, under, over, or near Railroad property.
- b. All employees of contractors not hired by CN that will work on, over, under or near CN property are required to have, at a minimum, safety certification with www.contractororientation.com and the railroad representative will be responsible for verifying and documenting said certifications.
 - i. Applicant must compile an Emergency Action Plan per OSHA which incorporates the proper Railroad contact information. Identify and list an adequate amount of properly trained employees to be able to enter CN property to respond to an emergency situation.
- c. On projects which have the potential to encroach or effect the operations to CN's property, it is required of the contractor to post informational documents at the jobsite for the benefit of the construction workers, CN personal, and the general public. The following required information is to be posted on a bulletin board. The bulletin board shall be weatherproof and watertight and be located in an area readily accessible to both CN and the general public.
 - i. Project overview: Including a general work description, job site location address, and approximate duration of the project
 - ii. Owner / Applicants Information
 - iii. Contractor's Designated points of contact: Including the Safety Officer, Superintendent, and 24 hour contact number
 - iv. Copies of reviewed drawings by CN
 - v. Copies of the Safety Action Plan
 - vi. Copies of approved permits
- d. Jacking or boring of corrugated metal pipe, cast iron pipe or pipe with flanges, bells or couplings will not be permitted.
- e. Casing may need to be extended to accommodate any proposed projects for Railroad as required by CN Chief Engineer or the designated representative.
- f. Soils investigation and a geotechnical report may be required.
- g. All underground utilities shall have an adequate casing for protection.
- h. Utilities shall not be placed within a culvert, under railroad bridges, nor closer than 100 feet to any portion of any railroad bridge, building, or other structure, except in special cases and be of special design as approved by the CN Chief Engineer or the designated representative.
- i. Restoration and backfill compaction should conform to a 95% Proctor test suitable for the soil type at the site and commence in lifts specified by the CN Chief Engineer or the designated representative.
- j. No excavation can be closer than 25' from the centerline of the nearest track.
- k. All utilities must be a minimum of 15 ft horizontally away from any existing or planned CN signals and facilities, when practicable.
- l. The zone of influence is as follows: Starting 15 feet from the centerline of nearest track at the base of rail, measured perpendicular to the track centerline, calculate a slope to the bottom of the proposed pipe at a 2H:1V slope. (See Section A-6)

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- i. If a 2H: 1V slope cannot be maintained or more restrictive conditions occur, approved shoring will be required. (See Section A-7)
- ii. If shoring is required as stated above, a shoring plan designed to withstand E-80 loading shall be created, **stamped by a Professional Engineer**, and submitted to CN.
- iii. If the excavation is outside the zone of influence, then the excavation shall follow OSHA requirements.
- m. A dewatering plan shall be created, **stamped by a Professional Engineer**, and submitted to CN as required by the CN Chief Engineer or the designated representative.
- n. Dry Horizontal Directional Drilling (HDD) is only allowed.
 - i. Mud slurry directional bore will be allowed only with the use of vents.
 - ii. No wet directional drilling is allowed.
- o. Vibrations Requirements
 - i. If there are fiber optic cables buried within the ROW, the Contractor shall submit details on the type of equipment to be used for pile driving, and estimate the vibrations that will be induced at ground level during operation.
 - ii. The Contractor may be required to monitor vibrations levels during pile driving operations, for which the Contractor shall submit a procedure and the type of monitoring equipment to be used.
 - Induced vibrations shall be limited to a maximum peak particle velocity (PPV) of less than 3.5"/sec (measured in 3 mutually perpendicular directions taken at tie level / ground surface). And induced amplitude of movement shall be less than 1/128"
 - Vibrations undertaken within 150 ft of fiber optic cables, induced vibrations shall be limited to a maximum of PPV of less than 1.5"/sec
- p. During construction, the Applicant shall maintain positive drainage of Railroad property. After construction is completed, the Railroad's right-of-way shall be restored to its original condition and to the satisfaction of the Railroad. Any fencing removed to facilitate construction shall be restored.
- q. Additional Resources for Underground Utilities:

<http://www.undergroundfocus.com/onecalldir.php>
<http://www.ntdpc.com/>
<http://www.commongroundalliance.com>

Provides links and information on state calls for cable locates
National Telecommunications Damage Prevention Council
Common Ground Alliance

2. Underground Utility Crossing Requirements

- a. Utilities shall be located, where practicable, to cross tracks at approximately right angles but must not cross at an angle less than 45 degrees.
 - i. Any utility crossing that is less than 45 degrees will be considered a longitudinal utility and may be subject to higher requirements as required by the CN Chief Engineer or the designated representative.
- b. For all utility crossings the utility must be protected by a casing for the full width of CN's right-of-way or 50 ft whichever is greater.
 - i. All casing pipes shall be sloped not less than 0.3%.

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- ii. Pipelines carrying commodities in a gaseous state are not required to have a steel casing as long as the top of the utility is at least 10 ft below base of rail.
 - iii. Fiber optic utilities do not need a steel casing if the depth is 15 ft or greater below the base of rail.
 - c. Directional boring will be allowed at the discretion of the Railroad.
 - i. If practicable, boring excavation must not exceed the outside diameter of the pipe.
 - Bore shall not be greater than 1" larger than the utility diameter
 - d. Minimum depth of burial below:
 - i. Dry jack and Bore
 - Main Tracks Base of Rail = 6 ft
 - Industrial Tracks Base of Rail = 6 ft
 - Road Surface = 4 ft
 - Ditch Bottom = 5 ft
 - ii. Uncased Utility
 - Main Tracks Base of Rail = 10 ft
 - Industrial Tracks Base of Rail = 10 ft
 - Road Surface = 6 ft
 - Ditch Bottom = 6 ft
 - iii. Directional Bore
 - Main Tracks Base of Rail = 15 ft
 - Industrial Tracks Base of Rail = 15 ft
 - Road Surface = 5 ft
 - Ditch Bottom = 6 ft
 - e. Any excavation must not be located on CN right-of-way or within a minimum of 50 ft from the centerline of track, whichever is greater.
 - f. Warning, utility markers shall be installed at any intersection of any utility and CN right-of-way.
 - i. Marker should show accurate owner, contact, and CN Agreement Number.
- 3. Longitudinal Underground Utility Requirements**
- a. Underground utilities laid longitudinally in railroad right-of-way shall be located as far as practicable from any tracks or other important structures.
 - b. Longitudinal lines must be a minimum of 25 ft from the center line of track, or outside the track embankment section, whichever is greater.
 - c. Uncased steel carrier pipe utilities laid longitudinally on the railroad right-of-way, 25 ft to 50 ft from the center line of the nearest rail shall be buried not less than 6 ft from the natural ground surface to the top of pipe. If distance is more than 50 ft from centerline of track, minimum cover shall be 5 ft.
 - i. At all locations on the right-of-way farther than 25 ft away from the centerline of the nearest track, the minimum natural ground cover for uncased steel natural gas pipes must be 6 ft.
 - d. Plastic carrier pipes are not allowed for longitudinal utilities on CN right-of-way.
 - e. Longitudinal underground utilities must be marked by a sign approved by the CN Chief Engineer or the designated representative every 500 ft, at every road crossing, streambed, other utility crossing, and at locations of major change in direction of the line.
 - i. Marker should show accurate owner, contact, and CN Agreement Number.

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VI. Additional Requirements for Underground Utilities with Diameter of 10 Inches or Greater (Including Casing)

1. Drawings shall be **stamped, signed, and dated** by a Professional Engineer licensed in the State where the work is being performed. CN reserves the right to prohibit a certain construction methodology, at its own discretion; however, CN shall not assume any responsibility for the suitability of the accepted method. Open cut methodology shall only be considered where other installation techniques are deemed impractical and where rail traffic volumes are low. Installations using water jet methods shall not be permitted.
2. Complete Subsurface Investigation
 - a. Boreholes are required at each end of the crossing and at each entry/exit pit with a maximum spacing between boreholes of 150 ft.
 - b. The boreholes shall be drilled to a depth of 20 ft below the proposed crossing depth or to 20 ft below the maximum feasible crossing depth if the proposed crossing depth has not yet been determined.
 - c. Soils samples shall be obtained at 3 ft intervals to a depth of 15 ft and also within the proposed utility horizon (i.e., from at least 7 ft or one pipe/casing diameter above the proposed utility invert to at least 7 ft or one pipe/casing diameter below the proposed utility invert). At other depths, soil samples may be obtained at 5 ft intervals; No boreholes will be completed between ties or tracks in double track territory.
 - d. If bedrock is encountered at the proposed location, the bedrock will be cored to establish the competency and engineering characteristics of the bedrock. The bedrock shall be cored to at least 5 ft below the invert of the proposed crossing.
 - e. Soil classification testing (i.e., water content determination, Atterberg Limits testing and grain size distributions) shall be carried out on soil samples obtained from all major soil strata and on soil samples obtained from every layer that the proposed tunnel would intersect.
 - f. The stabilized groundwater elevation must be established by installation of piezometer/monitoring well(s); at least one piezometer/monitoring well must be maintained in operation and checked prior to construction to confirm the groundwater elevation.
3. Submit a **stamped** Geotechnical Report prepared by a Licensed Geotechnical Engineer with experience in trenchless technology. The Report shall include:
 - a. Comments and recommendations with respect to construction methodology
 - b. An estimate of the expected extent and magnitude of ground movement over time
 - c. Measures to be undertaken to preserve the safety of rail operations and the structural integrity of the track structure
 - d. A detailed proposal for ground surface and subsurface monitoring
 - e. Factual subsurface information with all field and laboratory test data
 - f. A description of the site and soil stratigraphy including results of soil classification testing
 - g. A plan of the proposed crossing with borehole/testing/installation locations
 - h. A summary of groundwater conditions encountered during the investigation including the observed groundwater levels within the boreholes and the presence of any perched water levels at the borehole locations
 - i. Anticipated settlements as well as an assessment of the anticipated settlement through configurations

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- j. A detailed monitoring plan to monitor any ground surface and subsurface movements during construction shall be provided. The Review and Alert (work stoppage) levels shall be provided
 - k. Submit a contingency plan and notification procedure to be implemented in the event of excessive/unexpected settlement or heave, and unforeseen changes in subsurface conditions, i.e. cobbles and boulders, raveling /flowing ground
4. Submit a Detailed Work Plan
- a. Details of the proposed methodology - the installation operations, methods of maintaining and adjusting line and grade, drilled/bored diameter, drill hole stabilization procedures, temporary dewatering measures and any mitigation procedures if sinkholes/settlement above the pipe occurs or excessive movement of the settlement monitors is observed.
 - b. The design of the crossing - length, diameter and thickness of the casing, elevations of the crossing invert at both ends, excavation shoring details and methods of dealing with cobbles/boulders and obstructions.
 - c. Provide additional details for specific installation methodologies as follows:
 - i. Jack and Bore: size and location of the auger head relative to the casing, estimated jacking thrust required, method of monitoring casing elevation, thrust block design calculations, record keeping system to document casing advance and jacking pressures, bulk heading, and grouting procedures. Bore head should not extend more than 1" ahead of the casing.
 - d. Pipe Ramming: length, diameter and thickness of the casing, details of the reinforcing ring used at the leading edge of the pipe
 - e. HDD; slurry pressure and mitigation measures for frac out if applicable. Vents shall be installed on each side of the track(s) to prevent frac-outs.
 - f. TBM: type of machine, methods of primary ground support, grouting between the casing, ribs and lagging (primary support) and the surrounding soil/rock
5. Submit a Settlement Monitoring Plan including:
- a. Summary of Proposed Settlement Monitoring
 - i. Geographical Location
 - ii. Number of Settlement Monitoring Probes
 - iii. Type of Probe & installation Method
 - iv. Expected Amount of Settlement (in)
 - v. Frequency of Monitoring
 - vi. Duration of Monitoring
 - b. Site Plan:
 - i. Site Plan
 - ii. Identify Probe Locations and Offset Distances to Nearest Rails
 - iii. Elevation of Top-of-Probes
 - c. Probe Detail Drawing:
 - i. Show section through Railroad Track Road Bed
 - ii. Existing Ground Line
 - iii. Depth of Bore
 - iv. Distance to Bottom-of-Probe to Top of Casing Pipe
 - v. Submit a dewatering plan.

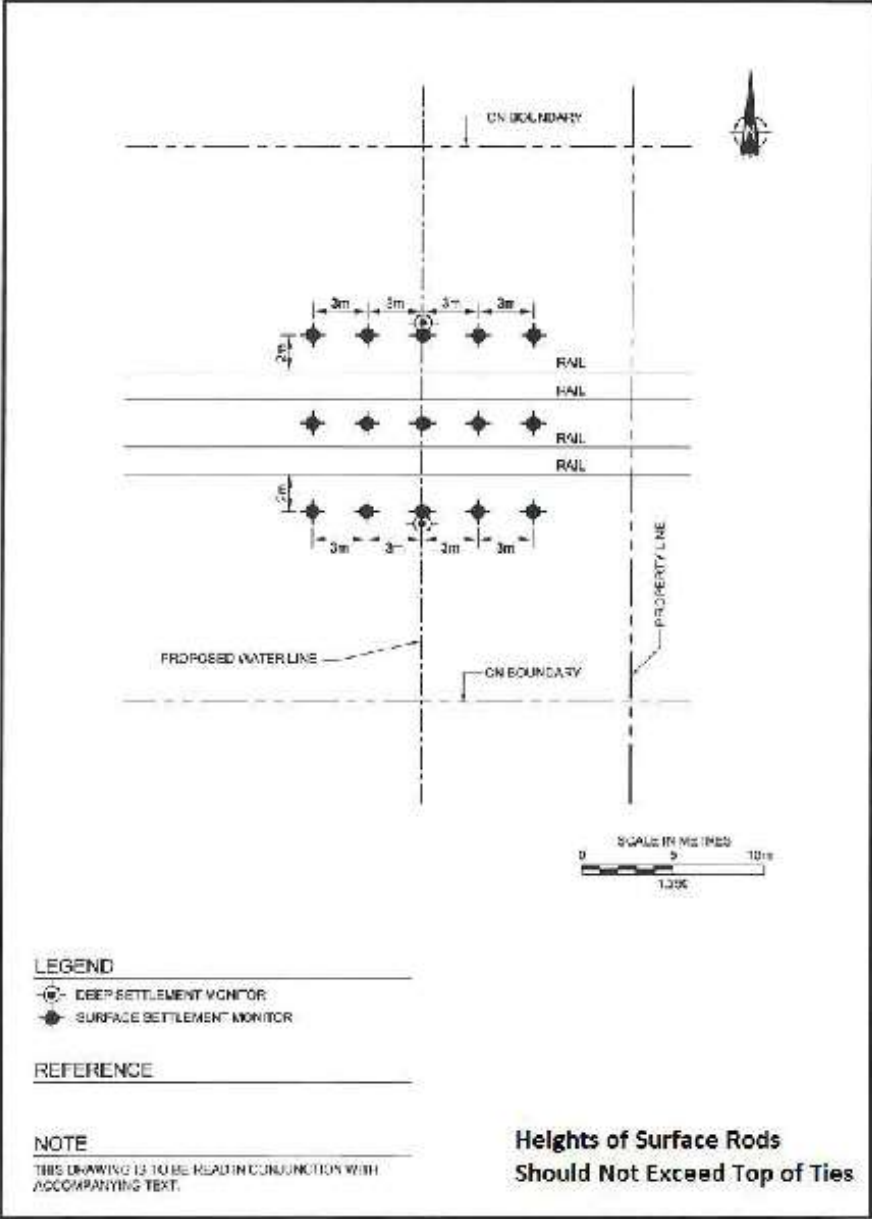
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6. Monitoring During Construction
 - a. Monitoring by a qualified geotechnical personnel and report to CN on a daily basis.
 - b. Installation in accordance with the Contractor's detailed work plan.
 - c. Over-excavation does not occur, and the liner / casing is installed tight to the excavation.
 - d. Report theoretical vs. actual volumes of spoils removed on per meter and total bases.
 - e. The excavation is fully supported until the liner / pipe installation is complete.
 - f. The bulkhead is installed at the end of every work shift or during any prolonged stoppage of work.
 - g. Voids are fully grouted to refusal immediately after the completion of liner / pipe installation. Report theoretical vs. actual volumes of grout pumped.
7. Reporting to CN during/post Construction
 - a. Progress of the contractor and pipe installation and what work was completed on that day,
 - b. A summary of the daily ground surface and subsurface movements showing a comparison to a baseline reading taken before the start of construction, settlements of greater than 3/8" shall be reported to CN immediately.
 - c. Any other geotechnical issues that may be of concern to CN.
 - d. Log of settlement survey results showing
 - i. Station
 - ii. Date and Elevation of Initial Readings
 - iii. Date and Elevation of Subsequent Readings
 - iv. Difference in Elevation
 - e. Submit ground surface and subsurface monitoring reports to CN on a daily basis, showing a comparison to baseline readings taken prior to the commencement of construction. Settlement of 3/16" is to be reported to CN immediately, and a settlement of 3/8" or greater the work is stopped until a resolution is achieved.
8. Provide, in writing, the name and phone number of the Applicant's qualified site inspector who will be on the job site on a full time basis for the duration of construction. Update prior to work beginning if there are any changes.

**NO CONSTRUCTION OR ACCESS TO CN ROW WILL COMMENCE UNTIL AN AGREEMENT HAS BEEN
ENTERED INTO BETWEEN CN AND THE UTILITY OWNER**

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A-1. Monitoring Points Requirements



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A-2. Minimum Wall Thickness for Steel Casing Pipe for E80 Loading

Table 1-5-1. Minimum Wall Thickness for Steel Casing Pipe for E80 Loading

Nominal Diameter (inches)	When coated or cathodically protected Nominal Thickness (inches)	When not coated or cathodically protected Nominal Thickness (inches)
12-3/4 and under	0.188	0.188
14	0.188	0.250
16	0.219	0.281
18	0.250	0.312
20 and 22	0.281	0.344
24	0.312	0.375
26	0.344	0.406
28	0.375	0.438
30	0.406	0.469
32	0.438	0.500
34 and 36	0.469	0.531
38	0.500	0.562
40	0.531	0.594
42	0.562	0.625
44 and 46	0.594	0.656
48	0.625	0.688
50	0.656	0.719
52	0.688	0.750
54	0.719	0.781
56 and 58	0.750	0.812
60	0.781	0.844
62	0.812	0.875
64	0.844	0.906
66 and 68	0.875	0.938
70	0.906	0.969
72	0.938	1.000

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A-3. Overhead Wireline Clearance Chart

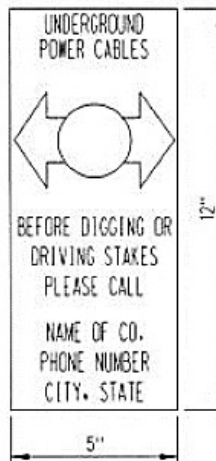
FORMULA: .5" increase for every 1,000 volts in excess of 50 KV
 6" increase for every 12,000 volts in excess of 50 KV

Voltage (to ground)	Minimum Clearance Required above top Of rail	Minimum Clearance (Including Static Wires) Required above Communication and Signal Lines
0 to 750	27'0"	4'0"
8,700	28'0"	4'0"
15,000	28'0"	6'0"
50,000	30'0"	6'0"
74,000	31'0"	7'0"
98,000	32'0"	8'0"
122,000	33'0"	9'0"
146,000	34'0"	10'0"
170,000	35'0"	11'0"
194,000	36'0"	12'0"
218,000	37'0"	13'0"
242,000	38'0"	14'0"
266,000	39'0"	15'0"
290,000	40'0"	16'0"
THESE CLEARANCES ARE TO INCLUDE ALL TRACKS OPERATED AS MAIN TRACKS, SIDINGS, AND OTHER AUXILIARY TRACKAGE.		

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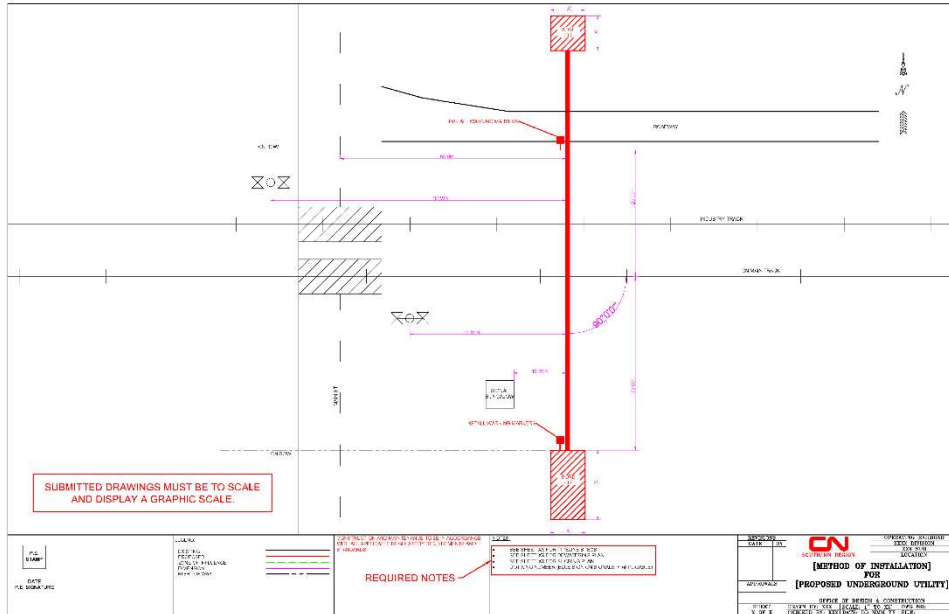
A-4. Marking of Utilities on Railroad Right-of-Way

CABLE ROUTE MUST BE MARKED AT EDGE OF RIGHT OF WAY WHERE CABLE ENTERS OR LEAVES RAILROAD PROPERTY. IN CASES OF PARALLEL CABLE ROUTE, SIGNS AS INDICATED IN FIGURE 1 ON THIS EXHIBIT WILL BE PLACED APPROXIMATELY EVERY 200 FEET. SIGNS TO BE OF A PERMANENT VERTICAL TYPE, NOT SMALLER THAN 5 INCHES WIDE BY 12 INCHES HEIGHT. YELLOW BACKGROUND WITH BOLD BLACK LETTERING. SIGNS TO BE MOUNTED ON METAL POSTS OR AS OTHERWISE AGREED TO AT A HEIGHT OF 3 FEET ABOVE GROUND LEVEL.



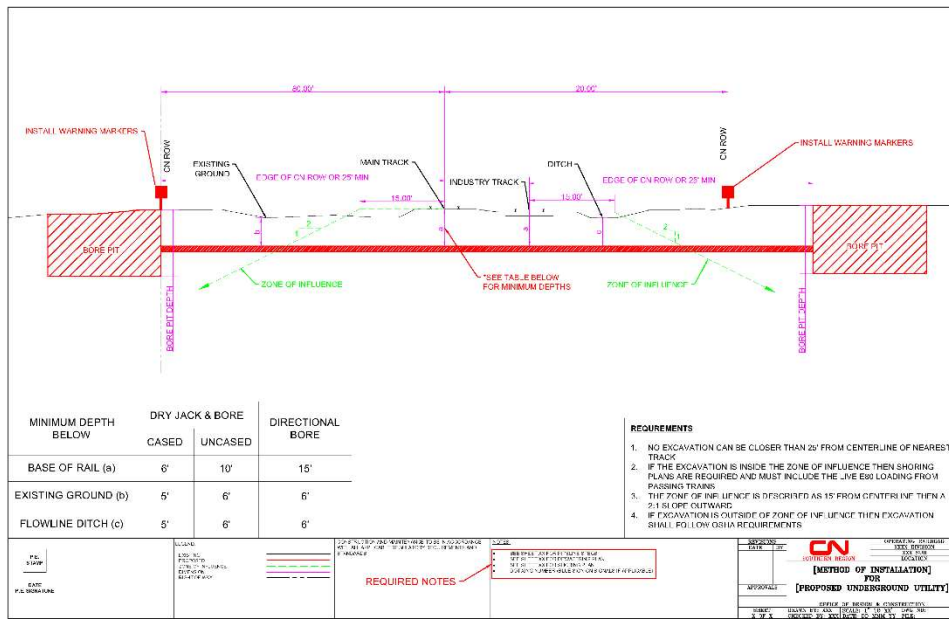
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A-5. Example Plan View



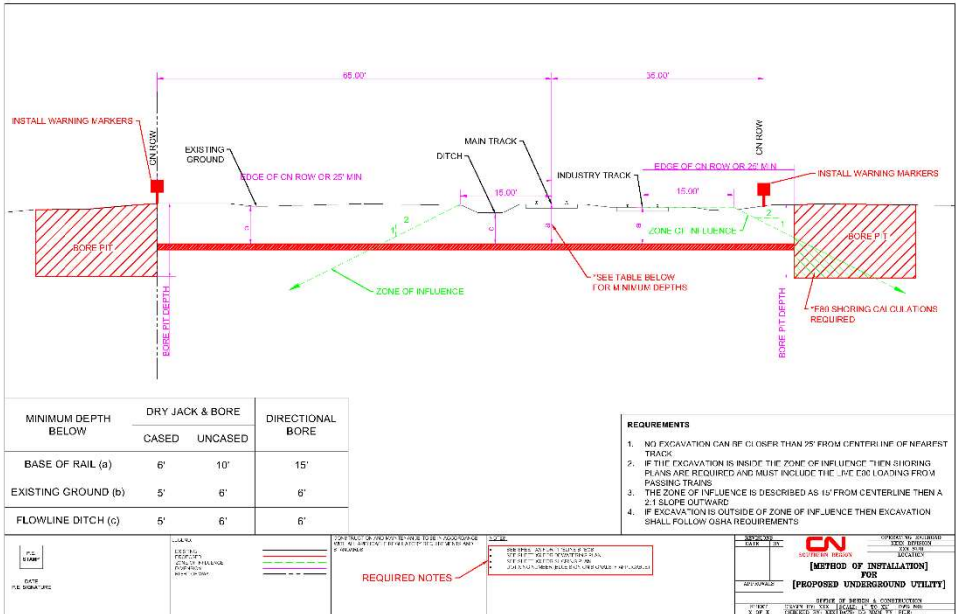
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A-5. Example Profile 1



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A-7. Example Profile 2 – Requires Shoring



INITIAL NOTIFICATION OF INTENT TO CONSTRUCT UTILITY CROSSING/ENCROACHMENT

Complete this form and return it along with a non-refundable preparation fee of \$1350 made out to CN.

Date: _____

1. Owner/Applicant Information	
A. Name:	_____
B. Address:	_____
C. Authorized Representative:	_____
D. Title:	_____
E. Phone Number:	_____ F. Fax Number: _____
G. Email Address:	_____
2. Engineer/Consultant Information	
A. Name:	_____
B. Address:	_____
C. Authorized Representative:	_____
D. Title:	_____
E. Phone Number:	_____ F. Fax Number: _____
G. Email Address:	_____
3. Location Description (Attach a Copy of a Sketch Showing Location)	
A.	_____ ¼ _____ ¼ Sec. _____, Township _____, Range _____
B.	Nearest Public Road Crossing Name: _____
C.	Nearest Public Road Crossing DOT Number: _____ <i>(Number on Blue Sign at Crossing, e.g. 123456L)</i>
D.	City / Village / Township: _____ <i>(Circle One)</i>
E.	County: _____ F. State: _____
G.	Utility Location – Railroad Mile Post: _____ plus _____ ft <i>(Start Railroad Mile Post of Segment if Longitudinal)</i>
H.	Utility Location – Railroad Mile Post: _____ plus _____ ft <i>(End Railroad Mile Post of Segment if Longitudinal)</i>
I.	Latitude: _____ °, Longitude: _____ °

 Name of Submitter Signature Telephone # Date

**INITIAL NOTIFICATION OF INTENT TO CONSTRUCT UTILITY CROSSING/ENCROACHMENT
 WIRE/FIBER/CABLE CONSTRUCTION INFORMATION**

4. Indicate Type of Utility/Facility A. Power Line _____ B. Telephone _____ • Fiber Optic _____ • Copper Pair _____ C. Cable TV _____ • Fiber Optic _____ • Coaxial _____ D. Other _____	5. Desired Method of Installation/Construction A. Underground _____ B. Overhead _____ C. Crossing _____ D. Longitudinal _____ E. Copper Pairs • # of Wires _____ F. Fiber Optic • # of Strands _____ G. Other _____
6. Wire/Cable Data A. Number of Poles/Towers on Property _____ B. Number of Guys/Anchors on Property _____ C. Cross arm Overhang _____ ft D. Maximum Voltage _____ E. Number of Wires/Cables/Pairs/Strands (circle one) _____ F. Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground _____ ft G. Clearance Over Railroad Company's Wires _____ ft H. Clearance Over Railroad Company's Tracks _____ ft I. Casing Length (Property Line to Property Line) _____ ft J. Size & Kind of Pipe or Duct _____ K. Method: How is Pipe or Duct to be installed under the track (dry bore & jack, directional, tunnel, other – specify) _____ L. Size and Type of Wire/Cable _____ M. Insulated _____ N. Bare/Open Wire _____ O. Stranded _____ P. Solid _____ Q. Angle of Crossing _____ R. Length of Span Crossing Tracks (unsupported length if above tracks) _____ ft	
7. Location References and Clearances of Facility (Encroachment) A. Width of Public Road (crossing track) _____ B. Distance From Each Facility (Encroachment) to Center Line of Main Track _____ ft C. Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track _____ ft D. Side Clearance from Railroad Company's Wire to Nearest Pole/Tower _____ ft E. Distance and Direction From Bridge Abutment, Culvert, Switch, Road Crossing, etc. _____ ft	

 Name of Submitter Signature Telephone # Date

**INITIAL NOTIFICATION OF INTENT TO CONSTRUCT PIPE CROSSING/ENCROACHMENT
 PIPE CONSTRUCTION INFORMATION**

8. Commodity to be transmitted in pipe: _____
(Steam, air, water, gasoline or other petroleum products, chemical-specify: natural or artificial gas. If sewer, identify as to force or gravity line, sanitary, storm or chemical waste – specify)

9. Pipe Data	CARRIER PIPE	CASING PIPE
A. Inside Diameter:	_____	_____
B. Outside Diameter:	_____	_____
C. Wall Thickness:	_____	_____
D. Pipe Material:	_____	_____
E. Specification/Grade or class:	_____	_____
F. Min. Yield Point of Material	_____	_____
G. Process of Manufacture	_____	_____
H. Name of Manufacturer	_____	_____
I. Type of Joint	_____	_____
J. Working Pressure	_____	_____
K. Maximum operating pressure (by gauge)		_____psi
L. Length of Casing pipe:		_____ft
M. Casing pipe/uncased carrier pipe cathodically protected?		Y / N
N. Hydrostatic pressure carrier pipe test pressure		_____psi
O. Will casing pipe be vented?		Y / N
P. Pipe Vent Size:		_____in
Q. Will casing pipe/uncased carrier pipe have a protective coating?		Y / N
R. Protective Coating Type		_____
S. Depth of top of casing or uncased carrier pipe below base of rail or top of ground. _____ft (Closest point of utility to any base of rail or ground)		
T. Method of installing casing pipe /uncased carrier pipe (Dry bore & jack, directional, tunnel, other – specify)		_____
U. Depth of pipe below the ground. (not beneath tracks)		_____ft
V. Depth of pipe below ditches.		_____ft
W. Distance from centerline of track to face of jacking/receiving pits.		_____ft
X. Depth from base of rail to bottom of jacking /receiving pits.		_____ft

 Name of Submitter

 Signature

 Telephone #

 Date



INSURANCE REQUIREMENTS

1. By Licensee

Before commencing work, and until this Agreement shall be terminated or the FACILITY shall be removed (whichever date is later), the LICENSEE shall provide and maintain the following insurance in form and amount with companies satisfactory to and as approved by the RAILROAD.

- a. Statutory Workers Compensation and Employer's Liability insurance.
- b. Automobile Liability in an amount not less than \$1,000,000 dollars combined single limit.
- c. Comprehensive General Liability (Occurrence Form) in an amount not less than \$5,000,000 dollars combined single limit, with an aggregate of at least \$10,000,000 dollars. The Policy must name the appropriate RAILROAD as an Additional Insured and must not contain any exclusions related to:
 1. Doing business on, near, or adjacent to railroad facilities.
 2. Loss or damage resulting from surface, subsurface pollution contamination or seepage, or handling, treatment, disposal, or dumping of waste materials or substances.

Before commencing work, the LICENSEE shall deliver to the RAILROAD a certificate of insurance evidencing the foregoing coverage and upon request the LICENSEE shall deliver a certified, true and complete copy of the policy or policies. The policies shall provide for not less than ten (10) days prior written notice to the RAILROAD of cancellation of or any material change in, the policies; and shall contain the waiver of right of subrogation.

It is understood and agreed that the foregoing insurance coverage is not intended to, and shall not, relieve the LICENSEE from or serve to limit LICENSEE's liability under the indemnity provisions of any applicable agreement.

It is further understood and agreed that, so long as the Agreement shall remain in force or the FACILITY shall have been removed (whichever shall be later), the RAILROAD shall have the right, from time to time, to revise the amount or form of insurance coverage provided as circumstances or changing economic conditions may require. The RAILROAD shall give the LICENSEE written notice of any such requested change at least thirty (30) days prior to the date of expiration of the then existing policy or policies; and the LICENSEE agrees to, and shall, thereupon provide the RAILROAD with such revised policy or policies thereof.



INSURANCE REQUIREMENTS

2. By the Licensee's Contractor

If a contractor is to be employed by the Licensee for the installation of the FACILITY, then, before commencing work, the contractor shall provide and maintain the following insurance, in form and amount and with companies satisfactory to, and as approved by, the RAILROAD.

- a. Statutory Workers' Compensation and Employer's Liability insurance.
- b. Automobile Liability in an amount not less than \$1,000,000 dollars combined single limit.
- c. An Occurrence Form Railroad Protective Policy with limits of not less than \$5,000,000 dollars per occurrence for Bodily Injury Liability, Property Damage Liability and Physical Damage to Property with \$10,000,000 dollars aggregate for the term of the policy with respect of Bodily Injury Liability, Property Damage Liability and Physical Damage to Property. The policy must name the appropriate RAILROAD as the insured, and shall provide for not less than ten (10) days prior written notice to the RAILROAD'S as cancellation of, or any material change, in the policy.

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER INSURED	CONTACT NAME: PHONE (A/C, No, Ext): _____ FAX (A/C, No): _____ E-MAIL ADDRESS: _____ <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <th style="width: 80%;">INSURER(S) AFFORDING COVERAGE</th> <th style="width: 20%;">NAIC #</th> </tr> <tr> <td>INSURER A :</td> <td></td> </tr> <tr> <td>INSURER B :</td> <td></td> </tr> <tr> <td>INSURER C :</td> <td></td> </tr> <tr> <td>INSURER D :</td> <td></td> </tr> <tr> <td>INSURER E :</td> <td></td> </tr> <tr> <td>INSURER F :</td> <td></td> </tr> </table>	INSURER(S) AFFORDING COVERAGE	NAIC #	INSURER A :		INSURER B :		INSURER C :		INSURER D :		INSURER E :		INSURER F :	
INSURER(S) AFFORDING COVERAGE	NAIC #														
INSURER A :															
INSURER B :															
INSURER C :															
INSURER D :															
INSURER E :															
INSURER F :															

COVERAGES **CERTIFICATE NUMBER:** _____ **REVISION NUMBER:** 1

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSUR LTR	TYPE OF INSURANCE	ADD L	SUB R	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
<input checked="" type="checkbox"/>	GENERAL LIABILITY COMMERCIAL GENERAL LIABILITY CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR GEN AGGREGATE POLICY LIM/PLES PROJ ECT PER: LOC	Y	Y		EFF DATE	EXP DATE	EACH OCCURRENCE \$5,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$10,000,000 PRODUCTS - COMP/OP AGG \$ \$
<input checked="" type="checkbox"/>	AUTOMOBILE LIABILITY ANY AUTO ALL OWNED S AUTO SCHEDULED AUTOS NON-OWNED AUTOS	Y	Y		EFF DATE	EXP DATE	COMBINED SINGLE \$1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ \$
<input checked="" type="checkbox"/>	UMBRELLA LIAB EXCESS LIAB OCCUR CLAIMS-MADE DED RETENTION \$	Y	Y		EFF DATE	EXP DATE	EACH OCCURRENCE \$5,000,000 AGGREGATE \$10,000,000 \$
<input checked="" type="checkbox"/>	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y	Y	Y/N	EFF DATE	EXP DATE	OTHER MIN STATUTORY \$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Certificate holder is an additional insured under all policies on this certificate including Commercial General Liability and Umbrella Liability.

A Waiver of Subrogation applies in favor of the Certificate Holder for all policies on this certificate including Commercial General Liability and Umbrella Liability.

50 foot railroad exclusion is removed through CG 2417 10.01

CERTIFICATE HOLDER (Appropriate Railroad Company Subsidiary for work location) <i>Example: Wisconsin Central Ltd. and its Parents</i> Attn: CN Flaggling - US 17641 South Ashland Avenue Homewood, IL 60430	CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE of
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**REQUIREMENTS TO PROVIDE FLAGGING PROTECTION AND CABLE LOCATION
FOR PROJECTS ON OR IN THE VICINITY OF CN PROPERTY**

(Hereinafter called "Railroad")
(Revised: Effective December 4th, 2018)

NOTE: Flagging and/or Cable Locate fees may apply

A utility or contractor shall not commence, or carry on, any work for installation, maintenance, repair, changing or renewal of any FACILITY, under, over, on, or near RAILROAD property at any location without giving notice to the RAILROAD authorized representative at the RAILROAD's office located at Homewood, IL. If in the opinion of the RAILROAD the presence of an authorized representative of the RAILROAD is required to supervise the same, the RAILROAD shall render bills to the utility or contractor for all expenses incurred by it for such supervision. This includes all labor costs for flagmen or cable locate supplied by the RAILROAD to protect RAILROAD operation, and for the full cost of furnishing, installation and later removal of any temporary supports for said tracks, as the RAILROAD's Chief Engineer's Office may deem necessary.

A flagman is required any time any work is performed (i) under or across any Railroad track, regardless of whether said work involves a physical presence on the surface of the Railroad property; (ii) on the surface of the Railroad property within twenty-five (25) feet horizontally of the centerline of any railroad track; or (iii) on, near, or over Railroad property if the work may potentially encroach (intentionally or unintentionally) within twenty-five (25) feet from the centerline of any railroad track. Causes of potential encroachment include but are not limited to equipment that has the potential to swing, pivot, extend or mechanically fail. Potential encroachment must also account for a distance of one-half the length of the largest load that any equipment may lift. Additionally, Railroad reserves the right to require a flagman for work on Railroad property not meeting the above criteria when there are other conditions or considerations that would indicate the need for a flagman to safeguard Railroad's operations, property and safety of any person.

Cable Location

A cable location of RAILROAD owned facilities may be required prior to the start of any work based on the RAILROAD's review of the proposed project. The purpose of cable location is to identify and protect Signal & Communication cables that have been installed to provide power, signal control, and wayside communications. These cables are vital to a safe and reliable railway operation. The cable locate will be performed by a qualified RAILROAD employee.

The cost for a cable location is \$350.00, and must be prepaid by check before RAILROAD will undertake the cable locate work.

Outside contractors are prohibited from driving on, along, or across any track that does not have a CN installed crossing. They may utilize an existing public crossing. The practice of allowing rubber tired equipment to operate over track with no crossing is strictly prohibited. Exceptions to this rule will require the express approval from CN Engineering.

Prior to any project being started, the RAILROAD requires a "Request for Flagging Services and Cable Location" form to be completed and submitted, including check for prepayment based on the number of days and hours flagging protection will be required and also prepayment for cable location as necessary. Separate checks must be issued for flagging protection and cable location. You must have an agreement with a CN railroad subsidiary, such as a Right of Entry, Permit, License, or Formal Agreement in addition to any necessary flagging before you may enter CN property.

Request for Flagging Services and Cable Location U.S.

Requests and inquiries must be directed to:
Flagging-US
17641 South Ashland Ave.
Homewood, IL 60430
Flagging_US@CN.CA

Is this a continuation of an existing project? Yes No

If YES, please provide your Service Order # _____

All blanks below **must be completely filled in before any flagman request will be honored.**

Work Authorization:

Right of Entry/License/Permit No.: _____ Dated: _____ Railroad: _____

Does your Right of Entry/License/Permit require a Railroad Cable Locate? Yes No

You must have an agreement with a CN railroad subsidiary, such as a Right of Entry, Permit, License or Formal Agreement in addition to any necessary flagging before you may enter CN property.

Project Information:

Please submit a detailed map of the location where protection is being requested.

Street Location/Intersection _____ City/State _____

Railroad Milepost _____ Railroad Subdivision _____

Description of work being performed: _____

Location for flagman to report: _____

Name of Site Contact: _____ Site Contact Phone: (____) - ____ - ____ Alt: (____) - ____

Requested Dates/Times:

Dates requested are subject to flagman availability. Minimum 5 business days advance notice required.

Requested Dates for Flagging Protection: _____, _____, _____, _____, _____, _____

Project Starting time: _____ Anticipated Ending Time: _____ Anticipated # Hours per Day: _____

*Flagmen start and end time may vary based on type of protection required.

Billing Information:

All blanks spaces must be filled out

Company Name: _____ Requestor Name: _____

Billing Address: _____

City: _____ State: _____ Zip: _____

Company Phone: _____ Company Fax: _____ E-Mail: _____

CN required online training must be completed before Flagman Protection will be scheduled.

Prepayment must be received before Flagging Protection will be scheduled. There is an 8 hour minimum per day. The base rate per day for Flagman Protection is \$1,300.00 for 10 hours; **this includes 2 overtime hours for flagman to set up/take down protection if needed.** Additional overtime hours must be prepaid at the rate of \$150.00 per hour. Weekends and Holidays must be prepaid at the overtime rate with a \$1,500.00 / 10 hour minimum. Any prepayment for additional days or overtime not used can be refunded.

Railroad Cable Location must be prepaid, the cost is \$350.00 per locate.

Separate Checks must be issued for Flagging Protection and Cable Location. Checks should be made payable to the railroad subsidiary listed on your Right of Entry/Permit/License or, Formal Agreement.

If additional days of protection are required they must be prepaid in advance.

Rates Effective January 1st 2017.

**THIS COMPLETED FORM MUST BE SENT WITH A MAP, PREPAYMENT CHECK(S), AND PROOF OF INSURANCE TO:
US-FLAGGING / 17641 SOUTH ASHLAND AVE. HOMEWOOD, IL 60430**

I agree to pay for flagging services as requested: _____

(SIGN AND PRINT NAME)

CN RIGHT OF ENTRY APPLICATION AND REQUIREMENTS



Manager Public Works
THOMAS L. BRASSEUR
700 Pershing Road
Pontiac, MI 48340
T 248.452.4854
F 248.452.4729
Email: THOMAS.BRASSEUR@CN.CA

Right of Entry (ROE) License Agreement Information

Railroad Company requires everyone (contractor, consultants, etc.) working on Railroad Company property to have a Right-of-Entry (ROE) License Agreement. No work may occur on Railroad Company property nor will flagging protection be provided until ROE License Agreement has been fully executed by both parties and returned. Follow these steps to obtain a ROE:

1. Applicant will **Email** this completed application to thomas.brasseur@cn.ca
2. Applicant will **mail** a check for the application fee \$1000.00* to the address listed at the end of this document
3. Applicant will **Email** a COI (Certificate of Insurance) meeting the requirements outlined in the Insurance requirements section of this document
4. Once steps 1-3 are completed, the Railroad Company will begin processing the ROE application
5. If approved, the Applicant will receive an electronic copy of the ROE agreement by email
6. Applicant will have the ROE agreement executed by Applicant's VP or president of Applicant's company
7. Applicant will return a **HARD COPY** of the partially executed ROE agreement by mail to the Railroad Company address listed at the end of this document
8. The Railroad Company will return a fully executed digital copy of the ROE License Agreement by email for the Applicants records.

Please use this form and return by email to submit application request for a Right of Entry agreement.

Contact name and Email address –

Name of Applicant/contractor and email address -

Street Address –

City, State, Zip –

Telephone –

Detailed Purpose for ROE –

Start and Completion Date of ROE –

Public Agency's Project No. –

Public Agency Easement No. (if known) –

Location of project –

Subdivision and Milepost –

FRA/AAR/DOT Crossing No. and Name –
(Nearest to jobsite)

If unable to locate this number at jobsite, please use following links to obtain:

<http://safetydata.fra.dot.gov/officeofsafety/publicsite/crossing/xingqryloc.aspx>

In Illinois

<http://www.icc.illinois.gov/railroad/advanced.aspx?>

Please attach an aerial snapshot and a Google Earth kmz file to help identify specific location.

FAQ

What time frame can I expect to begin work and have flagging protection for my work?

A **Right of Entry License Agreement usually takes 4 to 6 weeks to obtain**. Once you have a fully executed ROE agreement, you will receive a flagging request form. This flagging request form along with prepayment for flagging fees will need to be *mailed to the physical address listed on the flagging request form*. Once this flagging request form is received, it is usually about **10 days until a flagger can be scheduled**. These are normal time frames. **Time frames can vary substantially** based on many factors. Expedited time frames may be able to be requested at an additional fee.

A brief summary of time frame for each step toward obtaining flagging protection...

1. Right of Entry License Agreement usually takes **4 to 6 weeks to obtain**.
2. Send in flagging check and flagging request form...about **1 week**
3. Once this flagging request form is received, it is usually about **10 days** until a flagger can be scheduled

What are the insurance requirements?

Railroad Company allows outside parties to come onto Railroad Company property to perform work, such as survey or inspection work, installation of pipelines and wirelines, and other work for projects necessitating the occupancy of Railroad Company. Before commencing work, and until the license of allowing such occupancy ends or is terminated, outside parties shall provide and maintain the following insurance in form and amount with companies satisfactory to and as approved by Railroad Company.

1. Minimum insurance required of outside party:
 - A. Statutory Workers Compensation and Employer's Liability Insurance.
 - B. Automobile Liability Insurance in an amount not less than \$1,000,000 combined single limit.
 - C. Commercial General Liability Insurance (Occurrence Form) in an amount not less than **\$5,000,000 per occurrence, with an aggregate limit of not less than \$10,000,000**. The policy must name Railroad Company and its Parents as additional insureds in the following form:

Wisconsin Central Ltd. Company and its Parents
Attn: **Thomas Brasseur**
700 Pershing Road
Pontiac, MI 48340
(248) 452-4854 (office)
THOMAS.BRASSEUR@CN.CA

The policy must remove any provisions excluding coverage for injury, loss or damage arising out of or resulting from doing business or undertaking construction or demolition on, near, or adjacent to railroad track or facilities using endorsement CG 2417 10 01 or equivalent approved by Railroad Company.

- D. When outside party is required by Railroad Company or Governing Authority to purchase Railroad Protective Liability Insurance to cover work on, near or adjacent to railroad track or facilities, and outside party is not being hired for this project by Railroad Company, outside party must procure Railroad Protective Liability Insurance in the following form;

This coverage shall be written on an Occurrence Form with limits of not less than \$5,000,000 per occurrence for Bodily Injury, Personal Injury and Physical Damage to Property, with an aggregate limit of not less than \$10,000,000. The policy must name:

Wisconsin Central Ltd. Company and its Parents
Attn: **Thomas Brasseur**
700 Pershing Road
Pontiac, MI 48340
(248) 452-4854 (office)
THOMAS.BRASSEUR@CN.CA

- E. In the event the privileges provided herein to Applicant involve any work that could result in the discharge, spillage, disposal, release or escape of any Hazardous Material or petroleum product onto the Railroad Company's property, Applicant shall purchase and maintain in effect at all times during the term of this License a Contractor's Pollution Liability policy in an amount not less than two million dollars (\$2,000,000) combined single limit (and with a deductible not to exceed \$50,000) insuring Railroad against any and all damages, costs, liabilities and expenses resulting from on- or off-site bodily injury (including death to any person), on or off-site loss, damage or destruction of property (including that belonging to the parties hereto), and on-or off-site cleanup costs (including expenses incurred in the investigation, removal, remediation, neutralization, or immobilization of contaminated soils, surface water, groundwater or any other contamination) growing out of or incidental to any discharge, spillage, disposal, release, or escape of any Hazardous Material or petroleum product arising therefrom. For purposes of this Agreement, the term "Hazardous Material" shall include, without limit, any flammable explosives, radioactive materials, hazardous materials, hazardous wastes, hazardous or toxic substances, or related materials defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (42 U.S.C. §§ 9601, et seq.), the Hazardous Material Transportation Act, as amended (49 U.S.C. §§ 1801, et seq.), the Resource Conservation and Recovery Act, as amended (42 U.S.C. §§ 6901 et seq.), the Toxic Substances Control Act, as amended (15 U.S.C. §§ 2601, et seq.), similar laws or ordinances enacted by any state, county or municipality in which the Property is located, or in the regulations adopted and publications promulgated pursuant to any of the above, as such laws or regulations now exist or may exist in the future.

Applicant is required to advise Railroad Company by thirty (30) day advance written notice when any work to be performed under this License may require Pollution Liability Insurance pursuant to the previous paragraph.

- F. All policies described above must include description of operations, Railroad Company milepost, highway or street name, city and state of location, project number, and Railroad Company contact person on the certificate.
2. Before commencing work, outside party shall deliver to Railroad Company a certificate of insurance evidencing the foregoing coverages and, if requested by Railroad Company, true and complete copies of the policies described above. If the policy is being issued in conjunction with, or as a result of, a city, county or state contract, the policy should be initially submitted to the respective city, county or state agency that will review it first and then forward it to Railroad Company.
3. Common Policy Provisions. Each policy described in paragraph 1, parts A through E above, must include the following provisions:
- A. Each policy shall include a waiver by the insurer of any right of subrogation against any recovery by or on behalf of any insured.
- B. Each policy shall provide for not less than thirty (30) days prior written notice to Railroad Company at the address listed above of cancellation of or any material change in that policy.

4. It is understood and agreed that the foregoing insurance coverage requirements, and outside party's compliance with those requirements, is not intended to, and shall not, relieve outside party from, or serve to limit, outside party's liability and indemnity obligations under the provisions herein.
5. Railroad Company shall have the right, from time to time, to revise the amount or form of insurance coverage required as circumstances or changing economic conditions may require. Railroad Company shall give outside party written notice of any such requested change at least thirty (30) days before the date of expiration of the then-existing policy or policies, outside party agrees to, and shall, thereupon provide Railroad Company with such revised policy or policies.
6. Insurance required of SUBCONTRACTOR:
 - A. If a SUBCONTRACTOR is to be employed by outside party to perform work on Railroad Company under or by the permission for occupancy granted to outside party by Railroad Company, before commencing work, the SUBCONTRACTOR shall provide and thereafter maintain all of the insurance described in paragraph 1, parts A through E, above, in the same forms and amounts as provided for above and subject to the other terms and conditions provided for in paragraphs 2 through 4 above.
 - B. In the alternative, before the SUBCONTRACTOR commences work for outside party on Railroad Company, outside party may provide and thereafter maintain all of the insurance described in paragraph 1, parts A through E, above, in the same forms and amounts as provided for above and subject to the other terms and conditions provided for in paragraphs 2 through 5 above, provided that all such insurance names SUBCONTRACTOR as an additional insured and all such insurance provides coverage to all additional insureds, including Railroad Company, for any liability arising out of work performed by all other additional insureds, including SUBCONTRACTOR.

Is safety training required?

Prior to any entry onto Railroad Company's property, the employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee shall determine by the guidelines hereinafter provided and by the work to be performed the level of safety training to be required.

All employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee not hired by Railroad Company that will work on CN property are required to have minimum www.contractororientation.com.

- a. EXCEPTION: Railroad Company has exempted those it classifies as "Delivery Persons" from this training. This will include contractors such as UPS, FedEx, trucking companies, etc. who merely access the property to supply materials or equipment.

All employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee hired by Railroad Company which will work on Railroad Company property are required to have minimum CN Safety and Security Awareness training, in addition to undergoing a background check. This training and background check must be obtained through the eRailSafe.com website. If not done before, the contractor must contact e-RailSafe at 855-383-7434 to be issued either a vendor number or issued instructions on obtaining a non-railroad contractor vendor number prior to accessing the noted website. Minimum information required of a Contractor, Grantee, Licensee, or Permittee and/or their subcontractor when contacting e-RailSafe is Name, Address, Telephone, Contact Person for State Projects, DOT Contract Number, and the AAR/DOT Number. This training is good for a period of two years.

- a. EXCEPTION: Railroad Company has exempted those employees of contractors providing paving services at a road crossing under construction or repair from this requirement.
- b. EXCEPTION: Railroad Company has exempted those it classifies as "Delivery Persons" from this training. This will include contractors such as UPS, FedEx, trucking companies, etc. who merely access the property to supply materials or equipment.

All employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee hired by Railroad Company, whose duties include and who are engaged in the inspection, construction, maintenance, or repair of railroad track, bridges, roadway, signal and communication systems, roadway facilities, or roadway machinery that will work foul of or have the potential to foul a live track are considered Roadway Workers under FRA regulations and CN Policy. They must complete the On-Track Safety Training course approved by Railroad Company and provided by R.R. Safety – AMR, P.O. Box 75, Lomira, WI 53048, telephone (920) 517-1677, email rrsafetytraining@yahoo.com. This training must be repeated at least once each calendar year.

- a. EXCEPTION: Railroad Company has exempted those employees of contractors providing paving services at a road crossing under construction or repair from this requirement.
- b. EXCEPTION: Railroad Company has exempted those it classifies as "Delivery Persons" from this training. This will include contractors such as UPS, FedEx, trucking companies, etc. who merely access the property to supply materials or equipment.
- c. All the employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee who will operate on-track machinery or those who will provide protection for other employees and/or subcontractors of a Contractor, Grantee, Licensee, or Permittee must also be trained on CN US Operating Rules pertaining to their duties. They must take and pass the required examination. This training is good for a period of two years.
- d. "Potential to foul a live track" is considered, at a minimum, to be working within twenty-five (25) feet of the track; or as otherwise to be determined by CN Design & Construction Department.

The employees, subcontractors, and/or agents of the Licensee and/or its contractor shall qualify for, and make available for inspection to Railroad Company's employees or other authorized personnel at all times while on Railroad Company property, a photo identification issued by www.e-railsafe.com, along with at least one other government-issued form of identification. Licensee and/or their contractor shall bear all costs of compliance with the requirements of this Section. Railroad Company reserves the right to bar any of employees or agents of a Contractor, Grantee, Licensee, or Permittee and/or their contractor from Railroad Company's property at any time for any reason.

What are the costs and address to mail documents and ROE application fee check?

Application Fee Information:

Cost is \$1000.00* for application

*Fee may be increased for special handling, expedited handling, or multiple reviews.

Check Payable To: Wisconsin Central Ltd. Company
Mail To: Wisconsin Central Ltd. Company and its Parents
Attn: **Thomas Brasseur**
700 Pershing Road
Pontiac, MI 48340
(248) 452-4854 (office)
Thomas.Brasseur@cn.ca

Mailing Address Information:

Mail To: Wisconsin Central Ltd. Company and its Parents
Attn: **Thomas Brasseur**
700 Pershing Road
Pontiac, MI 48340

Flagging Protection Rates:

Basic daily rate – = \$1,300.00 per day
Monday thru Friday regular business hours
Includes 8 standard rate hours and 2 OT hours to set flags
Overtime rate – = \$150.00 per hour
hours in excess of 8 hours or outside of regular business hours
Weekend or holiday rate - = \$1,500.00 per day
\$150.00 per hour with a 10 hour minimum

Email the completed first page above to: Thomas.Brasseur@cn.ca

Revised 11-07-2016

CN CERTIFICATE OF LIABILITY INSURANCE

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
INSURED	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	
	NAIC #	
	INSURER A :	
	INSURER B :	
INSURER C :		
INSURER D :		
INSURER E :		
INSURER F :		

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER: 1**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADD L	SUB R	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
X	GENERAL LIABILITY COMMERCIAL GENERAL LIABILITY CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR	Y	Y		EFF DATE	EXP DATE	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$10,000,000 PRODUCTS - COMP/OP AGG \$
X	AUTOMOBILE LIABILITY ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS NON-OWNED AUTOS	Y	Y		EFF DATE	EXP DATE	COMBINED SINGLE \$1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
X	UMBRELLA LIAB EXCESS LIAB DED RETENTION \$	Y	Y		EFF DATE	EXP DATE	EACH OCCURRENCE \$5,000,000 AGGREGATE \$10,000,000
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y	Y		EFF DATE	EXP DATE	OTHER MIN STATUTORY

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
 Certificate holder is an additional insured under all polices on this certificate including Commercial General Liability and Umbrella Liability.
 A Waiver of Subrogation applies in favor of the Certificate Holder for all policies on this certificate including Commercial General Liability and Umbrella Liability.
 50 foot railroad exclusion is removed through CG 2417 10 01

<p>CERTIFICATE HOLDER</p> <p>Wisconsin Central Ltd and its Parents Attn: Thomas L. Brasseur 700 Pershing Rd Pontiac, MI 49340</p>	<p>CANCELLATION</p> <p>SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.</p> <hr/> <p>AUTHORIZED REPRESENTATIVE of</p>
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CN REQUEST FOR FLAGGING SERVICES AND CABLE LOCATION

CN Request for Flagging Services and Cable Location

Project Information:	
Please fill in each cell for processing	
Is this a new project?	Select answer
List CN Project # (Example SO# 123456, Network# R1234, PSC-132):	
Contractor's Right of Entry (ROE), License, Permit #:	
Date of Agreement for ROE, License or Permit:	
Termination Date of Agreement for ROE, License or Permit (If Applicable):	
Does the scope of work include underground, piledriving, excavation or other activities which would require a Railroad Cable Locate? Note: railroad cables and fibers are not part of any state utility locate programs. If a contractor shows up on site to perform work that requires a cable locate and it was not requested, the flagger will shut down the project	Select answer
Does your project require vehicular traffic to be shifted out of its intended lane against the current of traffic at a railroad grade crossing?	Select answer
Railroad Subsidiary (listed on your agreement):	Select Railroad Subsidiary
Licensee and/or their contractor shall request, prepay, and secure Railroad Company signal facility locates by written notice to Railroad Company along with submission of CN's "Request for Flagging Services" form at least, 10 business days in advance of proposed performance of any work or access to Railroad Company property. Notice to Railroad Company does not fulfill or satisfy any other notification requirements for utility locates for non-railroad facilities. You must have an agreement with a CN railroad subsidiary, such as a Right of Entry, Permit, License or Formal Agreement in addition to any necessary flagging before you may enter CN property.	
Flagging Protection Schedule:	
Requested Dates for Flagger Protection: Dates requested are subject to Flagger Co. availability and any project needing a cable locate will need 10 days minimum advance notice. This should be considered when requesting dates for flagging.	
Estimated Duration (in days) for Flagger:	
Estimated Work Schedule (example Mon. – Sat.)	
Daily Start Time / End Time (example 0700 to 1700 etc.): (Flagger start and end time may vary based on type of protection required)	
Flagging Protection Location:	
Railroad Mile Post (MP):	
Railroad Subdivision:	
Project's Location (Street location/intersection):	
Project - City / State:	
Project Description (example HDD, Jack and Bore, Encroachment, Underground or Overhead Pipeline / Wireline crossing, etc.):	
Location for flagger to report:	
Field Contact Person(s):	1 st Alternate
Mobile Phone Number(s):	1 st Alternate
Email Address(s):	

CN REQUEST FOR FLAGGING SERVICES AND CABLE LOCATION			
Billing Information:			
Company Name:			
Contact Name:			
E-Mail:			
Billing Address:			
City/State:			
ZIP Code:			
Company Phone:			
Electronic Payment Instructions		Payment Information	
Financial Institution	HARRIS TRUST AND SAVINGS BANK 311 WEST MONROE, CHICAGO, IL	Customer Number (if available)	
Account Name	Grand Trunk Western	CN Contact	
Account	274-733-5	Service Requested (Flagging MP, Request Date)	
US ROUTING (ABA)	071 000 288		
Remittance Details	nfcashmanagement@cn.ca	Prepayment Amount	
Please send payment remittance details and copy of this flagging request to nfcashmanagement@cn.ca			

Before Flagging Service is provided:
CN required online training must be completed before Flagging Protection will be scheduled.
Prepayment must be received before Flagging Protection will be scheduled.
There is an 8-hour minimum per day. The base rate for Flagging Protection is \$1,300 for 10 hours: this includes 2 overtime hours for flagger to set up/take down protection if needed. Additional overtime hour must be prepaid at the rate of \$150.00 per hour. Weekends and Holidays must be prepaid at the overtime rate with a \$1,500.00 / 10 hour minimum. (Rates Effective January 1st, 2021.)
If additional days of flagging protection are required, they must be prepaid in advance.
Any prepayment not used can be refunded.
Railroad Cable Location must be prepaid, the cost is \$350.00 per locate.

This completed form must be sent with a map, confirmation of electronic prepayment, and proof of insurance to US_Flagging@cn.ca

CN Flagging Department

US Flagging
 T: **248-914-9695**
 17641 South Ashland Ave.
 Homewood, IL 60430
US_Flagging@cn.ca

I, _____, agree to pay for flagging and/or cable locate services as requested _____
 Print Name Signature

CN NO OBJECTION LETTER



CN System Engineering

Robert Kitchen
Design and Construction
Field Engineer
700 Pershing Rd
Pontiac, MI 48340
T 248-452-4734

June 21, 2023

Andy Rabadi, P.E.
Railroad Engineer
Illinois Department of Transportation
201 West Center Court
Schaumburg, IL 60196

Subject: 8040-W: Wisconsin Central Ltd., WAUKESHA Subdivision, MP 13.25 - 13.25

CN Engineering Design & Construction has reviewed the request for a 4-inch steel conduit with a 2-inch HDPE innerduct containing two (2) 144-strand fiber optic cables for traffic signals. There are no engineering objections provided the following occurs:

- 1.) CN's operations are not to be impaired or effected by any of the described work.
- 2.) A flagman, railroad representative is to be present during any and all work on, over, under or near railroad property.
- 3.) All employees of contractors not hired by CN that will work on, over, under or near CN property are required to have, at a minimum, safety certification with www.contractororientation.com and the railroad representative will be responsible for verifying and documenting said certifications.
- 4.) Any work that involves temporary traffic control plans or railroad grade crossings should follow the requirements of the current edition of MUTCD Section 8A.08 Temporary Traffic Control Zones and MUTCD Section 6. Traffic plan to be presented and discussed with Railroad Flagman / Railroad representative during every briefing.

This letter shall be valid for a period of two (2) years from the date herein. If the work has not been completed by then, the application will need to be reviewed again to ensure it is in accordance with all applicable regulatory requirements and standards.

Sincerely,

Robert Kitchen
CN Field Engineer

CN SIGNED LETTER MELROSE PARK



www.cn.ca

Southern Region

Joseph Wojcik
IC Track Design Technician
17641 S Ashland Ave.
Homewood, IL. 60430

June 21, 2023
File: 8040-W

Illinois Department of Transportation
201 West Center Court
Schaumburg, IL 60196

This is in response to your submission of May 12, 2023 whereby you propose to install a 4-inch steel conduit with a 2-inch HDPE innerduct containing two (2) 144-strand fiber optic cables for traffic signals at Milepost 13.25 on the Waukesha subdivision in Melrose Park, IL.

According to your plans as submitted, this installation will be located entirely within the public right of way of IL-64/North Ave where the State will run a fiber for traffic signals. This crossing will be recorded under CN File No. 8040-W.

The 4-inch conduit shall be located a minimum of 20-feet below the lowest base of rail and be a minimum of six feet below the bottom of Railroad's right-of-way drainage ditches, if any. The entire installation operation shall be so conducted as to guarantee uninterrupted train operation, and upon completion of the installation, the Railroad Company's property shall be left in a neat and level condition with all pits filled and thoroughly compacted.

This office shall receive 5 days notice, exclusive of weekends and holidays, before any work is performed in the vicinity of the track. Such notice shall only be accepted from the owner or their duly authorized agent. Once execution of the agreement is complete and you have submitted a completed flagging and cable request form, you must contact US_Flagging@cn.ca to set up flagging and cable locate before any work. The utility must prepay the railroad for all anticipated flagging and cable location costs which are to be calculated pursuant to the Request for Flagging Services and Cable Location form.

The 4-inch conduit shall be installed by a reliable and qualified contractor with proper equipment and well versed in the process. The Contractor shall carry suitable Workmen's Compensation Insurance with limits to meet all statutory requirements and shall furnish the Railroad with a certificate of such insurance as evidence of compliance prior to commencement of work.

The Railroad shall be reimbursed for any necessary expenses it has incidental to the installation of the facilities, including plan review, project set-up and inspection charges. **The Railroad has a policy that requires us to collect in advance, a non-refundable administrative fee of \$0.00.**

WARNING: THIS INSTALLATION MAY BE CROSSING ONE OR MORE BURIED FIBER OPTIC CABLES LOCATED ALONG RAILROAD'S RIGHT-OF-WAY. ANY DAMAGE TO THESE CABLES WILL BE THE SOLE RESPONSIBILITY OF THE OWNER OF THE FACILITIES BEING INSTALLED. THE PRIME CONTRACTOR SHALL NOTIFY THE "ONE-CALL" SYSTEM PRIOR TO ANY EXCAVATION AND SHALL PROVIDE THE RAILROAD INSPECTOR WITH THE AUTHORIZATION NUMBER.

THE RAILROAD HAS BURIED SIGNAL CABLES AT MOST ROAD CROSSINGS. THESE CABLES WILL NOT BE LOCATED THROUGH THE ONE-CALL SYSTEM AND WILL ONLY BE LOCATED BY PROVIDING THE ADVANCE NOTICE AS PREVIOUSLY DESCRIBED IN THIS LETTER.

It is the applicant's responsibility to forward all pertinent information contained herein to the contractor and/or sub-contractor.

Kindly have the authorized representative of the Illinois Department of Transportation acknowledge their understanding of the Railroad's requirements by signing and returning one copy to me.

Very truly yours,

Joseph Wojcik
IC Track Design Technician

TERMS AND CONDITIONS ACCEPTED:
Illinois Department of Transportation
Applicant

BY: Andy Rabadi
Signature

DATE: 06-21-2023

Andy Rabadi, P.E.
Printed Name and Title

IHB RIGHT OF ENTRY APPLICATION PACKAGE

IHB Right of Entry Application Package

Instructions for Preparing Application Drawings

For uniformity in the preparation of prints and/or sketches to accompany applications, and in order to facilitate prompt processing, the following instructions will apply to all projects applications drawings and/or sketches. Failure to include all pertinent information (either on the application or drawing) may result in the delay of processing or return of the application.

The size of the project application drawing shall be 8-1/2" x 11". Larger drawings or construction plans may be submitted if necessary for clarification but cannot be used in lieu of the project application drawing.

The project application drawing and/or sketch shall be to scale, or show adequate dimensional information and must include:

- North arrow.
- Nearest road crossing showing milepost and DOT/AAR number as outlined below.
- Plan view clearly showing the proposed project, including stationing and legends if applicable.
- Centerline of all railroad tracks.
- Property and/or right-of-way lines if known.
- Location of all proposed work and routes of access.
- A statement indicating whether or not it will be necessary to: 1) physically cross any railroad track (with vehicles or on foot) and: 2) come within 25 feet of any railroad track at any point along the access route or while conducting work.
- Draw number and date.

Instructions for Preparing Application Form

- "Project Owner Information" and "Project Information" sections must be filled out completely.
- The agreement will be prepared in the name of the Project Owner. It is important to provide the Complete Legal Name of the entity as well as its state of incorporation.
- Check the appropriate space to designate where the agreement should be mailed. If none or both are check, the agreement will be mailed only to the Project Owner.
- **REQUIRED:** Provide the estimated distance to/from the nearest road crossing or milepost. Identify the road crossing by its IHB Railroad Milepost number (including prefix, i.e. QC 292.83) and/or DOT/AAR number. The DOT/AAR number is a specific number assigned to each road crossing IHB tracks and should be posted at or near the crossing (usually on a pole or signal mast). It is usually a rectangular white sign with black numbers/letters and will consist of 6 numbers followed by one letter (Example: 630543 P). In lieu of the DOT number, an exact

IHB Right of Entry Package

Latitude and Longitude may be provided to aid in finding the project location in the railroad's maps and files.

- Please remember to date and sign the application form.

Instruction for preparing Proposed Work Description

Prepare a brief description of the proposed work (not to exceed three pages), providing sufficient information to justify the need to access IHB property. The information shall include:

- the proposed start date and expected duration of the project;
- a description of the proposed work identify the nature and location of any item or structure to be installed on IHB property (e.g. culverts, monuments, ditches);
- types of equipment to be used onsite (drill rigs, backhoe, excavator, etc.);
- methods of restoring right-of-way disturbed by work.

Please be aware that the Agreement will be strictly limited to the scope of services as defined in your work description. If, at any time, it becomes necessary to modify the scope of service, you must request a modification in writing and obtain a supplemental Agreement prior to performing the work.

Application Fee

The application fee is non-refundable and must be submitted with the application. Failure to do so may result in the application being returned. All checks should be made payable to IHB Railroad.

Application Fee:

- Initial Application Review/Processing \$1,000.00
- Emergency Application \$3,000.00
- Per site Surcharge for more than one site* \$50.00
- Renewal of Existing Agreement (within 12 months Of Agreement Expiration Date)^ \$150.00

*Site is defined as follows:

- a) Each contiguous work site or work site segment along the Railroad track that is 500 feet or less in length, on a single subdivision, branch, or spur, such that protection can be provided by a single Railroad employee; or
- b) In areas such as yards and other facilities, each contiguous work site or portion thereof, consisting of ½ acre or less.

^ Renewal becomes effective upon receipt of written approval by IHB.

Please do not combine the amount for the application fee and risk fee (if applicable) into one check. Separate checks are needed to facilitate processing.

IHB Right of Entry Package

Flagging Requirements

If required for your work, an IHB flagman will be provided at the entire cost and expense of the work's owner and/or the applicant for the duration of the project. This protection cannot be provided by any personnel other than an authorized IHB employee. The IHB will make the sole determination as to whether flagging protection is required based on the work to be performed.

Roadway Worker Qualifications

All project workers including those of sub contractors must be Roadway Worker Qualified. Workers shall carry a Qualification card at all times and show on demand of any IHB employee.

Insurance

Each tenant/license shall be required to obtain, at its sole cost and expense, various type of insurance coverage with various limits. These insurance coverages must be of a form and be underwritten by insurance companies that meet with the IHB approval. In addition, the tenant/licensee may be required to pay IHB a risk-financing fee in certain instances. The types of insurance typically required by IHB include:

Commercial General Liability Insurance	Automobile Liability Insurance
Worker's Compensation Insurance	Railroad Protective Liability Insurance (during construction or maintenance only)

Indiana Harbor Belt generally requires a policy of Commercial General Liability Insurance with a combined single limit of not less than \$2,000,000 per occurrence for injury to or death of persons and damage to or loss or destruction of property. **Specific insurance requirements will be provided to you in the agreement covering your request when it is approved by the IHB.**

Railroad Valuation Maps

Railroad Valuation Maps are provided for information purposes only. There is a charge of \$50 per Valuation Map and \$25 for each copy of the same map. Shipping charges is \$2 per map for regular and \$12 for overnight delivery. To obtain a copy of the Valuation Map Reproduction Request form, please contact Manager Engineering Services at (219) 989-4909, Fax # (219) 989 4813 or email at IHBRR.com. In order to process the request for Valuation Map, the county and state must be provided along with one of the following: GIS#, Valuation Section and sheet, milepost with prefix, DOT crossing number, nearest street and distance from that street, or an attached map of the area.

Please do not address questions regarding obtaining Valuation Maps to the right of entry section.

IHB

Form: ROE 200405

Application for Public Improvements/ Right-of-Entry

Project Owner Information: ___ Check here if agreement should be mailed to this address.

1. Complete Legal Name of Applicant: _____
2. Company Contact Name: _____ Title: _____
3. Telephone: () _____ Fax: () _____ Emergency () _____
4. Address: _____
5. City: _____ State: _____ Zip Code: _____
6. Type of Business: _____
 Corporation (State of Incorporation: __ Individual __ Developer
 Partnership (Type & State _____)
 __ Municipality or Government

Engineer/Consultant Information: ___ Check here if agreement should be mailed to this address

7. Company Name: _____
8. Company Contact Name: _____ Title _____
9. Telephone: () _____ Fax: () _____
10. Address: _____
11. City: _____ State: _____ Zip Code: _____

Project Information : 12: Date of Application _____ Application Ref. # _____

12. Description of Location: _____
13. City: _____ County: _____ State: _____
14. Est. Distance _____ feet _____ (direction) from Road Xing _____ DOT# _____
15. Project Description: _____

16. Latitude: _____ Longitude: _____ (WGS84)
17. How close will project be to nearest track _____ ft.
18. Does the work on IHB R/W include _____ Soil Boring _____ Excavation
 _____ Construction/Demolition
19. How did applicant verify that property and/or track is owned by IHB _____
20. Expected beginning date of occupancy _____ Completion Date: _____
21. Requested contract expiration date: _____
22. Signature of Applicant: _____ Date: _____

- For Railroad Use Only: 22 Agreement Number: _____
22. Region: _____ Division _____ Subdivision _____
 23. Milepost: _____ Val Section: _____ Val Map # _____
 24. File review date: _____ Fees Attached Y N _____
 25. Comments: _____
 26. Distribution: _____
 27. Approved: ___ Yes ___ No By: _____ Date: _____

IHB RIGHT OF ENTRY AGREEMENT



INDIANA HARBOR BELT RAILROAD COMPANY (IHB)

THIS RIGHT OF ENTRY AGREEMENT, made this _____ day of _____ 20____, by and between INDIANA HARBOR BELT RAILROAD COMPANY, a corporation organized and existing under the laws of the State of Indiana and authorized to do business in the State of Illinois, hereinafter called the IHB, and **HBK Engineering LLC** hereinafter called the Vendor

WITNESSETH: That, in consideration of being granted permission and authority to enter upon the property of INDIANA HARBOR BELT RAILROAD COMPANY, for the purpose of **survey work only** it is mutually agreed as follows:

1. TERMS OF EMPLOYMENT. The IHB reserves no control whatsoever over the employment, discharge, compensation of or services rendered by the Vendor's employees, and it is the intention of the parties to this Agreement that the Vendor shall be and remain an independent contractor, and that nothing in the Agreement contained shall be construed as inconsistent with that status. The vendor agrees to pay the contributions measured by the wages of his (its) employees required to be made under the Unemployment Compensation Insurance, Social Security and Retirement Laws or similar laws, State and Federal, applicable to the work hereunder undertaken by the Vendor or his (its) subcontractors, and to accept exclusive liability for said contributions: the Vendor further promises and agrees to indemnify and hold harmless the IHB, its successors and assigns, from any all liability arising therefrom.

2. CONSENT TO TRANSFER. The Vendor shall not let, transfer or assign this Agreement as whole, without the consent in writing from the IHB.

3. WAIVER. It is expressly understood and agreed that any waiver on the part of the IHB, of any term, provision or covenant of this Right of Entry Agreement, shall not constitute a precedent, nor bind the IHB, to a waiver of any succeeding breach of the same or any other of the terms, provision or covenants of this Agreement.

4. PERMITS AND INSURANCE. A Vendor shall maintain the following insurance coverage which has been so designated. (x).

- (x) I. Statutory Workmen's Compensation and Occupational Disease Insurance and/or FELA coverage, if applicable.
- (x) a. To the extent permitted by law, all Workers' Compensation policies shall be endorsed to provide Waiver of subrogation in favor of owner.

- (x) II. Commercial General Liability Insurance which shall be no less comprehensive and nor more restrictive than the coverage provided by a standard form Commercial General Liability Policy with a minimum combined single limit of \$2,000,000 per occurrence for Bodily Injury and Property Damage and \$3,000,000 each for the General Aggregate and the Products/Completed Aggregate. This insurance must include the following features:
 - (x) a. Railroad Protective Liability Insurance naming the IHB as Named Insured with a limit for bodily injury and property damage liability of \$5,000,000 per occurrence, \$10,000,000 aggregate, the original of said policy shall be furnished to IHB prior to any entry upon IHB property by Vendor (if required).
 - () b. Contractual Liability, insuring the liabilities and indemnification assumed under the provisions of the Agreement inclusive of XCU exposure (d below) if applicable with any restrictions for work within 50 feet of a railroad removed (if required).
 - () c. Products and completed operations.
 - () d. Coverage for demolition of any building or structure, collapse, explosion, blasting, excavation and damage to property below the surface of the ground.
 - (x) e. Coverage will include appropriate endorsements naming IHB as additional insured. (ISO Form CG 2010)
 - () f. The coverage afforded the additional insureds shall be primary and noncontributory to any additional insureds.
- (x) III. Employers, liability coverage with limits of not less than \$1,000,000 each accident, \$1,000,000. policy limit for disease, and \$1,000,000 each employee disease, such policies shall contain a waiver of subrogation.
- (x) IV. Umbrella Liability/Excess coverages over primary insurance with a limit of not less than \$10,000,000. each occurrence and shall follow form of the underlying general liability coverages for employers liability, and auto liability and general liability (including products/completed operations). In addition, said policy shall have endorsement naming The Indiana Harbor Belt Railroad Company as additional insured.
- (x) V. Automobile Liability Insurance, covering all owned, non-owned and hired vehicles with a minimum combined single limit for Bodily Injury and Property Damage of \$2,000,000. per occurrence. This insurance will include contractual liability insuring the indemnification provisions contained in this Agreement.

- A. The insurance policies to be maintained under this Agreement must be issued by companies authorized to do business in Illinois and Indiana and shall include a requirement that the insurer provide IHB with thirty (30) days written notice prior to the effective date of any cancellation or material change of the insurance. The policies required herein shall name IHB as additional insured with respect to operations performed under this Right of Entry Agreement and shall be primary to and not in excess of or contributory with any other insurance available to IHB. Vendor shall, before commencing work, provide IHB with a certificate satisfactory to IHB of the Insurance coverages and endorsements set forth herein. Vendor shall provide IHB with certified copies of certificates. The obligation to carry the insurance required herein shall not limit or modify in any way any other obligations assumed by the Vendor under this Agreement. Vendor shall be held accountable for all insurance coverages, including those of subcontractors.
- B. Original of certificates shall be mailed to Director of Risk Management and Attention: Insurance, at the address set forth below IHB's signature to this Agreement. IHB shall not be under any duty to advise Vendor in the event that Vendor's insurance is not in compliance with this Agreement.

5. WAIVER OF SUBROGATION. Vendor on behalf of its insureds waives any right of subrogation that such insurers may have against IHB arising out of this Agreement. The insurance specified in Section 3 hereof shall contain a waiver of the right of subrogation against the IHB and an assignment of statutory lien, if applicable. Any physical damage insurance carried by Vendor on construction equipment, tools, temporary structures and supplies owned or used by Vendor shall provide a waiver of the right of subrogation against the IHB.

6. INDEMNITY. The Vendor hereby agrees to protect, indemnify and hold harmless said IHB, its officers, agents and employees against any and all liability or loss, damage or injury of every kind, nature and description, fatal or otherwise, which Vendor may sustain in any manner whatsoever to IHB and/or Vendor, arising either directly or indirectly, out of or in connection with the authority and permission herein granted or while Vendor is upon or about any of the property of the IHB, or upon any property of any of the tenants, lessees or licensees of the IHB, in connection with such permission.

7. PERSONAL SAFETY EQUIPMENT. All employees entering or remaining on IHB property under this right of entry must wear safety shoes, reflective vest, hardhats and eye protection while anywhere on IHB company property.

Vehicles must be marked with your company's name, or advance information must be provided as to whose vehicles will be on IHB property.

8. FLAG PROTECTION AND CONTACT. Under no circumstance may ANY work be carried out within twenty five (25) feet of any railroad right-of-way without a

IHB employee providing flag protection paid for by you. To obtain flag protection, call Manager Engineering Services at 219-989-4910, and provide information he requests at least 36 hours ahead of time. Vendor must include a name and telephone number for a designated employee contact who will be at the work site until work authorized herein is complete.

9. NATURE OF JOB. Prior to order of flag protection for the first day, Contractor shall provide in addition to the executed Right of Entry Agreement, a written summary of the job to be done, detailing the number of employees scheduled to be upon IHB property, the kind of equipment they will use, and particularly the kind of vehicle and fixed objects such as scaffolding, etc. Specific detailed information on the location of the equipment, and whether or not it will be placed within 25 feet of the right-of-way must be submitted. This information may be sent in letter form and preferably with a diagram or sketch plan. IHB must be updated daily by vendor designated employee contact as to nature and location of work for following day before close of business day. This Right of Entry will not be valid until this requirement is met and the nature of the work is clearly understood.

10. EXTENSION. The Right of Entry is good only for the project described and for the duration of the insurance coverage provided, whichever comes first. If the project expands or takes longer, you must re-contact IHB to assure insurance and other provisions are in order. Under no circumstances shall this Right of Entry be construed as granting any right, title or interest of any kind or character in or about the land or premises of the IHB.

11. RESTORATION OF PREMISES. Upon completion of the Project, IHB's property shall be left in a condition satisfactory to the said Office of the Chief Engineer or his Designee. This, includes, without limitation restoration of any fences removed.

12. HAZARDOUS MATERIALS. Prohibition of Certain Potentially Environmentally Damaging Operations on IHB Property: Electronics, electrical transformer repair or reconditioning, asbestos manufacturing, blast furnaces, steel works, rolling and finishing mills, smelting and/or refining, wood treatment or tie plants, salvage operations, junk yards, scrap dealers, drum or barrel reconditioners, battery recycling, tire storage or recycling, waste disposal operations of any kind including landfills, surface impoundments and waste piles, incinerators, sewage systems, electroplating operations, fuel blending, waste or used oil recycling or reclamation, explosives disposal, manufacturing or detonation, bulk oil storage or any facility requiring a TSD hazardous waste permit or any hazardous waste transloading facility.

The foregoing list of prohibited activities on IHB property is not exclusive. all proposed leases, licenses and permits will be carefully evaluated to determine if the proposed activities pose an unreasonable environmental risk.

13. NOTICE – HOW SERVED. Any notice to be given by the IHB to the Vendor under this Agreement except Section 7, 8, and 9, shall be deemed to be served if

the same be delivered to the person in charge of the office used by the Vendor, or to his representative at or near the work, deposited in the post office postpaid, addressed to the Vendor at his last known place of business. Notice under Sections 7, 8, and 9 shall be deemed served to the Vendor's designated employee contact by any means appropriate.

14. MISCELLANEOUS.

- A. The construction of this Agreement and the rights and obligations of the parties hereunder shall be governed by the laws of the State of Illinois.
- B. This Agreement and any amendments to it or them may be executed in several counterparts and such counterparts may be delivered by facsimile or in PDF form as an email attachment, and each Agreement so executed shall constitute one agreement, binding on the parties thereto, even though such parties are not signatories to the original or the same counterpart. Any counterpart of this Agreement that has attached to it separate signature pages, which altogether contain the signatures of the parties thereto, shall for all purposes be deemed a fully executed instrument. Each party agrees that it will be bound by its own telecopied or otherwise electronically transmitted signature to this Agreement and that it accepts the telecopied or otherwise electronically transmitted signatures of the other party to this Agreement.
- C. The prevailing party in any litigation or suit involving or arising out of this Agreement shall be entitled to recover from the non-prevailing party all of its attorneys' fees and costs.
- D. For any suit, proceeding or cause of action between them arising out of or relating to this Agreement, each party hereto consents and agrees to exclusive jurisdiction and venue in the federal courts sitting for the Northern District of Illinois, or if there is no federal jurisdiction, to the state courts located in Cook County, Illinois.

THIS AGREEMENT shall inure to the benefit of and be binding upon the legal representatives and successors of the parties respectively.

**INDIANA HARBOR BELTRAILROAD COMPANY
2721 161ST STREET – HAMMOND, INDIANA 46323**

Attest: _____ By: _____

Title

Date

Telephone

VENDOR

Attest: _____ By: _____

Title

Date

Company Name

Address

City, State

Telephone

Facsimile/Fax

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES (PROJECT SPECIFIC)

Description. This work shall consist of the removal and disposal of regulated substances according to Section 669 of the Standard Specifications as revised below.

Contract Specific Sites. The excavated soil and groundwater within the areas listed below shall be managed as either “uncontaminated soil”, hazardous waste, special waste or non-special waste. For stationing, the lateral distance is measured from centerline and the farthest distance is the offset distance or construction limit, whichever is less.

Soil Disposal Analysis. When the waste material requires sampling for landfill disposal acceptance, the Contractor shall secure a written list of the specific analytical parameters and analytical methods required by the landfill. The Contractor shall collect and analyze the required number of samples for the parameters required by the landfill using the appropriate analytical procedures. A copy of the required parameters and analytical methods (from landfill email or on landfill letterhead) shall be provided as Attachment 4A of the BDE 2733 (Regulated Substances Final Construction Report). The price shall include all sampling materials and effort necessary for collection and management of the samples, including transportation of samples from the job site to the laboratory. The Contractor shall be responsible for determining the specific disposal facilities to be utilized; and collect and analyze any samples required for disposal facility acceptance using a NELAP certified analytical laboratory registered with the State of Illinois.

Intersection of IL 64 (North Avenue) and York Street / York Road, Elmhurst, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and York Street / York Road. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) Near Howard Avenue, Elmhurst, Cook County

- All excavation planned for the Dynamic Message Sign near the south side of the intersection of IL 64 (North Avenue) and Howard Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Melrose Avenue / Emroy Avenue, Elmhurst, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and Melrose Avenue / Emroy Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Berteau Avenue, Elmhurst, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and Berteau Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Railroad Avenue, Northlake, Cook County

- All excavation planned at the northwest quadrant and northeast quadrant at the intersection of IL 64 (North Avenue) and Railroad Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Hillside Avenue / Walmart Entrance, Northlake, Cook County

- All excavation planned at all four quadrants and the northeast median at the intersection of IL 64 (North Avenue) and Hillside Avenue / Walmart Entrance. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) Near Lavergne Avenue, Northlake, Cook County

- All excavation planned for the Dynamic Message Sign location approximately 250 feet west of the intersection of IL 64 (North Avenue) and Lavergne Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Wolf Road, Northlake, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and Wolf Road. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Roy Avenue, Northlake, Cook County

- All excavation planned at northeast quadrant, southeast quadrant, southwest quadrant and northeast median at the intersection of IL 64 (North Avenue) and Roy Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at northwest quadrant at the intersection of IL 64 (North Avenue) and Roy Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Cornell Avenue / 35th Avenue, Melrose Park, Cook County

- All excavation planned at the southwest quadrant, southeast quadrant and east of the southeast quadrant at the intersection of IL 64 (North Avenue) and Cornell Avenue / 35th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Hawthorne Avenue, Melrose Park, Cook County

- All excavation planned at the northwest quadrant, southeast quadrant, southwest quadrant and east island at the intersection of IL 64 (North Avenue) and Hawthorne Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Indian Boundary Road, Melrose Park, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and Indian Boundary Road. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and 25th Avenue, Melrose Park, Cook County

- All excavation planned at the northwest quadrant at the intersection of IL 64 (North Avenue) and 25th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the southeast quadrant at the intersection of IL 64 (North Avenue) and 25th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Jewel Drive, Melrose Park, Cook County

- All excavation planned at the northwest quadrant and northeast quadrant at the intersection of IL 64 (North Avenue) and Jewel Drive. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and 19th Avenue, Melrose Park, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and 19th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and 15th Avenue, Melrose Park, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and 15th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and George Street, Melrose Park, Cook County

- All excavation planned at the northwest quadrant, northeast quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and George Street. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Winston Plaza Drive, Melrose Park, Cook County

- All excavation planned at the southwest quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and Winston Plaza Drive. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and 9th Avenue, Melrose Park, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and 9th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and 7th Avenue, Melrose Park, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and 7th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and 5th Avenue, Melrose Park, Cook County

- All excavation planned at the northwest quadrant, southwest quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and 5th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the northeast quadrant at the intersection of IL 64 (North Avenue) and 5th Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and 1st Avenue, Melrose Park, Cook County

- All excavation planned at the northwest quadrant, northeast quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and 1st Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the southwest quadrant at the intersection of IL 64 (North Avenue) and 1st Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Sunset Bridge, Melrose Park, Cook County

- All excavation planned at the northwest quadrant and northeast quadrant at the intersection of IL 64 (North Avenue) and Sunset Bridge. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Riverwoods Drive, Melrose Park, Cook County

- All excavation planned at the southwest quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and Riverwoods Drive. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and 76th Avenue / Lathrop Avenue, Elmwood Park, Cook County

- All excavation planned at the southwest quadrant, northeast quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and 76th Avenue / Lathrop Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the northwest quadrant at the intersection of IL 64 (North Avenue) and 76th Avenue / Lathrop Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Harlem Avenue, Elmwood Park / Chicago / River Forest / Oak Park, Cook County

- All excavation planned at the northwest quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and Harlem Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the southwest quadrant at the intersection of IL 64 (North Avenue) and Harlem Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Oak Park Avenue, Chicago / Oak Park, Cook County

- All excavation planned at the southwest quadrant, northeast quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and Oak Park Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the northwest quadrant at the intersection of IL 64 (North Avenue) and Oak Park Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Natoma Avenue / Columbian Avenue, Chicago / Oak Park, Cook County

- All excavation planned at the northwest quadrant and northeast quadrant at the intersection of IL 64 (North Avenue) and Natoma Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the southeast quadrant and east of the southeast quadrant at the intersection of IL 64 (North Avenue) and Columbian Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Narragansett Avenue, Chicago, Cook County

- All excavation planned at the northwest quadrant, northeast quadrant and southwest quadrant at the intersection of IL 64 (North Avenue) and Narragansett Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Mobile Avenue / Ridgeland Avenue, Chicago / Oak Park, Cook County

- All excavation planned at the southwest quadrant, northeast quadrant and southeast quadrant at the intersection of IL 64 (North Avenue) and Mobile Avenue / Ridgeland Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the northwest quadrant at the intersection of IL 64 (North Avenue) and Mobile Avenue / Ridgeland Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Austin Avenue / Austin Boulevard, Chicago, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and Austin Avenue / Austin Boulevard. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Menard Avenue, Chicago, Cook County

- All excavation planned at the northwest quadrant, west of the northwest quadrant, northeast quadrant and southwest quadrant at the intersection of IL 64 (North Avenue) and Menard Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the southeast quadrant at the intersection of IL 64 (North Avenue) and Menard Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Long Avenue, Chicago, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and Long Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Laramie Avenue, Chicago, Cook County

- All excavation planned at the northwest quadrant, northeast quadrant and southwest quadrant at the intersection of IL 64 (North Avenue) and Menard Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.
- All excavation planned at the southeast quadrant at the intersection of IL 64 (North Avenue) and Menard Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and Leclaire Avenue, Chicago, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and Leclaire Avenue. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Intersection of IL 64 (North Avenue) and IL 50 (Cicero Avenue), Chicago, Cook County

- All excavation planned at all four quadrants at the intersection of IL 64 (North Avenue) and IL 50 (Cicero Avenue). The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Potential contaminants of concern sampling parameters: VOCs, SVOCs and Metals.

Work Zones

Three distinct OSHA HAZWOPER work zones (exclusion, decontamination, and support) shall apply to projects adjacent to or within sites with documented leaking underground storage tank (LUST) incidents, or sites under management in accordance with the requirements of the Site Remediation Program (SRP), Resource Conservation and Recovery Act (RCRA), or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or as deemed necessary. For this project, the work zones apply for the following ISGS PESA Sites:

None

CHICAGO DOT PROJECT SPECIFICATIONS

ITEM 108, TRENCH AND BACKFILL WITH SCREENINGS

1. **DESCRIPTION** This work will consist of excavating a trench for the installation of conduit and backfilling with limestone screenings as a portion of the total backfill of the trench, all as shown in Bureau of Electricity Standard Drawings No. 579 and No. 813. This work must meet all applicable requirements of Article 815 of the Standard Specifications.
2. **MATERIAL**. Underground Cable Marking Tape must meet the requirements of Section 1066.05 of the Standard Specifications. Backfill must meet the requirements of Section 1003.04 of the Standard Specifications.
3. **CONSTRUCTION REQUIREMENTS**. The trench must be deep enough to provide thirty inches (30") of cover over the conduit to be installed. The trench must not exceed twelve inches (12") in width unless approved by the Resident Engineer. The bottom of the trench must be tamped, and the trench inspected by the Resident Engineer before conduit is installed. All trenches must be backfilled as soon as possible after the installation of the conduit or cable. Any material excavated from the trenches that in the opinion of the Resident Engineer is satisfactory backfill, may be used for backfill above the layer of screenings. The limestone screenings must be used to fill the bottom of the trench to a depth of one foot above the top of the conduit or duct encasement. Cinders, rocks, or other inappropriate materials will not be permitted to be used as backfilling material. Backfilling material, beginning with limestone screenings must be deposited in the trench in layers not to exceed six inches (6") in depth, and must be thoroughly compacted with a mechanical tamper before the next layer is deposited in the trench. All trenches for conduit must be backfilled as per this specification. Unsuitable material must be disposed of according to the requirements of Section 202.03 of the Standard Specifications. Underground cable marking tape must be installed twelve inches (12") below the finished grade for all conduit runs.
4. **METHOD OF MEASUREMENT**. This work will be measured in feet along the centerline of the trench. Trench and backfill will not be measured for payment for conduit which is installed by pushing or by directional boring. Where more than one (1) conduit is installed in a single trench, only one run will be measured for payment.
5. **BASIS OF PAYMENT**. This work will be paid for at the contract unit price per lineal foot, measured with conduit in place, for TRENCH AND BACKFILL WITH SCREENINGS. Such price will include the cost of all excavation, furnishing and placing all backfill material, and disposal of all surplus excavated material. If sidewalk, driveway pavement or pavement must be removed and replaced, such work will be paid for separately.

MATERIAL SPECIFICATION

DRAWINGS

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579

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January 1, 2002

ITEM 120, DRILL EXISTING MANHOLE OR HANDHOLE

1. **DESCRIPTION.** This work will consist of drilling a hole in an existing handhole or manhole for the installation of a new conduit. This item must meet the requirements of Article 879 of the Standard Specifications.
2. **CONSTRUCTION.** The size of the hole must be as close as possible to the size of the conduit to be installed. The conduit must be installed in the drilled hole with a bushing before the hole is grouted. The conduit will be covered by a separate item. The space between the conduit and the handhole or manhole wall must be caulked with a waterproof grout. Drawing 814 provides additional information.
3. **METHOD OF MEASUREMENT.** This work will be measured per each hole drilled.
4. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price each for DRILL EXISTING MANHOLE OR HANDHOLE, which price will be payment in full for drilling the hole, grouting, and any additional work required to accomplish this task.

DRAWING 814

January 1, 2002

ITEM 123, CLEAN EXISTING MANHOLE OR HAND HOLE

1. **DESCRIPTION.** This item will consist of furnishing all labor, materials, tools and equipment necessary to clean a manhole or handhole. Work must include the removal and disposal of all foreign debris and liquids from the manhole or handhole. Manholes or handholes to be cleaned will be identified on the plans or by the Resident Engineer.
2. **CLEANING.** The inside dimension of the hand hole will normally be 30 to 36 inches in diameter and three feet in depth. The inside dimension of the manhole will normally be 3'x4'x4' or 4'x6'x6'. Handholes and manholes of other dimensions may be encountered. Cleaning will include opening the lid and placing the lid back in place after cleaning. The cables must not be damaged or disturbed during the cleaning process. All debris removed from the hole must be properly disposed of in an approved manner and not be left in the public way or dumped into the City sewer system. Guidelines outlined in Section 202.03 of the Standard Specifications should be followed.
3. **METHOD OF MEASUREMENT.** This work will be measured per each manhole/handhole cleaned.
4. **BASIS OF PAYMENT.** This work will be paid at the contract unit price each for CLEAN EXISTING MANHOLE OR HANDHOLE, as directed by the Resident Engineer, which payment will include both cleaning and debris disposal.

January 1, 2002

ITEM 132, PVC CONDUIT IN TRENCH 2" ITEM 133, PVC CONDUIT IN TRENCH 3"

1. **DESCRIPTION** - this work will consist of furnishing and installing a conduit lateral of the type and size specified.
2. **MATERIALS**

Galvanized rigid steel conduit and PVC coated steel conduit must conform to the requirements of Material Specification 1462.

Polyvinyl chloride (PVC) conduit must conform to the requirements of Material Specification 1533 and to the requirements of the National Electrical Manufacturers Association Standard, Publication Number TC2 for EPC-40, or EPC-80. Conduit color will be determined by the Resident Engineer.

Coilable non-metallic conduit must be a high density polyethylene meeting the requirements of Material Specification 1533 and ASTM-D1248, Type III, Grade PE34, Category 5, and Class C. The duct must meet the requirements of Section 1088.01(c) of the Standard Specifications. The average outside diameter of the 1.25 inch duct must be 1.66 inches, with a minimum wall thickness of .15 inches for the Schedule 40 conduit, and a wall thickness of .20 for the Schedule 80 conduit. Conduit color will be as determined by the Resident Engineer.

Aluminum conduit will be rigid wall conduit with a minimum wall thickness of 0.099". The conduit will be extruded from 6063 aluminum alloy and tempered to T-1. Aluminum conduit must meet the requirements of UL-6 and ANSI C80.5.

3. CONSTRUCTION.

DEFINITION OF LATERALS - A lateral will mean a conduit raceway extending from one sub-surface location to another sub-surface location, and in every case intended to encase electric circuit cable under paved surfaces, or in unpaved parkway, street or alley, where specifically designated.

LOCATIONS - Laterals must be installed at the locations shown on the construction plans. Laterals must be installed in the shortest practicable line between points of termination, or under adverse conditions, as directed by the Resident Engineer. Laterals not shown on the drawing, but necessary to be installed will be paid for at the unit price bid for laterals as additional units of construction.

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INSTALLATION REQUIREMENTS - Galvanized rigid steel conduit may be installed in a trench, pushed underground, or attached to a structure. PVC conduit will normally be installed in a trench or attached to a structure. Coilable conduit will be installed in a trench. The Contractor must exercise care in installing the conduit to ensure that it is smooth, free from sharp bends or kinks, and has the minimum practicable number of bends. Crushed or deformed conduit will not be accepted. All conduit and fittings must have the burrs and rough places smoothed, and all conduit runs must be cleaned and swabbed before installation of electric cables. If cable is not to be installed immediately after cleaning of the conduit, a light weight pulling line such as 1/8" polyethylene line must be placed in the conduit and will remain in the conduit for future work. The excavation for pushing conduit must be located at least two feet (2') from the edge of pavement. All underground conduits must have a minimum cover of thirty inches (30") below grade. If conduit cannot be installed with a minimum cover of thirty inches (30"), the conduit must be encased in concrete for protection. The method of encasement and protection must be approved by the engineer. Concrete encasement will be paid for as a separate pay item.

When multiple laterals in a common trench are required, no more than three (3) three inch (3") or smaller conduit laterals can be laid on a single, horizontal level. Four or more conduit laterals must be installed on two (2) levels in accordance with instructions of the Resident Engineer.

Conduit laterals attached to a structure must be flush to the structure where possible. Clamps or hangers must be used at a maximum interval of five feet (5') to hold the conduit rigidly in place. Fittings must be supplied and installed that are compatible with the conduit in use. Expansion couplings must be used at locations where the conduit crosses expansion joints in the structure.

Conduit laterals installed under vaulted walks must be securely attached to the retaining wall by means of galvanized clamps and clamp backs held in place by anchor bolts. Laterals will be fastened as close to the underside of the sidewalk as possible, and securing clamps installed every five feet (5'). Laterals must be continuous through party walls.

Threaded fittings and bends of the same material as conduit must be furnished and installed as required. Threadless couplings may be used only for splicing existing conduit. All conduit splices, where required, will be considered incidental to this pay item.

Item 124 126 127 128 129 130 131 131a 131b 132 133 134 135 136 137
138 165 166 123B 123G
Page 3

4. **METHOD OF MEASUREMENT** - The length measured will be the number of lineal feet of conduit installed and accepted, measured in place. Each conduit will be measured separately even if in a single trench. The length for measurement will be the distance horizontally between changes in the direction of the conduit plus the conduit vertically attached to structures. All conduit on structures will be measured from point to point, whether vertical or horizontal.
5. **BASIS OF PAYMENT** - This work will be paid for at the contract unit price per lineal foot for Underground Conduit of the type and size as specified, which price will be payment in full for furnishing and installing the conduit and fittings complete. Cleaning, swabbing, and p-lining of new conduit will be incidental to this pay item. Hangers, clamps, and fittings for conduit attached to structure will be incidental to this item. Trench and backfill will be paid for separately. Concrete encasement, if required, will be paid for separately. No additional payment will be allowed for pushing under pavements or for jackholes for conduit laterals.

MATERIAL SPECIFICATIONS
1462 1533

DRAWINGS
579 813

August 29, 2006

Item 124 126 127 128 129 130 131 131a 131b 132 133 134 135 136 137 138 165 166
123B 123G

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ITEM 144, ROD AND CLEAN DUCT IN EXISTING CONDUIT SYSTEM

1. **DESCRIPTION AND SCOPE.** This work will consist of inserting a duct rod or electrical fish rod or tape of sufficient length and rigidity into an electrical conduit opening in one electrical manhole or handhole, and pushing the said rod through the conduit to emerge at the next or subsequent manhole in the conduit system at the location shown on the plans. The duct rod may be inserted and removed by any standard construction method which causes no damage to the conduit system. The size of the conduit may vary from two inch (2") to four inch (4"), but there will be no differentiation in cost for the size of the conduit.

The conduit system which is to be rodded and cleaned may exist with various amounts of standing water in the manholes. The contractor must pump the water or sufficient water from the manholes to drain the conduit and to afford compatible working conditions for the installation of the duct rods and/or cables. The pumping of the manholes will be incidental to the work of rodding and cleaning of the conduit.

Any manhole which, in the opinion of the Resident Engineer contains excessive debris, dirt or other materials to the extent that conduit rodding and cleaning is not feasible, will be cleaned at the Engineer's order and payment approved as a separate pay item, and not a part of this specification.

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

2. **METHOD OF MEASUREMENT.** This work will be measured per lineal foot for each conduit cleaned. Measurements will be made from point to point horizontally. No vertical rises will count in the measurement.
3. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price per lineal foot for ROD AND CLEAN EXISTING CONDUIT for the installation of new electric cables. Such price will include the furnishing of all necessary tools, equipment, and polyethylene line as required to prepare a conduit for the installation of cable. When the number of cables to be installed requires the use of more than one conduit in the same run, each additional conduit required will be rodded and cleaned as a separate unit and paid for at the contract unit price.

Item 144

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April 2, 2001

ITEM 145A, CONCRETE FOUNDATION FOR TYPE "SUPER P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER

1. **DESCRIPTION.** This item will be for all work necessary for installing a foundation for a APS cabinet, or a foundation for a "Super P" cabinet.
2. **MATERIAL.** Concrete will be Portland cement concrete, SI Class, meeting the requirements of Article 1020 of the Standard Specifications. Ground rods will meet the requirements of Material Specification 1465. Conduit will be PVC meeting the requirements of Material Specification 1533. Anchor rods will meet the applicable requirements of Material Specification 1467.
3. **CONSTRUCTION.** The Contractor will install a concrete foundation for a base mounted traffic signal controller cabinet, as shown on City of Chicago Drawing Number 888 for a "P" cabinet, or as shown on Drawing 888A for a "Super P" cabinet. Work under this item will be performed in accordance with Article 800 of the Standard Specifications.

The foundation will have a minimum depth of at least forty inches (40") below grade and must have large radius conduit elbows in quantity, size and type shown. The elbow ends above ground will be capped with standard conduit bushings. The ground rod will be installed adjacent to the foundation, and will be driven straight down with the top to be no higher than 30 inches below finished grade. The Contractor will furnish anchor bolts, hardware, conduit elbows, and all other material shown on the foundation construction drawing.

All excavation and restoration of parkway will be considered as part of this item. If the foundation is in sidewalk, an expansion joint will be required between the sidewalk and the foundation.

4. **METHOD OF MEASUREMENT.** This work will be measured as each for each unit installed complete.

5. **BASIS OF PAYMENT.** Unit price will include cost of all material and labor required to install this foundation, as per applicable construction plans and these specifications. The conduit elbows will be considered as part of the foundation and will not be paid for as a separate item or as part of the conduit laterals leading to the foundation. All necessary excavation and restoration of parkway to the original condition will be included in the unit price. Any sidewalk removal will be paid for as a separate pay item. However, any restoration of sidewalk will be considered as part of this item, including any expansion joint between the sidewalk and the foundation. This work will be paid for at the Contract Unit Price of EACH for CONCRETE FOUNDATION FOR TYPE "P" BASE MOUNTED TRAFFIC SIGNAL CONTROLLER CABINET.

MATERIAL SPECIFICATION	DRAWING
1465	888
1467	888A
1533	

August 8, 2006

Item 145, Item 145A
Page 2

ITEM 149, CONCRETE FOUNDATION, 20" DIAMETER, 3/4" ANCHOR RODS

1. **DESCRIPTION.** This foundation will be for structural support of a traffic signal post, or other pedestal mounted equipment. The foundation must be poured in place and must be 20" in diameter, with a 13" bolt circle, 3/4" diameter anchor rods, and must be 5 feet in depth.
2. **MATERIAL.** Concrete must be Portland cement concrete meeting the requirements of Article 1020 of the Standard Specifications for SI Class concrete. Anchor rods must meet the requirements of Material Specification 1467 and the ground rod must meet the requirements of Material Specification 1465. Conduit must be PVC meeting the requirements of Material Specification 1533.
3. **CONSTRUCTION.** Foundations must conform to Drawing Number 709. Top surface of these foundations will be at an elevation of two inches (2") above grade or as required by the Resident Engineer. Care must be taken to install a level foundation and to ensure adequate anchor rod projections for double-nut installation. The foundation top must be chamfered 3/4 of an inch. The foundation must be centered back from the face of the curb in accordance with dimensions shown on the construction plans. When the foundation is in a solid sidewalk area, the foundation must be installed level, with the height of the foundation as close to the height of the sidewalk as possible, or as directed by the Engineer. A proper expansion joint must be installed between the sidewalk and the foundation.

Foundation raceways must consist of large radius conduit elbow(s) in quantity, size and type specified on Drawing 709 or as indicated on the construction plans. Elbows, in excess of those shown on Drawing 709, will be paid for separately under an additional pay item. The elbow ends above ground must be capped with standard conduit bushings. The Contractor must furnish anchor rods, hardware, conduit elbow(s) and all other material shown on applicable foundation construction drawings. Depth of foundation will be as noted on Drawing 709.

The anchor rods will be set by means of a metal template which must be submitted for approval before any foundation work is begun. The template must hold the rods vertical, and in proper position.

All excavation and restoration of parkway will be considered as part of this item. If the foundation is in sidewalk, an expansion joint will be required between the sidewalk and the foundation.

4. **METHOD OF MEASUREMENT.** The measurement will be based on each foundation installed complete.

5. **BASIS OF PAYMENT.** Payment will be made for foundations installed in place including an elbow in accordance with construction plans and these specifications. All necessary excavation and restoration of parkway, or sidewalk and expansion joint will be included in the unit price. This work will be paid for at the contract unit price per each, or per lineal foot, as designated in the contract, for CONCRETE FOUNDATION, 20" DIAMETER, 3/4" ANCHOR RODS.

MATERIAL SPECIFICATION
1465 1467 1533

DRAWING
709 844 11825

August 8, 2006

Item 149

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ITEM 151, CONCRETE FOUNDATION, 24" DIAMETER, 1 1/4" ANCHOR RODS, 15" BOLT CIRCLE, 9 FEET
ITEM 152, CONCRETE FOUNDATION, 30" DIAMETER, 1 1/4" ANCHOR RODS, 17 1/4" BOLT CIRCLE
ITEM 153, CONCRETE FOUNDATION, 30" DIAMETER, 1 1/2" ANCHOR RODS, 16 1/2" BOLT CIRCLE

-
1. **DESCRIPTION.** The foundation will be a poured in place concrete structure used for structurally supporting street light poles or traffic signal poles.

 2. **MATERIAL.** Concrete must be Portland cement concrete meeting the requirements of Article 1020 of the Standard Specifications for SI Class concrete. Reinforcement bars must meet the requirements of Section 1006.10 of the Standard Specifications. Anchor rods must meet the requirements of Material Specification 1467 and the ground rod must meet the requirements of Material Specification 1465. Conduit elbows must be PVC conduit meeting the requirements of Material Specification 1533.

3. **CONSTRUCTION.** Every foundation will be installed at the location designated and in the manner herein specified or in special cases as specifically directed. The contractor will locate foundations as per plan or as directed by the Resident Engineer. A hole must be augered for placement of the concrete form.

Item 151 is a foundation for a traffic pole which can accommodate a 16, 20, or 26 foot monotube arm (Standard Drawing 818). Item 152 is a foundation for a traffic pole which can accommodate a 30 foot monotube arm (Standard Drawing 816). Item 153 is a foundation for a traffic pole which can accommodate a 35, 40, or 44 foot monotube arm (Standard Drawing 817). Item 151A is a foundation for arterial street light pole; either steel or aluminum, conventional or davit (Standard Drawing 818). Item 151B is a foundation for the Chicago 2000 Gateway and Pedestrian ornamental light poles (Standard Drawing 953). Item 152A is a foundation for both the Extended Loop pole and the Loop pole (Standard Drawing 956). Item 180 is an offset foundation for an arterial street light pole (Standard Drawing 937). Item 181 is an offset foundation for a residential street light pole (Standard Drawing 937, with exception that pole base is 20" diameter with 1" anchors in a 10" bolt circle).

Top surface of these foundations in parkway will be at an elevation of two inches (2") above grade or as required by the Engineer. Care must be taken to install a level foundation and to ensure adequate anchor rod projections for double-nut installation. The foundations must be centered back from the face of the curb in accordance with dimensions shown on the construction plans. Foundation raceways must consist of large radius conduit elbow(s) in quantity, size and type as specified on the corresponding standard drawing or in the construction plans. Any number of elbows in excess of the number shown on the standard drawing must be paid for under a separate pay item. The elbow ends above ground will be capped with standard conduit bushings. The Contractor must furnish anchor rods, a ground rod, hardware, conduit elbow(s) and all other material shown on applicable foundation construction drawings. Depth of foundation will be as shown on the appropriate drawing. The foundation top must be chamfered 3/4 of an inch. When the foundation is installed in a sidewalk, the foundation must be installed level, with the height of the foundation as close to the height of the sidewalk as possible, or as directed by the Engineer. A proper expansion joint will be installed between the sidewalk and the foundation.

Anchor rods must be set in accordance with applicable construction plans so that when poles are mounted on the foundations, the street lighting mast arm will be properly oriented as indicated on the construction plans. The anchor rods will be set by means of a metal template which shall be submitted for approval before any foundation work is begun. The template must hold the rods vertical, and in proper position. Anchor rods must conform in all respects to the appropriate City drawing.

4. **METHOD OF MEASUREMENT.** This item will be measured per each foundation installed complete.
5. **BASIS OF PAYMENT.** Payment will be made for foundations installed in place, including elbows, in accordance with construction drawings, constructions plans and these specifications. All necessary excavation and restoration of pavement, sidewalk and fill to their original conditions will be included in the unit price. This work will be paid for at the contract unit price per each, or per lineal foot, as specified in the contract, for CONCRETE FOUNDATIONS (SPECIAL) of the diameter and size specified. The offset foundation will be paid for per each.

MATERIAL SPECIFICATION	DRAWING		
1465	953	818	956
1467	806	837	830
1533	811	937	11825
	816	817	844

Item 151, page 2

August 8, 2006

ITEM 206, POLE STEEL, ANCHOR BASE, 10" DIAMETER, 3 GAUGE, 34'-6"
ITEM 207, POLE STEEL, ANCHOR BASE, 11" DIAMETER, 3 GAUGE, 34'-6"

1. **DESCRIPTION.** This item will consist of furnishing, installing, and setting plumb a steel anchor base pole to which equipment may be attached for the extension of the City street light and traffic signal systems.
2. **MATERIAL.** The material of the pole must meet the requirements of Material Specification 1447.
3. **INSTALLATION.** The pole must be installed on the concrete foundation designed for the particular pole usage as indicated on the plans or as directed by the Engineer. Double nut construction must be used as shown on Drawing 837. Double nut construction provides the proper ventilation, as well as providing a way to plumb the pole. Any exposed portions of anchor rods extending above the nuts which interfere with the installation of the bolt covers must be cut off to provide the necessary clearance. The excess must not be burned off. The pole must be set secure, properly orientated, and plumb using the nuts and washers provided with the anchor bolts. The bolt covers, handhole cover, and pole cap must be securely attached.

The contractor will utilize non-abrasive slinging materials and will otherwise exercise due care in erecting the pole and mast arm to minimize any possible damage to the finish. When necessary, the contractor will utilize, at his own expense, factory approved touch-up materials and methods to restore the finish to like new appearance and durability.

4. **METHOD OF MEASUREMENT.** This item will be measured per each unit installed, complete with anchor bolt covers, pole cap, and handhole cover.
5. **BASIS OF PAYMENT.** This work will be paid for at the Contract unit price each for a POLE, STEEL, ANCHOR BASE, 34'-6", which will be payment in full for furnishing and installing the pole complete in place. Light standard foundations, mast arms, and luminaires will not be included in this pay item but will be paid for separately.

MATERIAL SPECIFICATION
1447

DRAWING
837 827
808 824

April 12,2001

ITEM 220, MAST ARM, STEEL, 8 FOOT

1. **DESCRIPTION.** This item will consist of furnishing and installing a steel pipe mast arm of a specified length to support a street light luminaire, or other electrical equipment as required, as is shown on Drawing Numbers 661, 620, 839, and 840.
2. **MATERIAL.** The material of the mast arm must conform to the requirements of Material Specification 1450. The 4 foot arm must conform to Standard Drawing 661. The 8 foot mast arm must conform to Standard Drawing 620. The 12 foot mast arm must conform to Standard Drawing 839. The 15 foot mast arm must conform to Standard Drawing 840. The two bolt arm attachment must be equal to that shown on Standard Drawing 724. The 1 foot mast arm will be a 4 foot arm cut to the desired length.
3. **INSTALLATION.** The 1 foot, 4 foot, and 8 foot mast arms will be installed with two bolts to the mast arm attachment on the pole. The pole must have a mast arm attachment as shown in Standard Drawing 659 in order to properly mount the arm. The truss arms require 2 such mounts. The 12 foot and 15 foot truss arms will be attached with 4 bolts. Bolts will be supplied with the arm per Material Specification 1450.
4. **METHOD OF MEASUREMENT.** This work will be measured per each unit installed.
5. **BASIS OF PAYMENT.** This work must be paid for at the contract unit price each for a MAST ARM, STEEL, of the length specified, which will be payment in full for furnishing and installing the mast arm complete in place.

MATERIAL SPECIFICATION
1450
659 724

DRAWING
620 661 839 840

January 23, 2004

ITEM 232, RACK, SECONDARY AERIAL 2 WIRE

1. **Description.**

This item will consist of furnishing and installing an electrical secondary rack, to which wires may be attached, on a street light pole, as shown on the plans, specified herein, or directed by the Commissioner. The secondary rack must be banded to the pole in the manner as herein described.

2. **Materials.**

The materials of the secondary rack must conform to the requirements of Specification 1443.

3. **Installation Requirements.**

The secondary rack must be banded securely to the pole at such height as to locate the upper insulating spool at six inches (6") below the top mast arm port of the pole. The banding must consist of two - 3/4 inch stainless steel bands, one each through the top and bottom clevises in the manner shown on Drawing 11940. The rack must be banded at a position 90 degrees from the central axis of the street light mast arm, or in the position of direct strain, when the pole is the line termination, and at 180 degrees from the central axis of the street light mast arm when the pole is an intermediate one in the pole line.

4. **Basis of Payment.**

This work will be paid for at the contract price each for a RACK, SECONDARY AERIAL 1-WIRE OR RACK, SECONDARY AERIAL 2 OR 3-WIRE, which price will be payment in full for furnishing and installing a secondary rack of the size stated on the contract plans on an existing pole. Any attachment of wires to the rack will be paid for as part of the cost of installing the wire.

MATERIAL SPECIFICATION
1443

DRAWING
11940

March 21, 1995

ITEM 244, WIRE, AERIAL, 1/C - NO. 6

1. **DESCRIPTION.**

This item will consist of furnishing and installing electrical wire strung between poles, attached to secondary wire racks on the poles, and connected to other wires or cables for the purpose of extending street lighting circuits as shown on the plans, as specified herein, or as directed by the Commissioner.

2. **MATERIALS.**

The material must be single conductor #6 AWG aerial wire meeting the requirements of Material Specification 1441 for medium hard-drawn copper aerial wire.

3. **INSTALLATION REQUIREMENTS.**

The wire must be installed with a nominal tension of 150 pounds to produce a sag of approximately 6 inches in an 85 foot span. Through wire must be attached to the side of the insulator away from the pole and secured with four turns of a tie wire close wrapped. Dead-ends must have two wraps of the wire around the insulator and then six close turns of the wire around the wire under tension, or by the use of an approved automatic bail dead-end device. Where necessary, wire lengths will be spliced together by means of an approved automatic wedge-type, straight line splicing device. Each splice must be given two wrappings of friction tape and coated with insulating paint. Connections to lamp leads, or other conductors not under tension, must be made with approved split-bolt connectors and wrapped with three layers of half-lapped of plastic, electrical tape and coated with insulating paint.

4. **BASIS OF PAYMENT.**

This work will be paid for at the contract unit price per lineal foot for WIRE, AERIAL, 1/C #6, installed in place and connected, which price will be payment in full for furnishing, installing and connecting #6 AWG aerial line wire in place.

MATERIAL SPECIFICATION
1441

October 1, 1986

ITEM 250, ELECTRIC CABLE IN CONDUIT, 1/C #4
ITEM 251, ELECTRIC CABLE IN CONDUIT, 1/C #2

1. **DESCRIPTION.** This work will consist of furnishing and installing electric cable as specified. The cable will be installed in conduit underground.
2. **MATERIAL.** The cable must meet all requirements of Material Specification 1534 of the Bureau of Electricity, City of Chicago.
3. **CONSTRUCTION METHOD.** All cables must be installed with care to prevent damage to the cable. Any defects found in the cable must be reported to the resident engineer. Damaged cable must be replaced.

The cable must be pulled into the conduit with a minimum of dragging on the ground or pavement. This will be accomplished by means of reels mounted on jacks or other suitable devices located for unreeling cable directly into duct. Lubricants must be used to facilitate installation if deemed necessary by the contractor.

Bends in the cable will conform to the recommended minimum radii as outlined in the National Electric Code.

Cable passing through manholes must be trained and racked around the sides of the manhole into a permanent position. If racks are non-existent or in poor condition, the contractor must install racks. The material must be approved by the resident engineer. Any material and labor involved in training and racking the cable will be considered incidental to the cost of this pay item.

Where cable runs continue from manhole to manhole without tapping within a light pole, they will be continuous without splices unless authorized by the resident engineer.

All wire or cable in the distribution panels and control cabinets must be properly trained and have sufficient slack provided for any rearrangement of equipment or future additions. There must be at least two feet of slack in a street light pole base or street light controller base. A handhole must have at least five feet of slack and a manhole at least ten feet of slack.

4. **METHOD OF MEASUREMENT.** The length of cable furnished and installed will be measured as the length of conduit plus three feet for cable entering and leaving a light pole or street light control cabinet, plus any slack in manholes or handholes.
5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT of the size specified. Such price will be payment in full for furnishing, installing, and testing the cable, and will include all material, labor, terminations, and incidentals necessary to complete the work as per the contract plans.

MATERIAL
1534

Item 247, 250, 251, 252, 254
Page 2

August 14, 2006

ITEM 303, SIGNAL HEAD, POLYCARBONATE, LED, 3-SECTION, BRACKET MOUNTED

1. **DESCRIPTION.** This item will consist of furnishing and installing a traffic signal head or combination of heads on a street light pole, a traffic signal pole, or a traffic signal post as shown on the plans, as specified herein, or as directed by the Engineer. Specific installations and configurations are shown on Drawing Numbers 834 and 835, entitled "Standard Traffic Signal Mounting Details".

The type of installation will be as indicated on the plans. The number of signal faces, the number of signal sections in each signal face, any dual-indication sections, and the method of mounting will be as indicated in the plans and in the standard drawings.

Each signal face must be pointed in the direction of the approaching traffic that it is to control and must be aimed to have maximum effectiveness for an approaching driver located at a distance from the stop line equal to the normal distance traversed while stopping.

During construction and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by normal inclement weather or wind.

2. **MATERIAL.** The traffic signal must meet the requirements of Material Specification 1493 for LED signals. The mounting brackets must meet the requirements of Material Specification 1495.
3. **INSTALLATION.** The signals must be mounted using pole mounting brackets banded to the pole with two strips of 3/4" stainless steel banding single wrapped, one at the top and one at the bottom of the brackets, each secured with a stainless steel banding clip. The banding and clips will be coated with a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket must consist polycarbonate brackets specifically made for mounting signal heads to the side of poles, to create the designated structure. When the signals are to be mounted on a square pole or flat surface, the bracket used will be bolted to the flat pole or surface using 3/8" drive studs where permissible or using a 3/8" studs in a tapped hole.

The bottom mounting bracket must be accurately located to cover an opening 1" in diameter, for cable entrance, drilled into the pole or standard at a calculated height to position the bottom signal face at a standard height of 10 feet, or a height indicated on the plans. The opening must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation.

Cable. The Contractor must provide and install a length of 8/C #16 AWG, as per Specification 1475, flexible electrical cord, medium duty, of sufficient length to extend without strain or stress from the terminal strip in the "Green" section of the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be connected in accordance with Specification 1493. Both ends of the cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cable from the signal heads must enter the pole through the bottom mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with connector schematic, Bureau of Electricity Drawing Number 12268-A

- 4. **METHOD OF MEASUREMENT.** This work will be measured per each unit installed, complete.
- 5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price for each a SIGNAL HEAD, POLYCARBONATE, LED, X-SECTION, BRACKET MOUNTED@, which price will be payment in full for furnishing and installing the signal head complete, including all necessary wiring.

MATERIAL SPECIFICATION
 1475
 1493
 1495

DRAWING
 834 12268a
 835 740
 741

April 16, 2001

Item 303, 304, 305
 Page 2

ITEM 309, SIGNAL HEAD, POLYCARBONATE, LED, 3-SECTION, MAST ARM MOUNTED
ITEM 311, SIGNAL HEAD, POLYCARBONATE, LED, 5-SECTION, MAST ARM MOUNTED

1. **DESCRIPTION.** This item will consist of furnishing and installing a traffic signal head on a traffic signal monotube mast arm, as shown on the plans, as specified herein, or as directed by the Engineer. Specific installations and configurations are shown on Drawing 834 entitled "Standard Traffic Signal Mounting Details".

Each signal face must be pointed in the direction of the approaching traffic that it is to control and must be aimed to have maximum effectiveness for an approaching driver at a distance from the stop equal line to the normal distance traversed while stopping. The optically programmed signal face must be programmed in accordance with the visibility requirements of the Traffic Engineer.

During construction, and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by normal inclement weather or wind.

2. **MATERIAL.** The traffic signal head construction must meet the requirements of Material Specification 1493 for LED traffic signals. The material for a programmed LED traffic signal head must meet the Material Specification 1543. The mast arm bracket must meet the requirements of Material Specification 1463. The cable must meet the requirements of Material Specification 1475.

3. **INSTALLATION.** The signal must be mounted on the mast arm at the position indicated on the drawing in the manner shown on Drawing 834. The bracket must be banded to the mast arm with the 5/8" banding as shown on Drawing Number 834. The banding and clips must have a baked-on black finish. The bracket must be located over a hole drilled into the mast arm for the installation of cable. The hole must be reamed or filed to remove any sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation.

Cable. The contractor must provide and install a length of 8/C #16 flexible electrical cord, of sufficient length to extend without strain or stress from the terminal strip in the "Green" section of the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be connected in accordance with Material Specification 1493 for LED traffic signals, or Material Specification 1543 for optically programmed LED traffic signals. Both ends of the cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cable from the signal heads must enter the traffic signal mast arm through the hole from the mounting bracket, whence it will continue and enter the pole through the hole for mast arm wiring, then extend downward through the pole to enter the long sweep elbow to terminate by attachment to the terminal strip in the junction box in accordance with the terminal strip connector schematic, Bureau of Electricity Drawing Number 12268-A.

The mast arm brackets must be painted gloss black or another color as indicated in the plans.

4. **METHOD OF MEASUREMENT.** This work will be measured per each signal unit installed, completely wired and operational.
5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price each for SIGNAL HEAD or OPTICALLY PROGRAMMED SIGNAL HEAD of the type specified which price will be payment in full for furnishing and installing the signal head, or the optically programmed signal head, complete.

MATERIAL SPECIFICATION	DRAWING
1463 1543	834
1475	12268A
1493	

August 16, 2006
Item 309, 310, 311, 312, 313, 314
Page 2

ITEM 315A, PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, LED, COUNTDOWN, BRACKET MOUNTED

1. **DESCRIPTION.** This item will consist of furnishing and installing a pedestrian signal on a street light pole, a traffic signal pole or a traffic signal post as shown on the plans, as specified herein, or as directed by the Engineer. The signal may be installed as a single unit on a pole or in combination with other pedestrian signals or with traffic signals of various types and sizes. Specific installations and configurations are shown on Drawing Numbers 834 and 835 entitled "Standard Traffic Signal Mounting Details".

The method of mounting will be indicated on the plans, or as directed by the engineer. Each signal face must be pointed in the direction of the marked cross-walk area for the pedestrians it is intended to control.

2. **MATERIAL.** The pedestrian signal head material must be consistent with the requirements of Bureau of Electricity Material Specification 1494. The countdown pedestrian signal must meet the requirements of Material Specification 1545. All housing units must be made of polycarbonate. The light source must be LED. Mounting hardware must meet the requirements of Material Specification 1495. Cable must meet the requirements of Material Specification 1475.

3. **INSTALLATION.** The signal must be mounted using pole mounting brackets banded to the pole with two strips of 3/4" stainless steel banding, single wrapped, one at the top and one at the bottom of the bracket, each secured with a stainless steel banding clip. The banding and clips must have a baked-on black finish. The mounting configuration connecting the signals to the mounting bracket must consist of polycarbonate brackets specifically made for mounting signal heads to the side of poles, to create the designated structure.

The bottom mounting bracket must be accurately located to cover a hole 1" in diameter for the cable entrance drilled into the pole at a height calculated to position the bottom signal face at a standard height of 10 feet, or a height indicated on the plans. The hole must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation.

When the pedestrian signal is attached below a traffic signal head, the separate opening for cable may be omitted to eliminate additional weakening of the pole and the pedestrian signal cord will be installed using the same opening as the traffic signal cord.

Cable. The Contractor must provide and install a length of 8/C #16 AWG flexible electric cord, of sufficient length to extend without strain or stress from the terminal strip in the signal head to the terminal strip in the junction box mounted on the pole. The number of conductors in the cord, and the color coding of the conductors, must be sufficient to match the requirements of the signal head being installed, and must be so connected in accordance with Material Specification 1494. Both ends of the cable must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned. The service cord from the signal head must enter the pole through the bottom mounting bracket and enter the long sweep elbow to terminate by attachment to the terminal strip in accordance with the terminal strip connector schematic, Bureau of Electricity Drawing Number 12268-A.

During construction and until the installation is placed in operation, all signal faces must be hooded. The hooding material must be securely fastened so it will not be disturbed by inclement weather or wind

4. **METHOD OF MEASUREMENT.** This work will be measured per each signal unit installed, completely wired and operational.
5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price each for PEDESTRIAN SIGNAL HEAD, POLYCARBONATE, 1 FACE, LED, BRACKET MOUNTED, which price will be payment in full for furnishing and installing the signal head complete.

MATERIAL SPECIFICATION	
1494	1545
1495	
1475	

DRAWING	
	12268-A
740	834
741	835

August 16, 2006
 Item 315, 315A
 Page 2

ITEM 316, JUNCTION BOX, POLE OR POST MOUNTED

1. **DESCRIPTION.** This item will consist of furnishing and installing a Junction Box on each traffic signal post, traffic signal pole, or street light pole on which a signal head is mounted, as shown on the plans, specified herein, or directed by the Engineer.
2. **MATERIAL.** The Junction Box must conform to the requirements of Material Specification Number 1407 and to Drawing Number 954. The box will contain a 20 conductor terminal strip, securely fastened to an aluminum channel. Two Number 10 stainless steel machine screws will be used to mount the channel to the junction box.
3. **INSTALLATION.** The junction box must be mounted to the side of the pole away from the roadway, or as directed by the Engineer. The center of the box must be located approximately fifty-eight inches (58") above the adjacent sidewalk. Two long sweep elbows must be attached to the box, one to the top and one to the bottom, unless otherwise directed by the Engineer. Each will be attached with four (4) #10-24x3/4" stainless steel screws. The lower long sweep elbow will be properly positioned over a hole 1 1/2 inches in diameter drilled in the pole approximately 48" above the sidewalk, for the installation of cable. Another 1 1/2 inch hole must be drilled for the upper elbow. The holes must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation. A stainless steel, banding bracket, Drawing Number 11984, must be attached to the center of the back of the box with a 5/16"-18 x 1" stainless steel machine screw. The entire unit must be banded to the pole with five (5) 3/4" stainless steel bands, one through the banding bracket and one each at the top and bottom of each elbow. The banding and clips must have a baked-on black finish.
4. **METHOD OF MEASUREMENT.** This work will be measured per each junction box unit installed, complete with elbow(s).
5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price each for a JUNCTION BOX, POLE OR POST MOUNTED, of the type specified, which price will be payment in full for furnishing and installing the junction box complete with its component parts and appurtenances. Connection of cables and wires to the terminal strip will not be part of the cost of the junction box but will be considered part of the installation of the underground cable and the installation of signal heads.

MATERIAL SPECIFICATION
1407

DRAWING
954 834
11984

April 3, 2009
Item 316 - Page 2

ITEM 324, PEDESTRIAN PUSH BUTTON SIGNAL POST

1. **DESCRIPTION.** This item will consist of furnishing and installing a steel post, for supporting a push button for pedestrian traffic, in a concrete sidewalk, at the location shown on the plans, or as directed by the Engineer. The post installation itself must be consistent in construction to the post shown on Drawing Number 963, "Pedestrian Push Button Post".
2. **MATERIALS.** The post will be three inch (3") galvanized rigid steel conduit meeting the requirements of Material Specification 1462. The top of the post will be threaded for a length of two inches (2"). The bottom of the post will be threaded for a length of three and one-half inches (3.5"). A threaded conduit cap will be provided for the top. The base material will consist of a three and one-half inch (3.5") length of threaded conduit coupling circumferentially welded to a base plate. The base plate will be dimensioned as shown on Standard Drawing 963. The base plate will be made of a high strength low alloy steel meeting the requirements of ASTM A595, Grade A. The post, base, and cap must be powder coated black. Post threads must not be painted. The painting method must be pre-approved by the Engineer.
3. **INSTALLATION.** A hole must be drilled into the post at the proper height and location for the pedestrian push button wiring. The post must be screwed into the base. The post may be tack welded to the base to insure the two parts do not loosen. The post and base must be mounted in the sidewalk using a minimum of 1/2" concrete anchors of the appropriate length. (Please note that cable must be pulled into the post before the post is mounted to the sidewalk.) The nuts on the rods must be tightened to secure the post to the sidewalk such that there is no space separating the post from the sidewalk. There must be no double nutting. The post must be plumb; the use of shims will not be permitted. The post cap must be secured by screwing into the top of the pipe. After the post is erected, the Engineer will determine if touch-up paint is required.
4. **METHOD OF MEASUREMENT.** This work will be measured per each unit installed, complete with anchors, nuts, base, steel pipe, and post cap. Concrete work, wiring, and push buttons will not be included in this item.
5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price each for a PEDESTRIAN PUSH BUTTON SIGNAL POST, which will be payment in full for furnishing and installing the post complete in place.

MATERIAL
1462

DRAWING
963

March 5, 2008

ITEM 327, MAST ARM, STEEL, MONOTUBE, 26 FOOT
ITEM 328, MAST ARM, STEEL, MONOTUBE, 30 FOOT
ITEM 329, MAST ARM, STEEL, MONOTUBE, 35 FOOT
ITEM 330, MAST ARM, STEEL, MONOTUBE, 40 FOOT

1. **DESCRIPTION.** This item will consist of furnishing and installing a steel, monotube, mast arm for the purpose of supporting traffic signals, and/or illuminated signs on an anchor base pole at the locations shown on the plans, or as specified or directed by the Commissioner. The length of the mast arm and the angular orientation of the arm relative to the centerline of the roadway will be as indicated on the plans.

A mast arm must be installed only on a 3 gauge pole, and the length of the mast arm will govern the minimum base diameter of the pole on which the arm is to be installed, in accordance with the following chart:

MAST ARM LENGTH (feet)	POLE BASE DIAMETER (inches)
16	10
20	10
26	10
30	11
35	12.5
40	12.5
44	12.5

2. **MATERIAL.** The mast arm must be 7 gauge steel meeting the requirements of Standard Drawing 870 and Material Specification 1454.
3. **INSTALLATION.** The mast arm must be mounted on the pole at the height specified on Drawing 834, or at a different height if specified on the plans, or as directed by the Engineer. A one inch (1") diameter opening for the installation of cable must be field drilled in the pole in line with the orientation of the mast arm. The hole must be reamed or filed to remove all sharp edges or burrs which might damage cable during installation, or through vibration when the signals are in operation. A neoprene grommet must be inserted into the finished hole prior to the installation of the cable.

Two holes must be field drilled in the pole at 180 degrees relative to the orientation of the pole for installation of locator shear pins, provided with the back plate, to prevent rotation of the mast arm. These holes must be drilled after the mast arm is in place in order that the position of the holes will match the location of the locator bushings attached to the back half of the clamp.

All signals, signs, and electrical equipment must be attached in the correct relative position to the mast arm, with service cord in place, prepared to be installed on the pole, prior to the attachment of the mast arm to the pole. The installation of the cord in the pole must be coordinated with the attachment of the mast arm to the pole. The clamp bolts must be tightened securely so that there is no slippage of the mast arm either upward or downward to exert a vertical force on the shear pins. The end cap must be secured in place with the attachment screws provided.

The mast arm must be delivered completely finished with a factory applied black powder coat per Material Specification 1454. The contractor must utilize non-abrasive slinging materials and must otherwise exercise due care in erecting the pole and mast arm to prevent any damage to the finish.

4. **METHOD OF MEASUREMENT**. This work will be measured per each monotube arm installed on a traffic pole.
5. **BASIS OF PAYMENT**. This work will be paid for at the contract unit price for each MAST ARM, STEEL, MONOTUBE of the length indicated, and will be payment in full for furnishing and installing a steel mast arm in place, complete. Attachment of signals and signs will not be part of this pay item.

MATERIAL
1454

DRAWING
870

834

August 18, 2006

Item 325, 326, 327, 328, 329, 330, 331
Page 2

ITEM 336, TRAFFIC SIGNAL POST, ALUMINUM 17 FOOT

1. **DESCRIPTION.** This item will consist of furnishing and installing an aluminum post, for supporting a traffic signal, upon a concrete foundation, at the location shown on the plans, as specified herein, or as directed by the Engineer. The post installation itself must be consistent in construction to the post shown on Drawing Number 526 for the installation of a post for a traffic signal.
2. **MATERIALS.** The material of the post must meet the requirements of Material Specification 1385 and of Standard Drawing Number 526.
3. **INSTALLATION.** The post and base must be mounted on the foundation so that the handhole faces away from the curb. The nuts on the foundation must be tightened to secure the post to the foundation such that there is no space separating the post from the foundation. There must be no double nutting. The post must be plumb; the use of shims will not be permitted. The post cap must be secured by three 5/16-18 X3/4" hex head stainless steel set screws.

The height of the post will be as indicated on the plans.
4. **METHOD OF MEASUREMENT.** This work will be measured per each unit installed on a foundation, complete with bolt covers, handhole door, base casting, aluminum pipe, and post cap.
5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price each for a TRAFFIC SIGNAL POST, ALUMINUM 15 FT., TRAFFIC SIGNAL POST, ALUMINUM 17 FT. or TRAFFIC SIGNAL POST, ALUMINUM 20 FT. which will be payment in full for furnishing and installing the post complete in place.

MATERIAL SPECIFICATION
1385

DRAWING
526

June 27, 2008

ITEM 347, ELECTRIC CABLE IN CONDUIT NO. 18, 4/C
ITEM 349, ELECTRIC CABLE IN CONDUIT NO. 14 10/C
ITEM 350, ELECTRIC CABLE IN CONDUIT NO. 14 19/C

1. **DESCRIPTION.**

This work will consist of furnishing and installing electric cable for traffic signals of the type, size and number of conductors as specified on the plans. The cable will be rated 600 volts and comply with the following requirements.

2. **TRAFFIC SIGNAL CABLE.**

All cable must conform to the requirements of Material Specification number 1537, for Traffic Signal Cable.

3. **INSTALLATION.**

All cable must be installed in conduit, as indicated on the plans, with care to prevent damage to the insulation or cable. Suitable devices must be used in pulling the cable, and only approved lubricants should be used. All cables installed in conduit will be from the power source to the traffic signal controller cabinet, from the traffic controller cabinet to the traffic signal junction box, or from junction box to junction box. For cable terminating in a traffic signal controller cabinet or traffic signal junction box the following procedures must be followed:

a. **Controllers.**

1. Remove thirty six inches (36") of neoprene jacket.
2. Wrap vinyl electrical tape on two inches (2") of the neoprene jacket and two inches (2") on the exposed conductors.
3. Remove one inch (1") of insulation and scrape copper conductor.
4. Train cables neatly along the base and back of cabinet.
5. Connect conductors to proper terminal lugs.

b. **Traffic Signal Junction Box.**

1. Remove twenty four inches (24") of neoprene jacket.
2. Wrap vinyl electrical tape on two inches (2") of neoprene jacket and two inches (2") on the exposed conductors.

3. Remove one inch (1") of insulation and scrape copper conductor.
4. Train cables neatly along the side and back of the box.
5. Connect all conductors to terminal strip.

4. **CABLE SLACK.**

The length of cable slack that must be provided will be in accordance with the following schedule:

<u>Location</u>	<u>Length of Slack Cable (feet)</u>
Base of Controller	7
Detector, Junction Box	1
Base of Traffic Signal Post or Traffic Signal Pole	4
City Handhole	6
City Manhole	12
Commonwealth Edison Manhole	25

Cable slack in manholes/handholes must be trained and racked in the holes. If racks are non-existent, racks must be provided, and considered incidental and a part of this pay item.

No cable splices will be allowed for traffic signal cable, with the exception of 7 conductor interconnect cable. These splices must be indicated on the plans.

5. **METHOD OF MEASUREMENT.**

The length of measurement must be the distance horizontally measured between changes in direction, and will include cable slack. All vertical cables will not be measured for payment.

6. **BASIS OF PAYMENT.**

This work will be paid for at the contract unit price per lineal foot for ELECTRIC CABLE IN CONDUIT NO. 4, 2/C, ELECTRIC CABLE IN CONDUIT NO. 14, 7/C, ELECTRIC CABLE IN CONDUIT NO. 14 10/C, or ELECTRIC CABLE IN CONDUIT NO. 14 19/C. This price will be payment in full for furnishing, installing, connecting, splicing, and testing of cable, and will include all labor, materials, equipment, tools, and incidentals necessary to complete the work, as specified herein, and as shown on the plans.

MATERIAL SPECIFICATION
1537

September 1, 2006

Item 347, 348, 349, 350
Page 3

ITEM 353, REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT

1. **DESCRIPTION.** This work will consist of removing all the existing traffic signal equipment at the intersections listed on the plans.
2. **REMOVAL** The items to be removed will include traffic signal arms, traffic signal poles, traffic signal heads, traffic signal controllers, and all associated equipment and cable.

The traffic signal items, except for traffic signal cable, are to remain the property of the City of Chicago. The Contractor must deliver the obsolete traffic signal equipment to the City of Chicago Yard at 4101 South Cicero Avenue, Chicago, Illinois. Twenty four hour advance notice is necessary before delivery. The traffic signal cable must be removed and become the property of the Contractor and must be disposed of by him, outside the right-of-way, at his sole expense.

The Contractor must provide three (3) copies of a list of equipment that is to remain the property of the City, including model and serial numbers where applicable. He must also provide a copy of the contract plan, or special provisions, showing the quantities and type of equipment. The Contractor will be responsible for the condition of the traffic control equipment from the time of removal until its acceptance by a receipt drawn by the City indicating that the items have been returned.

3. **METHOD OF MEASUREMENT.** This item will be measured as one unit per project contract, or per signalized intersection, depending upon the contract conditions. The breaking down of foundations and manholes will not be considered part of this item.
4. **BASIS OF PAYMENT.** This work will be paid for at the contract lump sum price for REMOVE EXISTING TRAFFIC SIGNAL EQUIPMENT, or lump sum per intersection depending upon the contract conditions. This price will be payment in full for removing the equipment and disposing of it as required, The salvage value of the cable retained by the Contractor must be reflected in this contract lump sum price.

August 18, 2006

ITEM 376, ATC CONTROLLER, TRAFFIC, 16 LOAD BAY, WITH UPS

1. **DESCRIPTION.** This work will consist of furnishing and installing an Advanced Transportation Controller (ATC) with a battery powered back-up system and associated equipment in a cabinet onto a foundation and making all necessary connections.
2. **MATERIAL.** The material must meet the requirements of Material Specification 1560, "Advanced Transportation Controller and Cabinet with Universal Power Supply". The cabinet will be a super P cabinet 16 load bays. Each load bay must include a load switch. A battery powered universal power supply (UPS) system must be included. Communications interface equipment, if required, will be included under a separate item.
3. **PROCUREMENT.** The contractor must provide Request for Inspection of Material forms for traffic signal controllers and cabinets as requested for specific projects. The Bureau of Electricity will review and comment on the submitted material. The Bureau of Electricity will approve the purchase of the material from a supplier. Final material approval will be made in accordance with Bureau of Electricity specifications. The Contractor must provide proof of purchase to the Resident Engineer within seven (7) days following approval by the Bureau of Electricity. Payment will be withheld in accordance with the terms and conditions of this contract, until such time that the Commissioner determines the requirements are met.

The controllers and cabinets are to be delivered to the Bureau of Electricity within ninety (90) days of purchase. If the controllers and cabinets are not delivered, payment will be withheld until such time that the controllers and cabinets are delivered.

The Bureau of Electricity will notify the Contractor when the material has been inspected and approved. If a railroad interconnect is involved, a representative from the Illinois Commerce Commission will also need to review and inspect the controller at the Bureau of Electricity's facilities. Within forty-eight (48) hours of notification, the Contractor will pick-up the controllers and cabinets from the Bureau. The controllers and cabinets will be stored at a facility, approved by the Commissioner, at the contractor's expense.

4. **INSTALLATION.** The controller will be programmed to provide the sequencing and timing of operation as shown on the plans. The controller must be enclosed in a housing and installed in a completely wired cabinet. The model and serial numbers of the controller must be affixed on the front of the controller housing and be readily visible.

The cabinet must be set onto a pad foundation designed specifically for the cabinet, and affixed with bolts provided with the foundation. Electric cables inside the cabinet must be neatly trained along the base and back of the cabinet. Each conductor used must be connected individually to the proper terminal, and the spare conductors must be insulated and bound into a neat bundle. Each cable must be marked with suitable identification and recorded on a copy of the plans for the intersection and submitted to the Engineer. Signal indications for each direction must be wired to a separate circuit whether or not the signal plans call for a split movement. The absolute zero for the time-base coordinator will be set in the field by City personnel after obtaining the appropriate City time-tone reference.

When properly installed, all signals will be connected and controlled by the controller, and the sequencing and timing of the signals will be as set forth in the plans.

All conduit entrances into the cabinet must be sealed with a pliable waterproof material to restrict moisture entrance into the cabinet.

Bureau of Electricity (BOE) and Office of Emergency Management and Communications (OEMC) personnel must be present during the cutover to the new control equipment. If a railroad interconnect is part of the signal project, a representative from the Illinois Commerce Commission must be invited to be present for the cutover.

5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price for each ATC CONTROLLER, TRAFFIC, 16 LOAD BAY, WITH UPS, which price will be payment in full for furnishing and installing the controller complete and operational, with all wiring and connections as specified.

July 5, 2009

Item 3782, 3782A
Page 2

ITEM 386, MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION

1. **DESCRIPTION.** This work will consist of maintaining an existing traffic signal installation that has been designated to remain in operation during construction of the new traffic signals. If during the course of construction it becomes necessary to use temporary aerial cable to keep the intersection functioning, this work will be performed at no additional cost. However, the need for temporary traffic signals and controllers will be paid for under separate items, as shown on the plans or as directed by the Engineer.
2. **MAINTENANCE PROCEDURES.** Before taking over maintenance of the existing traffic signal installation, the Contractor must arrange to make an inspection with the Engineer to determine if any corrective action needs to be done, and to mutually agree on a date for transferring maintenance. The contractor should normally begin maintaining the existing traffic signals as soon as he begins any work at the site.

The contractor will be responsible for maintaining the traffic signal installation in proper operating condition. The contractor must perform the maintenance procedures as outlined in Section 802.07 of the Standard Specifications.

The traffic controller must be maintained as outlined in Section 850.03 of the Standard Specifications.

3. **METHOD OF MEASUREMENT.** This work will be measured per week. The time frame will begin at the mutually agreed date for taking over maintenance. The time frame will end upon the issuance of a Signal Acceptance Notice from the Engineer. Before such notice is given, a final inspection must be performed with the contractor, the Engineer, and a representative from the Chicago Department of Transportation. The time frame may be measured in full weeks and fractions thereof.
4. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price per week, or fraction thereof, for MAINTENANCE OF EXISTING TRAFFIC SIGNAL INSTALLATION, which payment will be in full for maintaining the traffic signals during said time frame. If for any reason the contractor fails to properly maintain the traffic installation, leading to and requiring a response from the City maintenance forces, the cost of such a response will be charged to the contractor.

October 24, 2006

ITEM 389, STREET NAME SIGNS

1. **DESCRIPTION.** This item will consist of furnishing, fabricating, and installing a street name sign on a traffic pole with a monotube arm as indicated on the plans, or as directed by the Engineer. The plans will indicate the location of the sign and the sign legend. The sign panel and associated hardware must meet the specifications of Section 720 - SIGN PANELS AND APPURTENANCES of the Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction. The signs must meet the requirements as to size, mounting hardware, and mounting location per City of Chicago Department of Transportation standard drawings APole and Mast Arm Mounted Street Name Signs@ and AMonotube D3-2 Sign Installation Details@.
2. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price per each street name sign, and must include all necessary hardware and labor to erect the sign.

DRAWINGS

Pole and Mast Arm Mounted Street Name Signs
Monotube D3-2 Sign Installation Details

May 23, 2001

ITEM 3782A, CONTROLLER, TRAFFIC, 16 LOAD BAY, WITH UPS

1. **DESCRIPTION** This work will consist of furnishing and installing a traffic signal controller with a battery powered back-up system and associated equipment in a cabinet onto a foundation and making all necessary connections.
2. **MATERIAL.** The material must meet the requirements of Material Specification 1536. The cabinet will be a super P cabinet 16 load bays. Each load bay must include a load switch. A battery powered universal power supply (UPS) system must be included. Communications interface equipment, if required, will be included under a separate item.
3. **PROCUREMENT.** The contractor must provide Request for Inspection of Material forms for traffic signal controllers and cabinets as requested for specific projects. The Bureau of Electricity will review and comment on the submitted material. The Bureau of Electricity will approve the purchase of the material from a supplier. Final material approval will be made in accordance with Bureau of Electricity specifications. The Contractor must provide proof of purchase to the Resident Engineer within seven (7) days following approval by the Bureau of Electricity. Payment will be withheld in accordance with the terms and conditions of this contract, until such time that the Commissioner determines the requirements are met.

The controllers and cabinets are to be delivered to the Bureau of Electricity within ninety(90) days of purchase. If the controllers and cabinets are not delivered, payment will be withheld until such time that the controllers and cabinets are delivered.

The Bureau of Electricity will notify the Contractor when the material has been inspected and approved. If a railroad interconnect is involved, a representative from the Illinois Commerce Commission will also need to review and inspect the controller at the Bureau of Electricity's facilities. Within forty-eight (48) hours of notification, the Contractor will pick-up the controllers and cabinets from the Bureau. The controllers and cabinets will be stored at a facility, approved by the Commissioner, at the contractor's expense.

4. **INSTALLATION.** The controller will be programmed to provide the sequencing and timing of operation as shown on the plans. The controller must be enclosed in a housing and installed in a completely wired cabinet. The model and serial numbers of the controller must be affixed on the front of the controller housing and be readily visible.

The cabinet must be set onto a pad foundation designed specifically for the cabinet, and affixed with bolts provided with the foundation. Electric cables inside the cabinet must be neatly trained along the base and back of the cabinet. Each conductor used must be connected individually to the proper terminal, and the spare conductors must be insulated and bound into a neat bundle. Each cable must be marked with suitable identification and recorded on a copy of the plans for the intersection and submitted to the Engineer. Signal indications for each direction must be wired to a separate circuit whether or not the signal plans call for a split movement. The absolute zero for the time-base coordinator will be set in the field by City personnel after obtaining the appropriate City time-tone reference.

When properly installed, all signals will be connected and controlled by the controller, and the sequencing and timing of the signals will be as set forth in the plans.

All conduit entrances into the cabinet must be sealed with a pliable waterproof material to restrict moisture entrance into the cabinet.

Bureau of Electricity (BOE) and Office of Emergency Management and Communications (OEMC) personnel must be present during the cutover to the new control equipment. If a railroad interconnect is part of the signal project, a representative from the Illinois Commerce Commission must be invited to be present for the cutover.

5. **BASIS OF PAYMENT.** This work will be paid for at the contract unit price for each CONTROLLER, TRAFFIC, 16 LOAD BAY, WITH UPS, which price will be payment in full for furnishing and installing the controller complete and operational, with all wiring and connections as specified.

Items 3782A

**SPECIFICATION 1385
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JULY 1, 2008**

PEDESTAL WITH BASE: ALUMINUM, FOR TRAFFIC SIGNALS

SUBJECT

1. The specification states the requirements of an aluminum pedestal and base with handhole and door for supporting a traffic signal.

GENERAL

2. (a) Specifications. The pedestal base shall conform to the requirements herein stated, to the specifications and methods of test of the American Society for Testing and Materials (ASTM), to the requirements of the Society of Protective Coatings (SSPC), and to the requirements of the American Welding Society (AWS), of which the most recently published revisions will govern.
- (b) Acceptance. Pedestal bases not conforming to this specification will not be accepted.
- (c) Drawing. The drawing mentioned herein is a drawing of the Department of Transportation, Division of Electrical Operations. It is an integral part of this specification cooperating to state the necessary requirements.
- (d) Workmanship. All pedestal bases must be free of casting flaws and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled. The bottom surface of the base must be ground smooth.
- (e) Sample. One complete pedestal of the manufacture intended to be furnished must be submitted within fifteen (15) business days upon receipt of a request from the Chief Procurement Officer.
- (f) Warranty. The manufacturer shall warrant the performance and construction of the traffic pedestal to meet the requirements of this specification and shall warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the traffic pedestals have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing material replacement including shipment, free of charge to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final.

DETAIL REQUIREMENTS

3. (a) Design. The pedestal base must conform to the design shown on Drawing Number 526. All bases must be of the same dimensions, and all doors must be interchangeable.
- (b) Base. The base must be cast of aluminum alloy 319 meeting the requirements of ASTM B26 with a minimum wall thickness of 9/32". The handhole opening must have a recessed lip along the entire length of both sides and the bottom such that with the door in place the exterior surface of the door is flush with the exterior surface of the base. The door must have the same curvature as the base. The door must be locked in place by means of two fingers located on its top edge which bear against the inside surface of the base, and a stainless steel Allen head locking screw which fastens to the base. The locking screw must be protected by a C-shaped drip edge protruding approximately 5/8" and concentrically encircling the screw head. The clearance between the inner surface of the drip edge and the outer surface of the screw head must be no greater than 1/8". The drip edge must encircle the screw head by a minimum of 300° with the opening in the drip edge centered at the bottom of the screw head. A continuous pipe stop must be integrally cast along the inside of the base 2.5" below the top edge.
- (c) Pedestal. The pedestal must be aluminum-alloy extruded round tube conforming to the requirements of ASTM B221, alloy 6063-T6. The aluminum pedestal must be flash anodized in accordance with Aluminum Association designation C22A21 or Alcoa designation 202-R1. Its outside diameter must be 5.563"; its wall thickness must be not less than 0.187", and its length must be as required to furnish the overall height specified in the order. The round tube must be inserted not less than two and one-half inches (2.5") into the base and welded with four (4) butt welds each not less than one (1) inch long on the inside and a continuous seam weld around the outside. Aluminum alloy pipe in lieu of aluminum alloy tube is acceptable.
- (d) The pedestal cap must be of the same cast aluminum as the base. The pedestal cap shall be essentially conical with a globe-shaped upper-end and having a minimum wall thickness throughout of not less than 1/4 inch. The cone portion must meet the skirted portion of the top in a smooth fillet. The skirt must enclose the top 7/8" inches of the pedestal. Three stainless steel, or other similar approved material, set screws not less than 3/4 inches long must be equally spaced in tapped holes around the skirt and must hold the cap securely in place atop the pedestal. The set screw size must be 5/16 – 18 hex head.
- (e) Welding. The welds shall be made by the inert gas metal welding process. Filler wire shall conform to chemical composition requirements of AWS Alloy Number A5.10-69.

PAINTING

4. (a) Facility. All surface preparation and painting shall be done indoors at a single facility specifically set up for painting purposes.
- (b) Surface preparation. Exterior surfaces must be prepared by solvent cleaning per SSPC – SP 1 (Surface Preparation Specification 1). The solvent used shall be recommended for aluminum surfaces. The solvent shall be used according to the manufacturer's instructions to remove all oil, grease, dirt, and contaminants.
- (c) Primer Coat.
1. Within one hour of surface preparation, surfaces must be primed using a primer specifically recommended for aluminum surfaces.
 2. Aluminum surface temperature must be at least 60° Fahrenheit and relative humidity must be less than 80% at time of primer application.
 3. A minimum wet thickness shall be applied to provide a 2mil dry thickness.
 4. The primer shall be dry for a period of 24 hours after which a second primer coat shall be applied. The second coat must also have a dry thickness of 2 mils.
- (d) Finish Coat.
1. The primer must be dry for a period of 24 hours before a finish coat can be applied.
 2. The finish coat shall be a polyurethane enamel specifically recommended for use over a primed aluminum surface.
 3. Two coats of finish shall be applied. Each must have a dry thickness of 1.5 mils.
 4. Color will be gloss black unless otherwise specified. Paint samples shall be approved before painting can commence.
- (e) Alternate Coating Methods. Alternate coating methods, such as electrostatic powder coating, may be considered. However, no coating method will be accepted without the Commissioner's or his representative's approval.
- (f) Durability. The paint coating shall be capable of passing 1000 hours of salt spray exposure as per ASTM B117 in a 5% NaCl(by weight) solution at 95° Fahrenheit and 95% relative humidity without blistering. Before testing, a coated aluminum panel shall be scribed with an "X" down to bare metal.

- (g) Coating Measurement. Measurement of coating thickness shall be done in accordance with SSPC – Pa 2-73T, “Measurement of Dry Paint Thickness with Magnetic Gauges”.

PACKING

5. Each pedestal shall be individually wrapped to prevent damage to the paint surface. Each pedestal shall be suitably packed or blocked to prevent damage during shipment and handling.

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1407
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED APRIL 2,2009**

POLE MOUNTED CAST ALUMINUM JUNCTION BOX FOR TRAFFIC SIGNALS

SCOPE

1. This specification states the requirements for pole mounted, cast aluminum junction boxes, with terminal strips, to be used for traffic signal multiple cable terminations.

GENERAL

2. (a) Specifications. The junction boxes shall conform in detail to the requirements herein stated, and to the specifications and methods of test of the American Society for Testing and Materials cited by ASTM Designation Number, of which the most recently published revisions will govern. The terminal strip shall meet the applicable sections of NEMA ICS 4-2005, as well as the requirements herein stated.
- (b) Drawing. The drawing mentioned herein is a drawing of the Department of Transportation, Division of Electrical Operations, and will be interpreted as part of these specifications.

- (c) Acceptance. Junction boxes not conforming to this specification will not be accepted.
- (d) Sample. One complete junction box with terminal strip of the manufacture intended to be furnished shall be submitted within fifteen (15) business days after receipt of a request from the Chief Procurement Officer. The box must be delivered to the Division of Electrical Operations.
- (e) Workmanship. All junction boxes shall be free of casting flaws and must have neat, smooth exterior surfaces. All holes must be accurately located and drilled to ensure interchangeability of all components.

DESIGN

- 3. (a) Drawing. The junction box must conform in detail to the dimensions and requirements shown on Drawing Number 954.
- (b) Material. The body door and plate must be castings of non-heat treated aluminum silicon alloy conforming to ANSI alloy 443.0 of ASTM B26.

DETAIL REQUIREMENTS

- 4. (a) Assembly. Each junction box shall consist of the body, door with its gasket, two cast elbows with gaskets at either end of the box, terminal block mounting bracket, and terminal strip on channel mounted to bracket. All must be completely assembled, painted and ready for installation. A flat plate with gasket shall also be provided so that the City can use the junction box with only one elbow if desired.
- (b) Body. The body shall be cast as shown in Drawing Number 954. The top and bottom sides of the box where flat plates, or other fittings, will be attached, must be identically cast, machined flat, and drilled and tapped in accordance with dimensions shown. All fittings which fit on the top side must fit on the bottom side.
- (c) Door. The door shall be cast as shown in Drawing Number 954. The door must be hinged at the left with stainless steel hinge pins and must open not less than 180° to permit complete access to the interior of the junction box. Two stainless steel Allen head machine screws, undercut and held captive, shall hold the door closed and maintain positive pressure against a sponge neoprene gasket cemented in place completely around the door jamb. The door shall be finished and painted prior to cementing the gasket into its groove in the door.
- (d) Elbow sweep. Two elbows must be provided for cable entry and exit into the box. The elbows shall be cast of the same alloy as the box. The dimensions will be as indicated on Standard Drawing 954.

- (e) End Plate. A flat end plate shall be furnished with each body casting. The plate must be drilled to align with tapped holes in the body casting and have a flush match with the periphery of the top and bottom body casting pads. The plate must have a properly fitted gasket.
- (f) Gaskets. The gasketing between the body and the door shall be of sponge neoprene and must be cemented in place after painting of the door. A cork gasket, 1/8 inch thick, shall be used between the elbow or end plate and the body of the junction box on the top end and bottom end and held in place by four (4) stainless steel screws.
- (g) Mounting Bracket. A terminal block mounting bracket, as shown on Drawing Number 954, shall be furnished and installed in each junction box. The bracket must be cast from ANSI alloy 443.0 per ASTM B26.
- (h) Terminal Strip. The terminal strip will consist of modular blocks. Each block will consist of two terminals to handle one circuit. The strip will consist of twenty blocks to handle twenty circuits. The terminal strip will be mounted to an aluminum channel. The channel will have pre-punched holes for mounting to the junction box. The channel will be mounted to the box with two #10 screws.

Each block housing shall be constructed of nylon, polypropylene, or another approved material of equal properties. The bottom of the block housing will be dovetailed to fit into the aluminum channel. Overall dimensions of each block will be approximately 1.2 inches wide by 1.5 inches high. Center-to-center spacing between contacts (blocks) must be at least .375 inches.

The terminals shall accommodate AWG wire sizes 8 to 22. The contact type will be tubular clamp, with electroplated tubular copper contact. The screw type will be a steel electroplated number 10-32, slotted pan head. The terminals will be rated at 30 amps and 600 volts.

Maximum service temperature for the terminal strip will be 150° Celsius. The flammability rating must meet UL 94V-0.

- (i) Hardware. The hinge pins and all screws required for assembly of this junction box must be of stainless steel.
- (j) Painting. The exterior surfaces of the junction box shall be properly cleaned and given one (1) coat of zinc chromate primer containing ten percent (10%) iron oxide and one (1) coat of enamel. The color of the enamel must be gloss black or as ordered. A color sample must be submitted and approved before manufacturing commences. The primer and enamel shall be of an approved grade and quality.

- (k) Packing. After the paint is completely dry, and the junction boxes have been assembled, they shall be suitably packed to prevent damage to painted surfaces during shipping and handling. All shipments must be fastened to, and shipped on, 48" x 48" hardwood, 4 way, non-returnable pallets. Total height must not exceed 64" and total weight must not exceed 2,000 pounds.

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1441
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED AUGUST 1, 2006**

**CABLE: SINGLE CONDUCTOR AERIAL, #6 AWG WEATHERPROOFED WITH
POLYETHYLENE JACKET**

SUBJECT

1. This specification states the requirements for cable intended to be used in overhead distribution on insulators for 240 VAC, 60 cycle, single phase, street lighting circuits.

GENERAL

2. (a) Specifications. The cable shall conform in detail to the requirements herein stated, and to the specifications and methods of test of the Insulated Cable Engineer's Association (ICEA) and the American Society for Testing and Materials (ASTM), cited by number, in which the most recently published revisions will govern.
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Sample. A three foot sample of the cable intended to be furnished shall be submitted within fifteen (15) business days after receipt of such a request from the Chief Procurement Officer. The sample must be sent to the Engineer of Electricity unless otherwise directed.

- (d) Warranty . The manufacturer shall warrant the cable to be first class material throughout. In lieu of other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. The Commissioner will be the sole judge in determining if a cable section needs to be replaced. The length of replacement will be the entire length of unspliced cable from existing termination/splice point to termination/splice point All replacements under this warranty shall be made free of charge F.O.B. delivery point of the original contract.

CONSTRUCTION

3. (a) The cable must have a copper conductor with a tight fitting concentric layer of polyethylene.
- (b) Conductor. The conductor must be made up of medium hard drawn, solid, round copper wire meeting the requirements of ASTM B-2. The conductor must be size 6, American Wire Gauge.
- (c) Jacket. The jacket must be polyethylene meeting the physical and electrical requirements specified herein. The jacket must be circular in cross-section, concentric to the conductor, and must have an average thickness of 30 mils. The minimum thickness at any cross section must not be less than ninety percent (90%) of the average thickness.

PHYSICAL AND ELECTRICAL REQUIREMENTS

4. The cable must meet the physical and electrical requirements of ICEA S-70-547.

TESTING

5. (a) General. Tests shall be performed on completed cables in accordance with applicable standards as listed in these specifications. All tests must be conducted on cable produced for this order.
- (b) Number of Tests. Tests shall be conducted on completed cables for approximately five percent (5%) of the cable. In no case shall samples be taken closer than 25,000 feet apart. Reels to be tested will be selected at random.
- (c) Test Reports. No cable may be shipped until certified copies of all factory tests have been reviewed and approved by the Engineer of Electricity. Test data required is:
1. Initial and Aged Physical Characteristics
 2. Accelerated Water Absorption Requirements
 3. Cold Bend Test
 4. Jacket Thickness (average and minimum)

- (d) Acceptance. Where the cable fails to conform to any of the tests specified herein, the Commissioner may subject additional cable to testing or reject the entire lot.

PACKAGING

6. (a) Cable Marking . The cable must be identified by a permanently inscribed legend in white lettering as follows:

1/C No. 6 AWG - Weatherproofed Aerial PE

The legend shall be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor. A sequential footage marking must be located on the opposite side from the legend.

- (b) Reels . The completed cable shall be delivered in lengths of 1000 feet in coils with a nominal 21 inch eye opening. Both ends of each length of cable shall be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps. The ends shall be securely fastened so as not to become loose in transit.

Before shipment, heavy cardboard or plastic wrapping shall be applied to all coils. Coils must then be fastened to 48 inch by 48 inch hardwood 4-way non-returnable pallets for shipment. Total height of each pallet must not exceed 64 inches. Total weight of each pallet must not exceed 2200 pounds.

- (c) Marking . A metal tag must be securely attached to each pallet indicating the coil number, contract number, date of shipment, gross and tare weights, City Commodity Code number if applicable , footage, and a description of the cable. Directions for unrolling the cable and any other pertinent information must be placed on each coil package with an approved permanent marking material such as oil-based paint or a securely attached metal tag.

THIS SPECIFICATION SHALL NOT BE ALTERED

SPECIFICATION 1454
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED APRIL 20, 2007

MAST ARM: TRAFFIC SIGNAL MONO-TUBE

SUBJECT

1. This specification states the requirements for a tapered, tubular, 7 gauge steel mono-tube arm with mounting brackets. The arm will support traffic signals and signs.

GENERAL

2. (a) Specifications. The arms shall conform in detail to the requirements herein stated, and to the Specifications and Methods of Test of the American Society for Testing and Materials cited by ASTM Designation Number of which the most recently published revisions will govern.
- (b) Acceptance. Arms not conforming to this specification will not be accepted.
- (c) Bidders Drawings. Bidders must submit with their bids detailed scale drawings of the mast arm showing actual dimensions, details, and welds. Shop drawings must be original engineering drawings created by the manufacturer. The drawings must show every dimension necessary to show how all parts will fit each other and be properly held in assembly. These drawings shall also be submitted in electronic format, preferably Microstation 95, if so requested by the City.
- (d) Drawings. The drawings mentioned herein are drawings of the Department of Transportation being an integral part of this specification cooperating to state necessary requirements.
- (e) Sample. If requested by the Chief Procurement Officer, one complete mast arm of the manufacture intended to be furnished must be submitted for review by the Commissioner within fifteen (15) business days of receiving such request.

(f) Warranty. The manufacturer shall warrant the performance and construction of the mast arms to meet the requirements of this specification and shall warrant all parts, components, and appurtenances against defects due to design, workmanship, or material developing within a period of five years after the mast arms have been delivered. This will be interpreted particularly to mean structural or mechanical failure of any element or weld, or failure of any portion of the painting system. The warranty must be furnished in writing guaranteeing material replacement including shipment, free of charge to the City. The Commissioner will be the sole judge in determining which replacements are to be made and the Commissioner's decision will be final.

STANDARDS

3. (a) Assembly. Each arm shall consist of a tubular tapered steel shaft, mounting brackets, an aluminum cap, and all mounting hardware.
- (b) Interchangeability. Members of each arm type must be mutually interchangeable for assembly, so that no reworking will be required to make any member fit properly in the place of any other similar member of any other similar arm.
- (c) Design. Each arm must meet the requirements as shown on Standard Drawing 870.

ARMS

4. (a) Arm Size. The outside diameters of the arm of each size shall be as listed in Standard Drawing 870.
- (b) Material. The arm must be fabricated from one length of No. 7 Standard gauge steel meeting the requirements of ASTM A606 for low alloy high strength coil steel, which, after fabrication, must possess an ultimate tensile strength of not less than 70,000 psi and a yield strength of not less than 60,000 psi, in accordance with ASTM A595, Grade C. Chemistry of the steel shall be such as to insure resistance to atmospheric corrosion superior to that of ordinary copper bearing steel. Material certification is required. Manufacturer's steel meeting the specified physical and chemical requirements, and approved by the Commissioner, will be accepted.
- (c) Fabrication. The arm must be fabricated with not more than one (1) longitudinal weld. The weld must be ground smooth so that it is virtually invisible. There must be no lateral welds in the arms other than where the arms are welded to the steel clamp. Each arm must be straight and centered on its longitudinal axis. Each arm must be formed on a mandrel and worked to form a round cross-section. The completed, unpainted arms shall have smooth external surfaces free from protuberances, dents, cracks or other imperfections marring their appearance.

- (d) Clamp. The arm clamp must be of low alloy, high strength steel as noted in Section 4 (b). The clamp must be constructed as shown on Standard Drawing 870.
- (e) Structural Requirements. The mast arm must be manufactured in accordance with AASTHO's 1994 version of the Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. The arm assembly must be designed to meet AASTHO's 1994 criteria for 80 MPH wind loading with a 30% gust factor. The arms shall be designed appropriately for traffic signal applications within the City of Chicago.

CAP

- 5. (a) Design. The arm cap shall be essentially conical with a globe-shaped upper-end and having a minimum wall thickness throughout of not less than 5/32 inches. The cone portion must meet the skirted portion of the arm in a smooth fillet, the skirt must enclose the top 7/8" inches of the arm. Three stainless steel, or other similar approved material, set screws not less than 3/4 inches long must be equally spaced in tapped holes around the skirt and must hold the cap securely in place on the arm.
- (b) Material. The cap must be of aluminum alloy 356-F per ASTM B108. It shall have smooth surfaces, neat edges and corners and be free from fins, holes or other casting flaws.
- (c) Finish. Tops shall be painted as herein specified.

HARDWARE

- 6. All the hardware necessary to complete the assembly of the arm must be furnished. All hardware shall be stainless steel, or equal corrosion-resistant non-seizing metal, subject to approval.

WELDING

- 7. (a) General. Every welded joint shall be made in conformity with the proper interpretation of the standard welding symbols of the American Welding Society as indicated on the drawings; however, each bidder must submit with his proposal a drawing showing the sizes and types of welds, must state the type of electrode, and must describe the welding methods, he proposes to use in fabricating the arm.
- (b) Testing. All welds of the first three (3) arms of the first fifty (50) arms in every lot must be inspected for penetration and soundness of the welds by the magnetic particle inspection method or by radiography. Acceptance or rejection must be governed by the same conditions as in Section 9. If the magnetic inspection process is used, the dry method with the direct current shall be employed. All transverse welds must be magnetized by the "prod" (circular magnetization) method. Longitudinal welds may be magnetized by either circular or longitudinal magnetization.

PAINTING

8. (a) Oil and Grease Removal. All metal surfaces must be washed with an alkaline detergent to remove any oils or grease.
- (b) Metal Cleaning. All exterior metal surfaces must be cleaned by blasting with a combination of shot and grit to remove all dirt, mill scale, rust, corrosion, oxides and foreign matter and provide a "near white" surface in accordance with SSPC-SP 10.
- (c) Chemical Pretreatment. The cleaned metal surfaces must then be treated with a hot, pressurized iron phosphate wash and must be dried by convection heat.
- (d) Primer Coat. All exterior surfaces are to be coated with Tnemec 90-97 corrosion-inhibiting zinc-rich aromatic urethane to a minimum dry film thickness of 2.5 mils (.0025"). The aromatic urethane is to consist of a zinc dust content not less than 83% by weight in dried film. The coating must be airless-spray applied and moisture cured.
- (e) Finish Coat. All exterior surfaces are to be subsequently coated with Tnemec Endura-Shield II 1074 aliphatic acrylic polyurethane to a minimum dry film thickness of 3.0 mils (.003"). The coating must be airless-spray applied and cured in an oven by heating the steel substrate to between 150° Fahrenheit and 220° Fahrenheit.
- (f) Interior Coat. Interior surfaces are to be coated with red oxide rust inhibitive alkyd primer to a dry film thickness of 1.5 mils.
- (g) Durability. Both the exterior and interior coats must be capable of passing 1,000 hours of salt spray exposure as per ASTM B117 in a five percent (5%) Na Cl (by weight) solution at 95°F and 95% relative humidity without blistering. Before test, the panel must be scribed with an "X" down to bare metal.
- (h) Coating Measurement. Measurement of coating thickness must be done in accordance with SSPC-Pa 2-73T, "Measurement of Dry Paint Thickness with Magnetic Gauges," except that the lowest "single spot measurement" in an area of two square inches must not be less than 5.5 mils.
- (i) Color. Color must be gloss black unless noted otherwise in the order. A paint chip must be submitted for approval prior to fabrication.
- (j) Alternate Methods. Alternate coating methods may be reviewed and tested on a case by case basis. However, no coating method will be accepted unless the Commissioner judges such alternate to be equal to the coating herein specified.

ARM TEST

9. (a) General. All completed arms shall be available for testing for maximum deflection and set. Unless specifically authorized in writing, all tests must be made at the works of the manufacturer. A record of every test must be made and a certified copy of the test record must be submitted to the Engineer of Electricity before the arms are shipped.
- (b) Lot. Tests for deflection and set must be made upon the first three (3) arms in the first fifty (50) arms in the lot. An additional one (1) arm must be tested for each additional fifty (50) arms. If any of the arms in any lot fail to meet the test, an additional three (3) arms of the same lot must be tested. If any of these arms fail to meet the test requirements, the entire lot will be subject to rejection, except that the manufacturer may subject each arm in the lot to the test, and those which fulfill the requirement will be accepted. After testing, each weld must be inspected by the magnetic particle method to determine that the welds have not been affected.
- (c) Requirements. With arm rigidly anchored, a test load as indicated in the table in Standard Drawing 870 must be applied at a point approximately two feet (2'0") from the free end. The load must be applied at right angles to the center line of the arm and in the same vertical plane. The deflection must not be greater than that indicated. Within one (1) minute after the test load is released, measurement must be made of the set taken by the arm. The deflection measurement device must be reset to zero and the test load must be reapplied. The deflection must not change from the deflection noted in the first test by more than $\pm 5\%$. No measurable set must be noted within one (1) minute after test load is released.

PACKAGING

10. (a) General. The arms shall be shipped in twelve (12) arm bundles. Each arm must be individually wrapped so that the arm can be bundled for shipping and unbundled for delivery to the job site without damaging the arm or its finish.
- (b) Bundles. The bundles shall consist of twelve (12) arms laid base to top to form an approximately rectangular cylinder. Materials such as lumber (2" x 4" min.), non-marring banding, and other appropriate bundling materials must be used to make a rigid, long lasting, bundle capable of being handled, shipped and stored without shifting of contents or breaking, subject to approval. Any bundles, in which either arms or packaging is received broken, damaged or with contents shifted, will not be accepted and it will be the responsibility of the supplier to return the bundle to its original destination at no cost to the City of Chicago. The bundles should be capable of being stacked two (2) high without breaking, or shifting of the contents. Each bundle must be capable of being lifted by a fork lift truck or crane and the bundles must be shipped on a flat bed truck to facilitate unloading. Each arm wrapping must be clearly labeled indicating the mast size, i.e. 30' SIGNAL MAST ARM.

- (c) Hardware. The hardware must be shipped with each bundle and packaged in twelve (12) sets of four (4) each. The package shall be placed in a prominent position to facilitate accessibility, and must be attached to, or within, the bundle in such a manner as to assure safe delivery. Payment will be withheld for any bundle delivered without the accompanying hardware. Arm caps must be attached at the manufacturer's facilities, or be packed separately in a manner similar to the other hardware, and the same payment conditions will prevail. Cracked, broken or chipped parts will be considered as an incomplete delivery as regards payment.
- (d) Delivery. All mast arms will be delivered to the Division of Electrical Operations storage yard at 4101 South Cicero Avenue in Chicago, or to another location within the City as indicated on the order.

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1462
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED AUGUST 3, 2006**

RIGID STEEL CONDUIT (HOT DIPPED GALVANIZED)

SCOPE

- 1. This specification describes rigid steel conduit, zinc coated. This specification also describes rigid steel conduit that is both zinc and PVC coated. The conduit will be used underground or on structure as a raceway for electrical cables.

GENERAL REQUIREMENTS

- 2. (a) Rigid steel conduit must be zinc coated by the hot-dip process. Conduit must be furnished in 10 foot lengths, threaded on each end and with one coupling attached to one end and a protective cap at the other end.

- (b) The conduit shall be manufactured according to Underwriters Laboratories Standard U.L. - 6 and must meet ANSI Standard C 80.1 and the requirements of NEC Article 344. In addition, conduit must be recognized as an equipment grounding conductor as per NEC Article 250.118(2). There will be no exceptions to meeting these standards.
- (c) Acceptance. Conduit not conforming to this specification will be rejected. The Commissioner will be the final judge in determining if the conduit meets the specification.
- (d) Sample. If requested by the Chief Procurement Officer, a sample of conduit must be submitted to the Engineer of Electricity within fifteen (15) business days of receipt of such a request.
- (e) Warranty. The manufacturer shall warrant the construction and performance of the conduit to meet the requirements of this specification and shall warrant all parts and components against defects due to design, workmanship, or material developing within a period of one (1) year after the conduit has been delivered.

STEEL

- 3. Conduit shall be formed from steel suitable for use as an electrical raceway. It shall be structurally sound so that it will hang straight and true when supported by hangers in accordance with Chicago electrical code requirements and shall be capable of being field bent without deformation of the walls.

Conduit shall have a circular cross section sufficiently accurate to permit the cutting of threads in accordance with Table 2 and shall provide a uniform wall thickness throughout. All surfaces shall be smooth and free of injurious defects. The dimensions and weights of rigid steel conduit must be in accordance with Table 1.

THREADING AND CHAMFERING

- 4. Each length of conduit, and each nipple, elbow and bend must be threaded on both ends, and each end must be chamfered to remove burrs and sharp edges.

The number of threads per inch, and the length of the threaded portion at each end of each length of conduit, nipple and elbow must be as indicated in Table 2. The perfect thread must be tapered for its entire length, and the taper must be 3/4 inch per foot.

ZINC COATING

5. After all cutting, threading, and chamfering all conduit surfaces shall be thoroughly cleaned before application of zinc. The cleaning process shall leave the interior and exterior surfaces of the conduit in such a condition that the zinc will be firmly adherent and smooth.

The conduit must be hot dipped galvanized both inside and out to provide approximately two (2) ounces of zinc per square foot. This is equivalent to 3.4 mils of zinc coating. An additional interior coating to aid in the installation of wires is required.

COUPLINGS

6. (a) The outside surface of couplings shall be protected by means of a zinc coating. The zinc content of the coating on the outside surface must be equivalent to a minimum thickness of 3.4 mils.
- (b) Couplings shall be so made that all threads will be covered when the coupling is pulled tight on standard conduit threads.
- (c) Both ends of the coupling must be chamfered to prevent damage to the starting threads.
- (d) The outside diameter, length and weight of coupling must be as indicated in Table 3.
- (e) Couplings must be straight tapped, except that the 2 1/2 inch and larger sizes may be taper-tapped.

PVC COATED (WHEN SPECIFIED)

7. (a) Only hot dipped galvanized conduit, couplings, and fittings may be polyvinylchloride (PVC) coated.
- (b) All conduit, couplings, and fittings must be cleaned before being coated.
- (c) All conduit, couplings, and fittings must have a PVC coating applied to the exterior by dipping in liquid plastisol. The coating thickness must be a nominal 40 mils.
- (d) All coated conduit, couplings, and fittings must conform to the requirements of NEMA Standard RN1- Section 3 , "External Coatings". The latest revision will apply.

PACKING AND IDENTIFICATION

8. The pipe shall be delivered in bundles. Each length of conduit must be marked with the manufacturer's name or trademark. Securely attached to each bundle at two (2) locations on the bundle must be a weather resistant tag containing the following information:
- a. conduit size
 - b. footage of bundle
 - c. gross weight of bundle

Precaution will be taken by the contractor in handling during shipment or delivery of conduit, and any conduit found to be damaged will not be accepted.

TEST AND INSPECTION

9. Galvanized rigid conduit must be capable of being bent cold into a quarter of a circle around a mandrel, the radius of which is four times the nominal size of the conduit, without developing cracks at any portion and without opening the weld.

The protective coatings used on the outside and inside surfaces of rigid steel conduit must be sufficiently elastic to prevent their cracking or flaking off when a finished sample of 2 inch conduit is tested within one year after the time of manufacture, by bending it into a half of a circle around a mandrel, the radius of which is 3 1/2 inches.

Tests on sizes other than 1/2 inch may be conducted within one year after the time of manufacture. If such tests are conducted, the conduit must be bent into a quarter of a circle around a mandrel, the radius of which is six times the nominal size of the conduit.

One of the following three test methods shall be employed for measuring the thickness or extent of the external zinc coating on conduit:

- (a) Magnetic test.
- (b) Dropping test.
- (c) Preece test (Material which will withstand four 1-minute immersions will be considered as meeting requirements as follows; the zinc content of the coating on the outside surface must be equivalent to a minimum thickness of 3.4 mils).

All tests and inspections must be made at the place of manufacture prior to shipment unless otherwise specified, and shall be so conducted as not to interfere with normal manufacturing processes.

Each length of conduit shall be examined visually both on the outside and inside to determine if the product is free from slivers, burrs, scale or other similar injurious defects (or a combination thereof), and if coverage of the coating is complete.

If any samples of rigid steel conduit tested as prescribed in this specification should fail, two additional samples must be tested, both of which must comply with the requirements of the specification.

All pipe which may develop any defect under tests, or which may before testing or on delivery be found defective, or not in accordance with these specifications, must be removed by the Contractor at his own expense; and such pipe so removed by the Contractor must be replaced by him within ten (10) days of such rejection with other pipe which will conform to these specifications.

TABLE 1

Design Dimension and Weights of Rigid Steel Conduit

Nominal or Size of Conduit	Inside Diameter	Outside Diameter	Wall Thickness Coupling	Length Without	Minimum Weight Trade of Ten Unit Length/coupl ings
(Inches)	(Inches)	(Inches)	(Inches)	(Feet/Inches)	(Pounds)
1/2	0.622	0.840	0.109	9-11 1/4	79.00
3/4	0.824	1.050	0.113	9-11 1/4	105.0
1	1.049	1.315	0.133	9-11	153.0
1 1/4	1.380	1.660	0.140	9-11	201.0
1 1/2	1.610	1.900	0.145	9-11	249.0
2	2.067	2.375	0.154	9-11	334.0
2 1/2	2.469	2.875	0.203	9-10 1/2	527.0
3	3.068	3.500	0.216	9-10 1/2	690.0
3 1/2	3.548	4.000	0.226	9-10 1/4	831.0
4	4.026	4.500	0.237	9-10 1/4	982.0

NOTE: The applicable tolerances are:

Length: + 1/4 inch (without coupling)

Outside diameter: + 1/64 inch or -1/32 inch for the 1 1/2 inch and smaller sizes,
 ± 1 % for the 2 inch and larger sizes.

Wall thickness: - 12 1/2 %

TABLE 2

Dimensions of Threads

Nominal or Trade Size of Conduit (Inches)	Threads per Inch	Pitch Diameter at end of Thread (Inches) Tapered 3/4 Inch per foot	Length of Thread (Inches)	
			Effective L2	Overall L4
1/2	14	0.7584	0.53	0.78
3/4	14	0.9677	0.55	0.79
1	11 1/2	1.2136	0.68	0.98
1 1/4	11 1/2	1.5571	0.71	1.01
1 1/2	11 1/2	1.7961	0.72	1.03
2	11 1/2	2.2690	0.76	1.06
2 1/2	8	2.7195	1.14	1.57
3	8	3.3406	1.20	1.63
3 1/2	8	3.8375	1.25	1.68
4	8	4.3344	1.30	1.73

NOTE: The applicable tolerances are:

Threaded Length (L4 Col 5): Plus or minus one thread

Pitch Diameter (Col 3): Plus or minus one turn is the maximum variation permitted from the gaging face of the working thread gages. This is equivalent to plus or minus one and one half turns from basic dimensions, since a variation of plus or minus one half turn from basic dimensions is permitted in working gages.

TABLE 3

Designed Dimensions and Weights of Couplings

Nominal or Trade Size of Conduit <u>(INCHES)</u>	Outside Diameter <u>(INCHES)</u>	Minimum Length <u>(INCHES)</u>	Minimum Weight <u>(POUNDS)</u>
1/2	1.010	1-9/16	0.115
3/4	1.250	1-5/8	0.170
1	1.525	2	0.300
1 1/4	1.869	2-1/16	0.370
1 1/2	2.155	2-1/16	0.515
2	2.650	2 1/8	0.671
2 1/2	3.250	3-1/8	1.675
3	3.870	3-1/4	2.085
3 1/2	4.500	3-3/8	2.400
4	4.875	3-1/2	2.839

THIS SPECIFICATION SHALL NOT BE ALTERED

SPECIFICATION 1463
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JUNE 22, 2001

TRAFFIC SIGNAL MOUNTING BRACKETS FOR MONOTUBE ARMS

SUBJECT

1. This specification states the requirements for mounting brackets which will be used to secure traffic signals and illuminated signs to steel monotube mast arms.

GENERAL

2. (a) Specifications. The mounting brackets shall conform in detail to the requirements herein stated and to the specifications and methods of test of the American Society for Testing and Materials cited by ASTM Designation number of which the most recently published revision will govern.
- (b) Acceptance. Mounting brackets not conforming to these specifications will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, one complete mounting bracket must be submitted within fifteen (15) business days upon receipt of such a request. It must be delivered to the Engineer of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- (d) Experience. The manufacturer shall demonstrate a knowledge of past production of the brackets herein described, as demonstrated by a submittal list of comparable projects.
- (e) Warranty. Bracket must have a minimum three (3) year warranty. The warranty must cover the material and workmanship. Any structural flaws or inability to maintain alignment will be deemed a failure and result in the warranty being invoked. The manufacturer will supply a new bracket for each failed bracket, at no cost to the City.

DESIGN

3. (a) General. The mounting bracket shall be designed such that no portion of the bracket is put into tension when it is attached to the mast arm with banding. The signal support tube will be attached to the bracket using compression type attachments. All materials must be corrosion resistant and designed to be structurally sound. The signal support tube will be a slotted aluminum pipe of sufficient length to hold either a 3, 4, or 5 section signal head, or an illuminated sign. The slot must have a neoprene gasket to protect the cable. There must also be top and bottom brackets that hold the signal head assembly at each end to the tube. The bottom bracket will also be used as a cable runway.
- (b) Hardware. All components of the mounting brackets must be held firmly in place with stainless steel hardware.
- (c) Adjustments. Bracket shall allow for mounting and adjustment of signal faces in any direction desired on a fixed mast arm. Adjustments shall be made using standard hand tools. Neither mounting nor adjusting the bracket should require the use of a torque wrench.
- (d) Signal Mounting. Mounting hardware shall be available for use with standard two, three and five signal head configurations; for use with optically programmed signal heads; and with signs.
- (e) Wiring. Bracket design shall allow for ease of installation of components and wiring. All wiring troughs and nipples must provide smooth, burr-free surfaces and adequate space for facile movement of nominal 2" diameter cable between the mast arm and the signal face.
- (f) Banding. Where banding is used to attach the mounting bracket to the mast arm, the banding must be 3/4" x 42" stainless steel.
- (g) Castings. Where castings are used for the brackets, they shall be smooth and free of defects.

TESTING

4. (a) General. One Percent (1%) of the traffic signal mounting brackets in each order shall be tested for rigidity and structural integrity.
- (b) Re-testing. If any mounting bracket fails any portion of the test, an additional three percent (3%) of the brackets must be tested. If an additional bracket fails, the entire lot will be rejected.

(c) Tests.

1. With five (5), twelve inch (12") signal head sections attached to the bracket, the assembly shall be mounted to a suitable and proper supporting structure.
2. Using a calibrated dynamometer, a one hundred pound force must be applied for sixty seconds at the center of the bracket in the horizontal plane. At the completion of the test, there must be no movement of the assembly or deterioration of the bracket or appurtenant hardware.
3. Using a calibrated dynamometer, a one hundred pound force must be applied to the top signal head section for sixty seconds in a direction which will pull the head away from the mounting post in the mounting post plane. During this time period, the mounting bracket castings must be struck ten times with an eight ounce flat head hammer at the point(s) which appear to be most vulnerable to stress. At the completion of the test, no movement of the assembly must have been observed and there must be no cracking of the castings or deterioration of the appurtenant hardware.
4. The above test must be repeated except that the force must be applied in a plane which is perpendicular to the mounting post plane.

THIS SPECIFICATION SHALL NOT BE ALTERED

SPECIFICATION 1465
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JULY 12, 2006

GROUND RODS

SUBJECT

1. This specification states requirements for ground rods and clamps to be used for ground electrodes in street lighting, traffic signal, and miscellaneous electrical circuits.

GENERAL

2. (a) Ground rods must be copper clad, steel rods suitable for driving into the ground without deformation of the rod or scoring, separation or other deterioration of the copper cladding.
- (b) Sample. If requested by the Chief Procurement Officer, the contractor must furnish one sample of the ground rod proposed to be furnished within fifteen (15) business days from receipt of such request. The sample ground rod must be delivered to the Engineer of Electricity, 2451 S. Ashland Avenue, Chicago, Illinois 60608.
- (c) Warranty. The manufacturer shall warrant every ground rod against defects due to design, workmanship, or material developing within a period of one (1) year after the ground rod has been accepted. Any ground rod which fails during this period must be replaced by the contractor without expense to the City. The Commissioner of Transportation or his duly authorized representative will be the sole judge in determining which replacements are to be made.
- (d) The Commissioner will be the sole judge in determining whether the submitted ground rods meet the requirements of this specification. Ground rods not accepted must be removed at the sole expense of the contractor.

DESIGN

3. (a) The ground rods and couplings must meet the latest requirements of (National Electrical Manufacturer's Association) NEMA Standard GR-1, for copper bonded ground rod electrodes and couplings. The ground rods must also meet the requirements of (Underwriter's Laboratories) UL 467.
- (b) Ground rods shall be made of steel core suitable for driving into the earth without deformation.
- (c) A uniform covering of electrolytic copper, 10 mils in thickness, shall be metallicly bonded to the steel core to provide a corrosion resistant, inseparable bond between the steel core and the copper overlay.
- (d) The finished rod must be of uniform cross-section; straight, and free of nicks, cuts or protuberances.
- (e) The rod must be pointed at one end and chamfered at the other.
- (f) All ground rods must be three-quarter inches (3/4") in diameter. The length shall be as specified in the order or in the plans. The length and diameter of the rod and the manufacturer must be clearly and permanently marked near the top of the rod (chamfered end).
- (g) All ground rods must have a ground clamp capable of accommodating a No. 6 AWG Copper Wire.

PACKING

4. (a) Ground rods must be packed in bundles with reinforced tape or plastic banding that will not damage the rods. Small bundles may then be bound in larger bundles held together with steel banding.
- (b) Ground clamps must be packed in a suitable carton. The carton must be labeled to indicate the contents.

THIS SPECIFICATION SHALL NOT BE ALTERED

SPECIFICATION 1467
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
MAY 12, 1993

ROD: ANCHOR, STEEL, WITH HARDWARE

SUBJECT

1. This specification states the requirements for steel anchor rods with hardware for street light pole foundations.

GENERAL

2. (a) Specifications. The anchor rods shall conform in detail to the requirements herein stated, and to the specifications of the American Society for Testing and Materials cited by ASTM Designation Number, of which the most recently published revision will govern.
- (b) Drawing. The drawings mentioned herein are issued by the Department of Transportation, Division of Electrical Operations, and are an integral part of this specification.

ANCHOR ROD

3. (a) Fabrication. Each anchor rod must be fabricated in conformity with City of Chicago drawings numbered 806, 811, 830 and 844.
- (b) Material. The rods must be fabricated from cold rolled carbon steel bar meeting the requirements of ASTM Specification A-36, except that the Specification must be modified to provide a minimum yield point of 55,000 psi (379 MPa).
- (c) Thread. The straight end of each rod must be threaded as shown on City of Chicago drawing for that size rod, and must be American Standard, National Coarse.

HARDWARE

4. Hardware furnished with the anchor rod shall be as shown on the applicable drawing. It must include two (2) hexagonal nuts, American Standard Regular, two (2) flat washers, type B, series W, and one (1) lock washer, steel, helical spring. The nuts must have a Class 2 or 3 fit.

FINISH

5. (a) Galvanizing. The threaded end of each rod must be hot dipped galvanized for the distance shown on the applicable drawing. The thickness of the galvanized coating must not be less than 0.0021 inches. Each hexagonal nut and washer must be galvanized to the minimum thickness required by ASTM A-153, Class C, or ASTM B-454, Class 50. After galvanization, each anchor rod and nut must have a mating fit equivalent to the American Standard Class 2 or 3 fit for nuts and bolts.
- (b) Rust Inhibitor. With the hardware in place on the end of the bolt, the galvanized portion of the bolt must be coated with heavy No-Ox-Id or equal rust inhibiting greasy compound.

TESTS

6. At the discretion of the Commissioner, anchor rods and hardware furnished under this specification will be subject to testing to determine compliance with the materials physical requirements.

INSPECTION

7. Final inspection must be made at point of delivery. Any anchor rods and hardware rejected must be removed by the Contractor at his sole expense.

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1475
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED SEPTEMBER 26, 2006**

CORD: TRAFFIC SIGNAL, EIGHT CONDUCTOR NO. 16 AWG, 600 VOLT

SUBJECT

1. This specification states the requirements for an eight (8) conductor number 16 AWG, electrical cable, to be installed in poles and conduit and used to electrically energize traffic signal faces at street intersections within the City of Chicago. The cable shall be flame retardant, have low acid gas content, good resistance to oil, moisture and mechanical abuse, and exhibit excellent heat aging and electrical characteristics.

GENERAL

2. (a) Specifications. The cable shall conform in detail to the requirements herein stated, and to the specifications and methods of test of the American Society for Testing and Materials cited by ASTM Designation Number, the Underwriters Laboratories, Inc. Standard or Style number and any other recognized standardization group=s specifications referred to by the appropriate designation, of which the most recently published revision will govern.
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Warranty. The manufacturer shall warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.
- (d) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be provided under this specification must be submitted to the attention of the Engineer of Electricity within fifteen (15) business days after receipt of such request.

CABLE

3. (a) Construction. This cable shall consist of stranded, coated, conductors each concentrically encased with a "free stripping," ethylene propylene rubber insulation. Suitable fillers shall be used to produce an essentially round cross-section. The insulated conductors and the fillers must be cabled with a suitable left-hand lay as close together as is consistent with forming a core of minimum diameter. A Mylar tape must be wrapped over the conductor assembly, and a jacket applied overall.
- (b) Outer Diameter. The maximum allowable outer diameter must be one-half (0.50) inch.
- (c) Sealing. Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture or other foreign matter.

MARKING

4. (a) Conductors. Identification must be provided by colors in accordance with I.M.S.A. Standards.
- (b) Jacket. The outer jacket must be marked as follows: "8/C 16 AWG 600V 90°C LSZH, name of manufacturer and date of manufacture. The height of letters must not be less than 1/8 inch in height and the message must repeat at approximately two (2) foot intervals. A sequential footage marking must be located on the opposite side of the jacket. All marking must be perfectly legible with permanent white ink.

CONDUCTOR

5. (a) Material. Round, Soft or annealed, stranded copper wire in accordance with ASTM B-3 and B-8, and coated in accordance with ASTM B33 (tin coated) , must be furnished.
- (b) Size. The stranded conductor must consist of stranded wires twisted with an appropriate lay to form a No. 16 AWG conductor with an approximate diameter of 0.048 inches.

INSULATION

6. (a) Type. The insulation must be an easily strippable low smoke zero halogen (LSZH) thermosetting polyolefin compound or ethylene propylene rubber (EPR), or equal meeting or exceeding the requirements of ICEA S-95-658 and the additional requirements of this specification.

- (b) Rating. The insulation must be rated for continuous duty at 90°C in accordance with U.L. AWM Style 3400.
- (c) Thickness. The insulated conductor must be circular in cross-section, concentric to the conductor, with a nominal insulation thickness of 0.031 inches (2/64") and a minimum spot thickness of 90% of the nominal thickness.
- (d) Initial Physical Requirements:
 - 1. Tensile strength, min., PSI 1,600
 - 2. Elongation at rupture, min. % 250
- (e) Air Oven Exposure Test. After conditioning in an air oven at 158 ± 1°C for 168 hours using methods of test described in ASTM-D 573:
 - Tensile strength, minimum percent of unaged value85
 - Elongation at rupture, minimum percent of unaged value65
- (f) Mechanical Water Absorption:
 - 1. Gravimetric Method. After 168 hours in water at 70± 1°C:
 - Water absorption, maximum, milligrams per square inch . . .5.0
- (g) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend," Long-Time Voltage Test on Short Specimens of ASTM D-470 except that the test temperature must be minus (-) 25°C.
- (h) Electrical Requirements:
 - 1. Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.
 - 2. Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.
- (i) Flexibility Tests. A sample length of insulated conductor must be formed in a loose coil, placed in a circulating air oven, and aged for 168 hours at 158° C ± 1°C. The sample must then be allowed to cool to room temperature for one (1) hour and tightly wrapped around a 3X metal mandrel. The sample must show no cracks and must pass the same voltage test specified for the "Cold-Bend Test."

JACKET

7. (a) Type. The jacket must be a thermosetting low smoke zero halogen (LSZH) polyolefin compound or chlorinated polyethylene (CPE), or equal meeting the physical and electrical requirements specified herein.
- (b) Rating. The jacket must be rated for continuous duty at 90° C.
- (c) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than 45 mils and a spot thickness not less than ninety percent (90%) of the average thickness.
- (d) Initial Physical Requirements:
- | | | |
|----|--|------|
| 1. | Tensile strength minimum PSI | 1800 |
| 2. | Elongation at rupture, minimum percent | 300 |
- (e) Air Oven Exposure Test. After conditioning in an air oven at 121 ± 1°C for 168 hours for LSZH or 136 ± 1°C for CPE:
- | | | |
|----|---|----|
| 1. | Tensile strength, minimum percent of unused value | 75 |
| 2. | Elongation at rupture, minimum percent of unaged valued | 55 |
- (f) Mechanical Water Absorption. After 168 hours at 70 ± 1° C:
- | | | |
|----|-------------------------------------|----|
| 1. | Milligrams per square inch, maximum | 20 |
|----|-------------------------------------|----|

TESTING

8. (a) General. Tests shall be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in this specification. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by the Engineer of Electricity will apply.

All tests must be conducted on cable produced for this order. Where cable insulation and/or jacket thickness preclude obtaining samples of sufficient size for testing, special arrangements must be made with the engineer to obtain samples of unprocessed materials directly from the extrusion feed bins which will be separately processed and prepared for tests.

- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Test Reports. No cable shall be shipped until certified copies of all factory tests have been reviewed and approved by the engineer.
- (d) Acceptance. Samples shall be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

PACKAGING

- 9. (a) Reels. The completed cord shall be delivered on sound, substantial reels. The ends of the cable must be securely fastened so that they will not become loose during shipment and handling.
- (b) Footage. The number of feet per reel must be five hundred (500) feet plus or minus ten percent ($\pm 10\%$).
- (c) Marking. A metal tag, or an approved indelible marking material such as alkyd enamel paint, must be used to mark the reel. The marking information must include, but not be limited to, the following: reel number, contract number, a description of the cord, and the footage of that particular reel.

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1493
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
REVISED JANUARY 27, 2010**

**TRAFFIC SIGNAL: VEHICULAR, TWELVE-INCH SINGLE FACE, SINGLE OR
MULTIPLE-SECTION, POLYCARBONATE, LED OR INCANDESCENT**

1. GENERAL REQUIREMENTS

1.1 This specification states the requirements for twelve-inch, single face, single and multiple-section, traffic signals with polycarbonate housings, using LED or incandescent light source, for use in the traffic control system of the City of Chicago. Units include red ball, yellow ball, green ball, red arrow, yellow arrow, and green arrow.

1.2 Sample and Certified Test Reports. One complete signal, fully assembled and wired, of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within fifteen (15) business days upon request of the Chief Procurement Officer. The sample must be delivered to the Engineer of Electricity, Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.

1.3 Standards. Equipment furnished under this specification shall meet the appropriate requirements of the following standards, as required within the body of this specification:

American Association of State Highway and Transportation Officials (AASHTO)
American Society for Testing and Materials (ASTM)
Institute of Transportation Engineers (ITE)
National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL)

1.4 Approval. Approval will mean approval in writing by the Commissioner or his duly authorized representative.

1.5 Warranty. The manufacturer shall warrant the signals to meet the requirements of this specification, and shall warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of three (3) years from date of acceptance. In addition, LED optical units must carry a seven (7) year warranty against failure or loss of color (chromaticity) and signal brightness (luminance) below minimum acceptable VTCSH standard levels from date of final acceptance for contract construction, or date of delivery on a specific order. In the event defects or failures occur in the LED units during the warranty period, the manufacturer must replace all defective units, at no expense to the City. This warranty shall be evidenced by a letter or certificate of warranty submitted to the City at the time delivery is made. The LED warranty must cover all units delivered in an order or installed by contract, and must include unit serial numbers. The warranty must be signed and dated by an official of the manufacturer who is empowered by the manufacturer to enter into such a warranty.

1.6 Location. The supplier of the LED modules shall actively maintain an office, stocking warehouse, and technical support within a 100 mile radius of the City of Chicago.

2. MATERIALS AND EQUIPMENT REQUIREMENTS

2.1 The traffic signal heads shall conform to ITE Standard "Vehicle Traffic Control Signal Heads" (VTCSH), in which the most recently published revision will govern.

2.2 Housing. The housing of each section must be one piece, ultraviolet stabilized polycarbonate resin of the specified color, injection molded complete with integral top, bottom, and sides, having a minimum thickness of 0.1 inch.

(a) The polycarbonate shall meet or exceed the following tests:

TEST	REQUIRED	METHOD
Specific gravity	1.17 minimum	ASTM D 792
Vicat Softening temp	310-320° F	ASTM D 1525
Brittleness temp.	-200° F	ASTM D 746
Flammability	Self-extinguishing	ASTM D 635
Tensile strength, yield	8,500 PSI	ASTM D 638
Elongation at yield	5.5-8.5%	ASTM D 638
Shear strength, yield	5,500 PSI min.	ASTM D 732
Izod impact strength (notched, 1/8" thick)	12-16 ft-lbs/in.	ASTM D 256
Fatigue strength (at 2.5 mm cycles)	950 PSI min.	ASTM D 671

(b) Assembly. A traffic signal section shall be comprised of, but not limited to, the housing, hinged door, visor, optical unit and all necessary gaskets and hardware. The multi-section, single face, traffic signal shall be comprised of single face single sections assembled together, containing an internally mounted terminal block. Arrow indications must be shipped as single sections. The traffic signals shall be designed and constructed to permit sections to be assembled together, one above the other, forming a weatherproof and dust-tight unit.

(c) Individual sections shall be fastened together with a coupling washer assembly composed of two washers, three zinc plated bolts, nuts, and lock washers which lock the individual sections together. As an alternative, individual sections may be fastened together with four cadmium plated bolts, lock washers, and nuts. The hole in the coupling washer assembly must accommodate three 3/4 inch cables.

(d) Height. The overall height of an assembled traffic signal must be fourteen (14) inches for a single-section signal, forty-two (42) inches for a three-section signal, and seventy (70) inches for a five-section, plus or minus one (1) inch.

- (e) Mounting. The traffic signal shall be designed for mounting with standard traffic signal brackets using 1-1/2 inch pipe size fittings.
- (f) Positioning Device. The top and bottom opening of each housing must have integral serrated bosses that will provide positive positioning of the signal head in five degree increments. A total of 72 teeth must be provided in the serrated bosses to allow the signal face to be rotated 360 degrees about its axis. The teeth shall be clean and well defined to provide positive positioning.
- (g) Hinges. The signal housing shall be sectional; one section for each optical unit. Each housing must have four integral hinge lugs, with stainless steel hinge pins (AISI 304 or equivalent), located on the left side for mounting the door. The hinge pins shall be straight and not protrude past the outside of the housing lugs. The housing must have two integral latching bolt lugs on the right side each with a stainless steel hinge pin to which a latching bolt (AISI 304 or equivalent), washer, and wing nut will be attached. The wing nuts must be captive. Each housing must be equipped with holes to be used for mounting backplates.
- (h) Door. The door shall be a one piece ultraviolet stabilized polycarbonate resin of the specified color, injection molded complete with a minimum thickness of 0.1 inch. Two (2) hinge lugs on the left side and two (2) sets of latch screw jaws centered on the right side, as viewed from the front of the signal, must be integrally cast with the housing door. The door must be hinged to the housing with two (2) stainless steel hinge pins, drive fitted. Two (2) stainless steel latch screws and wing nut and washer assemblies on the latch side of the housing body shall provide for opening and closing the door without the use of tools. The door must have eight (8) holes with threaded metal inserts for stainless steel machine screws to secure the visor(4 holes) and the lens(4 holes). The inside of the door must be grooved to accommodate a one piece, air-cored EPDM (ethylene propylene diene monomer) gasket to provide a weatherproof and dust proof seal when the door is closed. The inside of the door must have four equally spaced threaded metal inserts for the lens attachment. The outside of the door must have an integral rim completely encircling the lens opening to prevent leakage between the door and the lens. The rim must have four equally spaced tabs around the circumference with threaded metal inserts for the visor.
- (i) Visor. Each traffic signal shall have a visor for each signal indication (section). The visor shall be the tunnel type, nine and one-quarter inches (9-1/4") long, fabricated of ultraviolet stabilized polycarbonate resin of the specified color, injection molded. The visor shall fit tightly against the door and not permit any light leakage between the door and visor. All hardware necessary for, but not limited to, attachment of the visor must be of stainless steel. The visor must have four mounting lugs for attaching the visor to the door. Screws must go through the visor lugs into the metal inserts in the door to secure the visor.

- 2.3 The traffic signal heads shall be provided with incandescent or LED optical units as specified in the line item or Contract Plans.

2.3.1 INCANDESCENT OPTICAL UNITS

- (a) Incandescent Optical Unit. The incandescent optical unit consists of the lens, reflector and lamp holder. The optical unit and visor shall be designed as a whole so as to eliminate the return of outside rays entering the unit from above the horizontal (known as sun phantom). The optical unit shall be designed and assembled so that no light can escape from one indication to another.
- (b) Lenses. The red, yellow and green polycarbonate lenses must be round with a nominal twelve (12) inch diameter and shall conform to all requirements set forth under the heading "Traffic Signal Lenses" in the ITE standard. The red, green or yellow arrow lenses must be round with a nominal twelve (12) inch diameter and the outside surface must be covered, except for the arrow, with a dull or dark grey opaque material of a thickness sufficient to totally hide the light from a 2000-lumen lamp placed behind it operating at rated voltage. The opaque material shall be hard and durable and shall be bonded such that it will not peel or flake when subject to the heat of a signal lamp or when the lens is washed. The shape and size of the arrow shall be of an approved design with a minimum stroke of fifteen-sixteenths (15/16) inch. The arrow shall appear uniformly illuminated when viewed from angles usually encountered in service, whatever may be the angular position of the lens in the signal section. The lens must be enclosed by an air-cored EPDM (ethylene propylene diene monomer) gasket providing a weather proof and dust proof seal between the lens, door, and reflector assembly. The gasketed lens must be secured to the housing door by four (4) stainless steel screws (AISI 304 or equivalent) and clamps equally spaced around the lens opening. The door must have threaded metal inserts to receive the screws.
- (c) Reflector. The reflector shall be fabricated of high-purity, clad-type aluminum sheet formed to a parabolic shape and cut to fit in a circular polycarbonate, hinged frame for rigid mounting within the housing. The circular rim of the reflector shall be mounted in such a way as to seal the internal optical system by being compressed against the lens gasket when the signal door is closed. The reflecting surface must be an "ALZAK" class SI specular finish having a minimum reflectivity of eighty-two (82) percent and a protective oxide coating of 7.5 milligrams per square inch, minimum. The reflectivity shall be determined with a Taylor-Baugartner Reflectometer, and the weight of the protective oxide coating by the method of test outlined in ASTM B 137. The reflecting surface must be tested for proper sealing by applying one (1) drop of a water solution (1 gram per 50 cc) of Anthraquinone Violet R at a room temperature. After five (5) minutes, the dye must be washed from the surface with running water. No stain must remain after the surface is lightly rubbed with a soft cloth wet with mild soap and water, and rinsed with water. The reflector must have an opening in the back to accommodate the lamp holder.

- (d) Lamp Holder. The lamp holder must have a heat, moisture and weatherproof molded phenolic housing designed to accommodate a standard 133 watt, 3 inch light center length, incandescent lamp. The lamp holder shall be so designed that it can be readily rotated and positively positioned to provide proper lamp filament orientation and focus. The inner brass shell, or ferrule, of the lamp holder must have a grip to prevent the lamp from working loose due to vibration. A gasket must be furnished at the junction of the lamp holder and the reflector.

2.3.2 LIGHT EMITTING DIODE (LED) OPTICAL UNITS

- (a) Light emitting diode (LED) optical units shall consist of an integral unit containing the following components: power leads, housing, integral lens, matrix of light emitting diodes (LEDs) emitting monochromatic light of desired signal color, and electronic and electrical components necessary to permit operation at nominal 120 volt, 60 hertz power.
- (b) The LED unit shall be of such dimensions as to permit mounting in any standard traffic signal housing, be interchangeable with incandescent optical units, and must include appropriate gasket for this purpose. Gasketing provided must provide a watertight seal meeting existing ITE standard for signal heads, and exclude the infiltration of moisture into either the signal housing or into the LED optical unit case.
- (c) The LED unit shall meet the applicable requirements of the ITE standards for Vehicle Traffic Control Signal Heads(VTCSH) Part 2: LED Vehicle Signal Modules, for color (chromaticity), signal brightness (luminance), and beam spread (luminance at various vertical and horizontal angles). Yellow LED modules shall meet the green module requirements for brightness.
- (d) Minimum brightness of LED signal units shall be in accordance with the luminous requirements in a standard testing procedure as defined by Section 4 of the VTCSH Part 2: LED Vehicle Signal Modules. During the required operating life of LED signal units, the luminance output of the units must not be less than 60 percent (.60) of the values specified in the standard.
- (e) Unit lenses must be twelve inches in diameter and be constructed of ultraviolet (UV) stabilized , impact resistant polycarbonate, acrylic or other approved material. Lenses shall be clear or tinted.
- (f) Units shall consist of LEDs uniformly distributed to present a homogeneous appearance on the face of the lens from a wide viewing angle.
- (g) LEDs shall be wired so that the loss of a single LED or a string of LEDs will not reduce the luminescence below the minimum requirement.

- (h) For purposes of this specification, failure of a single unit is defined as an occurrence where the luminescence of the signal measured in candela in standard test procedures is less than the required initial luminance or luminance at time points and conditions specified; or where minimum required brightness is achieved, but two or more series strings of LEDs or in excess of twenty percent of 20% of LEDs are not operable.
- (i) Unit power supply shall be constant current regulated and filtered to provide instant on indications, and to prevent momentary signal outages or flicker. Units must be fully operable over a range of 90 volts to 130 volts at 60 hertz, plus or minus 3 hertz.
- (j) Surge protection: Each unit must be provided with integral surge protection to withstand transient of 600 volt, 100 microsecond rise and 1 millisecond pulse width. The surge protector shall provide full electrical and physical protection to all unit components.
- (k) Maximum permissible power consumption at ambient conditions (nominal 120 volts, 60 hertz, 70 degrees F.) must be 30 watts at a minimum 90 percent power factor. Power consumed must not vary by more than ten (10) percent from nominal power consumption over voltage range of 105 volts to 125 volts, and over permissible environmental ranges.
 - (l) Units must be fully operable at temperature ranges of -40 degrees F. (-40 deg C) to +165 degrees F. (+74 deg C) at up to 100 percent relative humidity.
- (m) Units shall be clearly marked on the back surface of the unit in a permanent manner showing information required for warranty and long term performance. Information to be shown must include manufacturer name, date of manufacture, electric power requirements, signal model type including color and indication type, and signal serial number.
 - (n) The LED unit shall be compatible with the traffic signal controller equipment currently in use by the City of Chicago, and meeting the City=s latest specifications for traffic signal control equipment. In particular the LED unit shall be compatible with the NEMA TS-1 and later traffic signal load switches and conflict monitors.
- (o) Units shall meet applicable sections of Title 47, SubPart B, Section 15 of the Federal Communications Commission (FCC) rules as applies to electronic noise limitation and electromagnetic interference.
- (p) Total harmonic distortion (THD) induced into the voltage and current AC power line sine waves must not exceed 20 percent.

- (q) LED optical units must meet the requirements of VTCSH Part 2: LED Vehicle Signal Modules Section 6.3.1 for signal burn-in.

2.4 Wiring. Each lamp holder must be furnished with two (2) leads color coded as follows:

White	Common
Red	Red Lens Section
Yellow	Yellow Lens Section
Green	Green Lens Section
Green with Black Tracer	Green Arrow Lens Section
Yellow with Black Tracer	Yellow Arrow Lens Section
Red with Black Trace	Red Arrow Lens Section

The lead must be type TEW No. 18 AWG stranded copper wire with 2/64 inch thick, 600 volt, 105 degree centigrade rated, thermo-plastic insulation meeting MIL-W-76A specifications. The lead must connect to the terminal strip without being spliced. The ends of the lamp leads must be stripped of one-half inch (2") of insulation and tinned.

2.5 Terminal Strip. A dual-point, barrier type terminal strip with a solid base and pressure plate type connectors shall be securely attached at both ends to the housing body inside the "Green" section of the signal head.

2.6 Cable. One, eleven foot (11') length of flexible electric cord, medium duty, type SO, No. 16 AWG stranded copper conductor, color coded, rubber insulated, neoprene jacketed, must be furnished with each signal head. The number of conductors must include neutral, ground, and one switch leg for each section. Both ends of each cable length must be carefully stripped of six inches (6") of jacket and one inch (1") of insulation, and each conductor properly tinned.

2.7 Gaskets. Wherever necessary to make a completely dustproof, moistureproof and weatherproof assembly of the housing and optical system, approved type gaskets of neoprene or silicone rubber shall be provided.

3. TESTING AND DOCUMENTATION REQUIREMENTS

3.1 Documentation. The contractor shall provide certified manufacturing and testing documentation to demonstrate that the traffic signals being supplied meet or exceed the specification requirements. All LED Optical Units shall be tested by a nationally recognized testing laboratory (NRTL), such as Intertek (ETL), to demonstrate compliance with the latest ITE VTCSH specification. All LED units shall have the testing laboratory's label attached.

3.2 Inspection. The signals shall be subject to inspection at the discretion of the Commissioner. Final inspection shall be made at point of delivery. Any signal rejected shall be removed and disposed of by the contractor at his sole cost.

4. PACKING

- 4.1 Packing. Each traffic signal assembly shall be packed in a suitable carton so secured that the signal will not be damaged during shipment, handling or storage.
- 4.2 Marking. Each carton containing a traffic signal shall be clearly marked on the outside in letters not less than three-eighths (3/8) inch tall with the legend: "TRAFFIC SIGNAL, TWELVE-INCH, POLYCARBONATE@ or ATRAFFIC SIGNAL, TWELVE INCH, POLYCARBONATE, LED OPTICS@ and the number of Sections as required, the color and indication types, the name of the manufacturer, the date of manufacture, the pertinent Contract Number and the appropriate City Commodity Code Number.

THIS SPECIFICATION SHALL NOT BE ALTERED

**SPECIFICATION 1533
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
AUGUST 8, 2006**

NON-METALLIC CONDUIT

SCOPE

1. This specification states the requirements for both rigid and coilable non-metallic conduit. The conduit will be used for low voltage (600 volt rated cables) electrical street lighting and traffic control systems. It may also be used for fiber-optic communications cables. This conduit will be installed underground. Rigid non-metallic conduit may be installed on structure.

GENERAL

2. (a) Standards. The following standards are referenced herein.

ASTM – American Society for Testing and Materials
NEC – National Electrical Code
NEMA – National Electrical Manufacturer’s Association
UL – Underwriter’s Laboratories

- (b) Warranty. The manufacturer must warrant the conduit against defective workmanship and material for a period of one year from date of installation or date of delivery. Any conduit that is found to be defective must be replaced without cost to the City.
- (c) Sample. If requested by the Chief Procurement Officer, a sample of the conduit intended to be furnished under this specification, must be submitted to the Engineer of Electricity within fifteen (15) business days upon receipt of such request.

MATERIAL

- 2. (a) Rigid non-metallic conduit will be made of polyvinyl chloride (PVC). All conduit and fittings must comply with ASTM D 1784 and with the applicable sections of NEMA TC2, UL standard 651, and NEC Article 347. Fittings must meet the standards of NEMA TC3 and TC6, as well as UL 514.
- (b) Coilable non-metallic conduit will be made of high density polyethylene (HDPE). All conduit must comply with ASTM D3485 ,ASTM D 1248, and NEMA TC7.

SIZES

- 3. (a) PVC and HDPE will come in two wall thicknesses; schedule 40 and schedule 80.
- (b) PVC will come in ten foot sections. HDPE will come on reels.
- (c) Nominal inside diameters (in inches) for non-metallic conduits will include the following: $\frac{1}{2}$, $\frac{3}{4}$, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, 2, 2 $\frac{1}{2}$, 3, 3 $\frac{1}{2}$, 4.

PACKING

- 4. Rigid conduit must be shipped in bundles. Coilable conduit must come on wooden reels. Both bundles and reels must be tagged to indicate the size and diameter of the conduit, the quantity in feet, the weight, and the manufacturer's name. The conduit itself must be marked to indicate the type and size, as well as the manufacturer.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1534
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
SEPTEMBER 25, 2006**

CABLE: SINGLE-CONDUCTOR, COPPER 600 VOLT

SUBJECT

1. This specification states the requirements for cables intended to be used as conductors in 120/240 VAC, 60 cycle, single phase, street lighting circuits. The cables will be installed in underground ducts or conduit.

GENERAL

2. (a) Specifications. The cable must conform in detail to the requirements herein stated, and to the applicable portions of the latest revisions of the specifications and methods of test of the following agencies:
 - (1) ICEA Specification S-95-658
 - (2) IEEE Standard 383
 - (3) ASTM Standard E662-06
 - (4) ASTM Standard D470-05
 - (5) U.L. 44
 - (6) U.L. 854
- (b) Acceptance. Cable not in accordance with this specification will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be provided under this specification must be sent to the attention of the Engineer of Electricity within fifteen (15) days of receipt of such request.
- (d) Warranty. The manufacturer must warrant the cable to be first class material throughout. In lieu of other claims against them, if the cables are installed within twelve (12) months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.

CONSTRUCTION

3. This cable must consist of a round copper conductor with a tight fitting, free stripping, concentric layer of ethylene propylene (EPR) insulation and a concentric low lead chlorosulfonated polyethylene (CSPE) jacket extruded in tandem with, and bonded to, the insulation, or ethylene propylene (EPR) insulation only. The cable must be rated for continuous duty in wet or dry conditions at 90° C operating temperature, 130° C emergency overload temperature and 250° C short circuit temperature.

CONDUCTOR

- 4. (a) Material. The conductor must either be soft or annealed round copper wire.
- (b) Specifications. The conductor must meet the requirements of ASTM B3, B8 or B258, as applicable.
- (c) Sizes. The conductor size must be as stated in the PROPOSAL and in accordance with all requirements in Table A of this specification.
- (d) Stranding. The number of strands, must be as indicted in Table A. Stranding must meet the requirements of ASTM B8, Class B.

INSULATION

- 5. (a) Type. The insulation must be ethylene propylene rubber compound meeting the physical and electrical requirements specified herein.
- (b) Thickness. The insulation must be circular in cross-section, concentric to the conductor, and must have an average thickness not less than that set forth in Table A of this specification, and a spot thickness not less than ninety percent (90%) of the average thickness.
- (c) Initial Physical Requirements:
 - 1. Tensile strength, min., psi. 1,200
 - 2. Elongation at rupture, min. % 250
- (d) Air Oven Exposure Test. After conditioning in an air oven at 121 +/- 1°C for 168 hours using methods of test described in ASTM-D 573:

Tensile strength, minimum percent of unaged value.....75
 Elongation at rupture, minimum percent of unaged value.....75

(e) Mechanical Water Absorption:

GRAVIMETRIC METHOD: After 168 hours in water at 70 +/- 1°C:
 water absorption, maximum, milligrams per square inch.....5

(f) Cold Bend Test Requirements. The completed cable must pass the "Cold-Bend, Long-Time Voltage Test on Short Specimens" of ASTM D-470 except that the test temperature must be minus (-) 25°C.

(g) Electrical Requirements

1. Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D-470 and D-2655.
2. Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D-470.

JACKET

6. (a) Type. If the cable is jacketed, the jacket must be a chlorosulfonated polyethylene (CSPE) compound meeting the physical and electrical requirements specified herein. The CSPE jacket must meet CFR Title 40, Part 261, for leachable lead.

(b) Thickness. The jacket must be circular in cross-section, concentric with the insulation, must have an average thickness not less than that set forth in Table A of this specification and a spot thickness not less than ninety percent (90%) of the average thickness.

(c) Initial Physical Requirements:

1. Tensile strength minimum PSI 1800
2. Elongation at rupture, minimum percent 300

(d) Air Oven Exposure Test. After conditioning in an air oven at 121 +/- 1°C for 168 hours:

1. Tensile strength, minimum percent of unaged value 75
2. Elongation at rupture, minimum percent of unaged value 60

(e) Mechanical Water Absorption. After 168 hours at 70 +/- 1°C:

1. Milligrams per square inch, maximum 20

TESTING

7. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in these specifications. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the Bureau of Electricity, will apply. All tests must be conducted on cable produced for this order. Where cable insulation and/or jacket thickness preclude obtaining samples of sufficient size for testing, special arrangements must be made with the engineer to obtain samples of unprocessed materials directly from the extrusion feed bins which will be separately processed and prepared for tests.
- (b) Number Of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 250,000 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity, if so requested by the City. Included in these tests will be a 70,000 BTU per hour flame test in accordance with IEEE 383. Reels to be tested will be selected at random. The contractor must include in his bid, the cost of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of all travel arrangements.
- (d) Test Reports. No cable may be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

PACKAGING

8. (a) Cable Marking. The cable must be identified by a permanently inscribed legend in white lettering as follows:

1/c No. (conductor size) AWG-600V-90°C-EPR or EPR/CSPE

The legend must be repeated at approximately eighteen (18) inch intervals on the outside surface of the cable parallel to the longitudinal axis of the conductor. A sequential footage marking must be located on the opposite side from the legend.

- (b) All cable will be black pigmented. When three conductors (triplex) are specified, one conductor will be black, another will be red or black with a red tracer, the smaller of the conductors must have a green colored jacket and the three conductors must be triplexed with a 16"-18" lay. The insulation color must not be unduly affected by cable installation, or prolonged exposure to either direct sunlight or moisture. Where the quantity of triplex cable exceeds 80,000 feet, witness testing as outlined in section 7(c) will apply.
- (c) Reels. The completed cable must be delivered on sound substantial, non-returnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, all reels must be wrapped with cardboard or other approved wrapping.
- (d) Footage. Each reel must contain the length of cable as set forth in Table A of this specification. Alternate lengths may be considered.
- (e) Reel Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, description of the cable, the total footage, and the beginning and ending sequential footage numbers. Directions for unrolling the cable must be placed on the reel with an approved permanent marking material such as oil-based paint or a securely attached metal tag.

TABLE "A"

CONDUCTOR AWG	THICKNESS STRANDS	INSULATION/JACKET		A-C TEST LENGTH VOLTS	REEL FEET
		MILS	MILS		
14	7	30	15	5500	2000
8	7	45	15	5500	2000
6	7	45	30	5500	2000
4	7	45	30	5500	2000
2	7	45	30	5500	1000
0	19	55	45	7000	1000
00	19	55	45	7000	1000
000	19	55	45	7000	1000
0000	19	55	45	7000	1000
250 MCM	37	65	65	8000	1000

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1537
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
SEPTEMBER 26, 2006**

CABLE: TRAFFIC SIGNAL, MULTIPLE CONDUCTOR, COPPER WIRE, 600 VOLT

SUBJECT

1. This specification states the requirements for a multiple cable to be installed in underground conduits and used to distribute electrical energy to operate automatic traffic control equipment at street intersections within the City of Chicago. The cable will be used between the traffic controller cabinet and the junction boxes on the traffic signal poles.

GENERAL

2. (a) Specification. The cable must conform in detail to the requirements herein stated, and to the specifications and methods of test of the following:

ASTM - American Society for Testing and Materials
ICEA - Insulated Cable Engineers Association
IEEE - Institute of Electrical and Electronic Engineers
UL - Underwriters Laboratories
- (b) Acceptance. Cable not conforming to this specification will not be accepted.
- (c) Sample. If requested by the Chief Procurement Officer, a three (3) foot sample of the cable intended to be furnished under this specification must be submitted to the attention of the Engineer of Electricity within fifteen (15) business days of receipt of such request.
- (d) Warranty. The manufacturer must warrant the cable to be first class material throughout. In addition to any other claims against them, if the cable is installed within six months of date of shipment, the manufacturer must replace any cable failing during normal and proper use within two years of date of installation. All replacements under this warranty must be made free of charge F.O.B. delivery point of the original contract.

CABLES

3. (a) Construction. The cable must meet the requirements of ICEA standard S-95-658 and UL 44 for cable. The cable must consist of coated conductors each concentrically encased with a “free- stripping”, ethylene propylene, insulation. In two-conductor cables, the insulated and covered conductors must be parallel and not twisted, with suitable filler, as necessary, to produce a flat core of minimum practicable dimensions. In the larger count cables suitable fillers must be used to produce an essentially round cross-section. A Mylar tape must be wrapped over the conductor assembly, and a low smoke zero halogen polyolefin (LSZH) or chlorosulfonated polyethylene (CSPE) jacket applied overall.

(b) Outer Diameter. The maximum allowable outer diameter for round cables must be as follows:

<u>No. Of Conductors</u>	<u>Outer Diameter</u>
	(inches)
Seven	0.49
Ten	0.69
Nineteen	0.90

(c) Sealing. Both ends of each length of cable must be thoroughly sealed to prevent the entrance of moisture and other foreign matter.

COLOR CODE

4. Conductor identification must be provided by color synthetic-resin coverings, or an approved equal. Table A sets forth the color code for the various conductor arrangements.

CONDUCTOR

5. (a) Material. Round, soft or annealed, copper wire, meeting the requirements of ASTM B-3 and B-8, and coated in accordance with ASTM B33.

(b) Size. Cables must be made up of conductor sizes as set forth in this specification. The Number 14 AWG will be solid. Number 4 AWG conductors will be stranded.

INSULATION

6. (a) Type. The insulation must be an ethylene propylene compound meeting the physical and electrical requirements herein specified when tested in accordance with ASTM D-470-81.

- (b) Thickness. The insulation must be circular in cross-section and have the following minimum thicknesses.

<u>Conductor Size. AWG</u>	<u>stranding (No. Of Wires)</u>	<u>No. of Conductors</u>	<u>Insulation Thickness (mils)</u>
#4	7	2	45
#14	1	7	30
#14	1	10	30
#14	1	19	30

- (c) Physical Properties. Initial Value.

Tensile Strength	1200 psi minimum
Elongation at Rupture	250% minimum

- (d) Physical Properties. After Aging.

After 168 hours in air oven at 121° Centigrade:

Tensile Strength	75% of initial value
Elongation	75% of initial value

- (e) Accelerated Water Absorption Characteristics. Test must be made in accordance with methods discussed ASTM D470.

Gravimetric Method. The insulation must not absorb more than five (5) milligrams of water per square inch of exposed surface area after immersion in distilled water at 70° Centigrade for a period of seven (7) days.

- (f) Cold-Bend Test Requirements. The completed cable must pass the “Cold”B end, Long-Time Voltage Test on Short Specimens” of ASTM D470 except that the test temperature must be minus (-) 25°Centigrade.

- (g) Electrical Requirements.

(1) Voltage Test. The completed cable must meet an A.C. and D.C. voltage test in accordance with ASTM D470 and D2655.

(2) Insulation Resistance. The completed cable must have an insulation resistance constant of not less than 20,000 when tested in accordance with methods shown in ASTM D470.

CABLE TAPE

7. The assembled and cabled conductor core must be wrapped with a one mil (0.001 inch) thick Mylar tape allowing a minimum of ten percent (10%) overlap.

JACKET

8. (a) Material. The jacket must be either a heavy duty low smoke zero halogen (LSZH) polyolefin or low lead chlorosulfonated polyethylene (CSPE) meeting the physical and electrical requirements specified herein. CSPE must meet the requirements of CFR Title 40, Part 261 for leachable lead.

- (b) Workmanship. The jacket must have a smooth exterior surface free from holes, cracks and splits, and must be tough, elastic, homogeneous in composition, and properly vulcanized.

- (c) Thickness. Average thicknesses of the jacket must be not less than that given below. Minimum thickness must be not less than ninety percent (90%) of the average thickness.

(1)	Two-Conductor # 4 AWG	5/64 inch
(2)	Seven-Conductor	3/64 inch
(3)	Ten-Conductor	4/64 inch
(4)	Nineteen-Conductor	4/64 inch

- (d) Initial Physical Requirements:

1. Tensile strength minimum PSI	1800
2. Elongation at rupture, minimum percent	300

- (e) Air Oven Exposure Test. After conditioning in an air oven at $121^{\circ} \pm 1^{\circ}\text{C}$ for 168 hours:

1. Tensile strength minimum percent of unaged value	75
2. Elongation at rupture, minimum percent of unaged value	65

- (f) Mechanical Water Absorption. After 168 hours at $70^{\circ} \pm 1^{\circ}\text{C}$: one (1) milligram per square inch, maximum

- (f) Cable Marking. Outer Jacket must be embossed or printed with the manufacturer's name, year of manufacture, insulation and jacket materials, conductor number, conductor size, at approximately 18" intervals. On the side opposite, the cable must be sequentially marked in one (1) foot increments.

TESTING

9. (a) General. Tests must be performed on insulation, jacket and completed cables in accordance with applicable standards as listed in these specifications. Where standards are at variance with each other or with other portions of this specification, the most stringent requirements, as determined by an engineer from the Bureau of Electricity, will apply.
- (b) Number of Tests. Insulation and jacket tests must be conducted on samples taken every 25,000 feet or fraction thereof of each conductor size. In no case must samples be taken closer than 15,000 feet apart.
- (c) Witness Tests. Where the quantity of cable on a single purchase order is 250,000 feet or more, all insulation and jacket tests must be witnessed by an engineer from the Bureau of Electricity, if so requested by the City. Included in these tests will be a 70,000 BTU per hour flame tests in accordance with IEEE 383. Reels to be tested will selected a random. The contractor must include in his bid, the coast of travel, food and lodging for one (1) engineer. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn. The engineer must be given ten (10) working days notice of all travel arrangements.
- (d) Test Reports. No cable may be shipped until certified copies of all factory tests, including witness tests where applicable, have been reviewed and approved by the engineer.
- (e) Acceptance. Samples must be taken from each reel and must successfully conform to all tests specified herein. Reels from which samples fail to conform, will be rejected.

PACKAGING

10. (a) Reels. The completed cable must be delivered on sound substantial, nonreturnable reels. Both ends of each length of cable must be properly sealed against the entrance of moisture and other foreign matter by the use of clamp-on cable caps, such as the Reliable Electric Company neoprene cable cap No. 1405, or equal. The ends must be securely fastened so as not to become loose in transit. Before shipment, complete 2 x 4 lagging must be applied to all reels.
- (b) Footage. Each reel must contain the length of cable as set forth below. A tolerance limit of plus or minus five percent ($\pm 5\%$) must be adhered to.
- | | |
|------------------------|-----------|
| (1) Two-Conductor | 2000 feet |
| (2) Seven-Conductor | 2000 feet |
| (3) Ten-Conductor | 2000 feet |
| (4) Nineteen-Conductor | 1000 feet |

(c) Marking. A metal tag must be securely attached to each reel indicating the reel number, contract number, date of shipment, gross and tare weights, the appropriate City commodity Code Number as set forth below, and a description of the cable. Also, each reel must have permanent marking on it indicating directions for unrolling the cable and the footage of cable contained in the reel. Indelible ink or other such material susceptible to washing off or fading will not be permitted; and approved permanent marking material such as paint or a securely attached metal tag is required.

(d) Commodity Code Number.

(1) Two-conductor No. 4 AWG	31-4686-5826
(2) Seven-Conductor	31-4682-5620
(3) Ten-Conductor	31-4682-5630
(4) Nineteen-Conductor	31-4682-5645

TABLE A COLOR CODE CONDUCTOR IDENTIFICATION

Base Color	First Tracer	Second Tracer	2 (# 4)	7	10	19
White	Black	Red	--	--	--	14
White	Red	Green	--	--	--	14
Black	--	--	4	14	14	14
White	--	--	4	14	14	14
Red	--	--	--	14	14	14
Green	--	--	--	14	14	14
Orange	--	--	--	14	14	14
Blue	--	--	--	14	14	14
White	Black	--	--	14	--	--
Red	Black	--	--	--	14	14
Green	Black	--	--	--	14	14
Orange	Black	--	--	--	14	14
Blue	Black	--	--	--	14	--
Black	White	--	--	--	--	--
Red	White	--	--	--	--	14
Green	White	--	--	--	--	14
Blue	White	--	--	--	--	14
Orange	White	--	--	--	--	14
White	Red	--	--	--	--	--
Blue	Orange	--	--	--	--	14
Red	Blue	--	--	--	--	14
Green	Blue	--	--	--	--	14
Orange	Blue	--	--	--	--	14

**SPECIFICATION 1554
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
APRIL 13, 2006**

ACCESSIBLE PEDESTRIAN SIGNAL - CONTROLLER

1. GENERAL REQUIREMENTS

1.1 This specification states the requirements for a controller unit capable of operating accessible (audible) pedestrian signals.

1.2 Sample and Certified Test Reports. One complete controller unit (Unit), fully assembled and wired, of the manufacture proposed to be furnished, must be submitted along with the required certified test reports, within fifteen (15) business days upon request of the Chief Procurement Officer. The sample must be delivered to the Engineer of Electricity, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608.

1.3 Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards, as required within the body of this specification:

Manual on Uniform Traffic Control Devices (MUTCD)
International Organization for Standards (ISO)
IDOT Special Provision for Accessible Pedestrian Signals
American Society for Testing and Materials (ASTM)
National Electrical Manufacturers Association (NEMA)
Underwriters Laboratories (UL)

1.4 Approval. Approval will mean approval in writing by the Commissioner of Streets and Sanitation or his/her duly authorized representative.

2. EQUIPMENT AND FUNCTIONALITY REQUIREMENTS

2.1 Unit must be designed for installation in standard City of Chicago traffic controller cabinet.

2.2 Unit must be compatible with City of Chicago Accessible Pedestrian Signal Push Button Station.

- 2.3 Unit must be capable of operating with 115 VAC.
- 2.4 Unit will function as the power supply and signaling interface between the traffic signal controller and the accessible pedestrian signal push button stations.
- 2.5 One Unit must be capable of controlling up to 12 push button stations.
- 2.6 The system must be able to perform self-test of push buttons and report any failures to traffic controller.
- 2.7 Unit must be designed for operation over a range of temperatures from -351 F to +1651 F (-371 C to +751 C).

3. TESTING AND DOCUMENTATION REQUIREMENTS

- 3.1 Documentation. The contractor must provide certified manufacturing and testing documentation to demonstrate that the controller units being supplied meet or exceed the specification requirements. Testing must be conducted by an independent and certified testing laboratory.
- 3.2 Inspection. The signals must be subject to inspection at the discretion of the Commissioner. Final inspection must be made at point of delivery. Any Unit rejected must be removed and disposed of by the contractor at his sole cost.
- 3.3 Warranty. The manufacturer must warrant the Units to meet the requirements of this specification, and must warrant all equipment, components, parts and appurtenances against defective design, material and workmanship for a period of five (5) years from date of acceptance. In the event defects or failures of Units occur during the warranty period, the manufacturer must repair and/or replace all defective materials at no expense to the City. This warranty must be evidenced by a letter or certificate of warranty submitted to the City at the time final delivery is made. The warranty must cover all Units delivered in an order or installed by contract, and must include serial numbers for all Units. The warranty must be signed by an official of the manufacturer who is empowered by the manufacturer to enter into such an agreement.

THIS SPECIFICATION MUST NOT BE ALTERED

**SPECIFICATION 1558
BUREAU OF ELECTRICITY
DEPARTMENT OF STREETS AND SANITATION
CITY OF CHICAGO
REVISED APRIL 28, 2009**

ADVANCED TRANSPORTATION CONTROLLER AND CABINET

1. GENERAL REQUIREMENTS

1.1 This specification details the requirements for traffic signal control equipment for use in the City of Chicago.

1.2 Within sixty (60) business days from receipt of notice, the contractor must provide a sample to the General Superintendent of Electrical Operations, Bureau of Electricity, 2451 South Ashland Avenue, Chicago, Illinois 60608. The sample must consist of the controller, cabinet, load switches, conflict monitor and all appurtenant wiring and equipment completely assembled as a working unit. This sample will be regarded as a finished production sample and conformance or non-conformance of the bid to these specifications will be based on the sample submitted. No subsequent modifications to the production sample will be allowed. If the sample is acceptable and the contractor is awarded a contract, the sample will become the property of the City of Chicago with a suitable credit issued to this contract.

1.3 All tests as outlined herein or in the referenced specifications must be regarded as minimum requirements. The contractor must submit his testing procedure for approval prior to performing any testing functions. Upon successful completion of all testing, certified test reports must be submitted for each unit. Units not successfully passing these tests or lacking proper documentation will be rejected.

1.4 Standards. Equipment furnished under this specification must meet the appropriate requirements of the following standards organizations, as required within the body of this specification:

American Association of State Highway and Transportation Officials (AASHTO)
American Society for Testing and Materials (ASTM)
Institute of Transportation Engineers (ITE)
Manual on Uniform Traffic Control Devices (MUTCD)
National Electrical Manufacturers Association (NEMA)
Occupational Safety and Health Administration (OSHA)
Underwriters Laboratories (UL)

- 1.5 Standard Drawings. The Bureau of Electricity standard drawing 962 “Load Switch and Conflict Assignment”, standard drawing 964 “Traffic Controller Cabinet Back Panel and Power Supply, 1 Of 2” and standard drawing 965 “Traffic Controller Cabinet Back Panel and Power Supply, 2 of 2” are integral parts of this specification.
- 1.6 Manufacturers. The manufacturer of the controller and of each major component must demonstrate a knowledge of past production, or have been actively engaged in the sale and/or service of traffic signal controllers, cabinets, and the other equipment herein described, as demonstrated by a submitted list of comparable projects.
- 1.7 Warranty. The manufacturer must warranty the performance and construction of the traffic signal controllers to meet the requirements of this specification, and must warranty all parts, components, and appurtenances against defects in design, material, and workmanship for a period of one (1) year after installation on moving parts, and for a period of five (5) years after installation on solid state devices. The manufacturer must warranty all other equipment, including the cabinet, for a period of one (1) year after installation. In the event of defects or failures during these periods, the manufacturer must repair and/or replace all defective or failed parts or appurtenances at no expense to the City within sixty (60) days from the date of shipment by the City.

2. CONTROLLER REQUIREMENTS

- 2.1 ATC. The controller must be an Advanced Transportation Controller (ATC) meeting the requirements of the specification “Advanced Transportation Controller (ATC) Standard Version 5.2b” dated June 26,2006. The referenced specification is a joint effort of AASTHO, NEMA , and ITE. Since each user agency has different controller needs, for the City of Chicago the controller must meet the programming modifications and options listed in the ATC Matrix as indicated in Table A. All software necessary to make the controller operational must be included.
- 2.2 Power. The controller must operate on 120 volt, 60 cycle (± 3 Hertz), single phase, alternating current. The controller must function in the range from 95 to 135 Volts a.c. The power consumed must be under 50VA.
- 2.3 Packing. Each controller, with all its component parts, must be suitably packed in a single container in such a manner as to prevent damage to the contents in shipment and handling.

- 2.4 Instructions. One (1) complete set of up to date instructions providing complete information on installation, adjustment, operation and maintenance, including both up to date "Logic Schematics" and "Electronic Circuit" diagrams, of these controllers, must be furnished to the Bureau of Electricity for approval prior to the first shipment of controllers. All information, including photos and schematics, must reference to the controller being furnished on this contract and must be a high quality, completely legible reproduction. Upon approval, one complete set of data must be furnished with each controller.
- 2.5 Training. The contractor must provide training at the City's facilities. The training must be on the actual equipment provided under the contract, and must include, but not be limited to, programming all features, connecting and wiring , and troubleshooting. Training manuals are required (training manuals should include instructions in a teaching-type format). Training for up to five (5) City personnel is required.
- 2.6 Chassis. Aluminum construction with powder coat finish. No plastic chassis or composite chassis will be allowed. The controller must physically fit into existing 'M', 'P', and 'SUPER P' cabinets configured for City of Chicago applications. The controller must not exceed the following dimensions: 10.5 inches high, 10.5 inches deep, and 15 inches wide.
- 2.7 Processor / Memory. At a minimum, the processor will be:

Clock speed - 300MHz
Non-volatile Memory - 16MB Flash
RAM - 16MB
SRAM - 1MB
(All memory and firmware must be stored in flash memory. No EPROMS will be allowed.)
- 2.8 Display. 16 x 40 backlit LCD using a 6 x 8 character font. Display and keypad must be permanently attached to chassis. Detachable keypads will not be allowed.
- 2.9 Environmental. The controller must operate in the temperature range of -34 degrees Celsius to +74 degrees Celsius. The controller must operate within the relative humidity of 5% to 95%.
- 2.10 All printed circuit boards must be mounted vertically.
- 2.11 Encapsulation of 2 or more discrete components into circuit modules is prohibited except for transient suppression circuits, resistor networks, diode arrays, solid-state switches, optical isolators and transistor arrays. All encapsulated components must be second sourced and must be of such design, fabrication, nomenclature or other identification as to be purchased from a wholesale distributor or from the component's manufacturer as a standard product. Custom encapsulated components are not allowed.

- 2.12 Obsolete components, components no longer supported by the manufacturer, components not recommended for new designs, components which have been discontinued or which the CONTRACTOR should have reasonably been expected to know were discontinued, or components which the vendor/manufacturer has announced plans to discontinue at the time of the bid must not be used in the design of any subassemblies provided under this contract.
- 2.13 The controller must meet the functional and environmental requirements of NEMA TS2 2003. The use of 2070s, 170s, BIUs, SIUs, or similar devices is not allowed.
- 2.14 As allowed by ATC v5.2b, Section 8.1.1, the controller will utilize NEMA 'A', 'B', and 'C' I/O connectors, except for the HMC-1000 and LMD40 I/O variants. Pin assignments for NEMA 'A', 'B', and 'C' connectors must follow the NEMA TS2 2003 standards for I/O. Port 2 must be the ATC v5.2b pin-limited version of NEMA TS2 Port 2. Port 3 must not be FSK, but should be TIA-574. Port 4 (C50S) must be a 9-pin connector with only limited signals being required.

Special function connector for the TS2-2 must follow the CPC style "D" pin outs as follows:

CPC MSD Pin	Function
1	Flash
2	Offset 1
3	Interconnect Common
4	User defined input 6
5	Offset 2
6	Offset 3
7	Time Plan A
8	User defined input 7
9	User defined input 8
10	Call to Free
11	Call to week 10
12	Time Plan B
13	Time Plan C
14	Time Plan D
15	Alt Seq A
16	Alt Seq B
17	Alt Seq C
18	Dimming
19	Monitor status bit C
20	System Input
21	Alt Seq D
22	Monitor status bit A
23	Monitor status bit B
24	Veh Det 13
25	Veh Det 9
26	Veh Det 10
27	Veh Det 11

CPC MSD Pin	Function
28	Polarizing Pin
29	Veh Det 12
30	Veh Det 14
31	Veh Det 15
32	Veh Det 16
33	SGO/Conditional Service
34	Preempt input 5
35	Preempt output 1
36	Preempt output 2
37	Interconnect inhibit
38	Time Clock sync
39	Sync inhibit
40	Preempt input 1
41	Preempt input 2
42	Preempt input 3
43	Preempt output 3
44	Polarizing Pin
45	Preempt output 4
46	Preempt output 5
47	System Out
48	Preempt output 6
49	Preempt input 4
50	Clock Ckt 9 (Aux 1)
51	Clock Ckt 10 (Aux 2)
52	Clock Ckt 11 (Aux 3)
53	Clock Ckt 12 (Aux 4)
54	Clock Ckt 13 (System)
55	Clock Ckt 8 (Flash)
56	Clock Ckt 3 (Offset 1)
57	Clock Ckt 4 (Offset 2)
58	Clock Ckt 5 (Offset 3)
59	Clock Ckt 1 (T/P A)
60	Clock Ckt 2 (T/P B)
61	Clock Ckt 6 (T/P C)
62	Clock Ckt 7 (T/P D)
63	Preempt input 6

2.15 Downward compatibility with existing City of Chicago cabinets.

(1) The controller must be of a modular design allowing for the ability to exchange I/O modules to allow for use in existing City of Chicago HMC-1000, LMD40, and standard NEMA TS2-2 cabinets. This I/O module must be “plug and play”. The controller’s firmware must detect the type of I/O installed (HMC-1000, LMD40 or NEMA TS2) and provide the proper user interface. Adapter harnesses for the HMC-1000, LMD40 and Setcon clock will not be allowed.

(2) The HMC-1000 I/O module must be pinned as follows:

63 PIN CONNECTOR	Function
1	Output 20
2	Output 11
3	Manual Advance
4	Stop Time
5	Output 24
6	Offset 1
7	Offset 3
8	Output 15
9	Preempt 2
10	Advance
11	Output 23
12	Restart
13	Output 32
14	Offset 2
15	Output 16
16	Preempt 1
17	Output 25
18	Output 28
19	Spare 1
20	Spare 2
21	Output 7
22	Output 18
23	Output 21
24	Output 22
25	Dial 3
26	Dial 2
27	Output 1
28	Output 14
29	Output 4
30	Output 29
31	Output 27
32	Output 17
33	Output 9

63 PIN CONNECTOR	Function
34	Output 19
35	Dial 4
36	On-Line
37	Flashing Bus
38	Manual
39	Output 30
40	Output 31
41	Output 12
42	Output 10
43	Output 2
44	Output 3
45	Output 13
46	Output 8
47	Output 26
48	Logic Ground
49	Not Used
50	Not Used
51	Output 5
52	Output 6
53	Logic Ground
54	Logic Ground
55	Not Used
56	Not Used
57	Not Used
58	Not Used
59	24 V.D.C
60	Not Used
61	115 Volts AC
62	AC Neutral
63	Chassis Ground

- (3) The LMD40 I/O module contains 4 I/O connectors, MSA, MSB, MSD, and communications connectors which must be pinned as follows:

LMD40 MSA	Pin	Voltage Level
Actuation 3	A	DC
24 V.D.C	B	DC
Voltage Monitor	C	DC
Actuation 1	D	DC
Actuation 2	E	DC
Preemption 2	F	DC
Preemption 1	G	DC
Interval Advance	H	DC
Stop Time	J	DC

LMD40 MSA	Pin	Voltage Level
MCE (Manual Control)	K	DC
External C/S/O	L	DC
Signal Plan 2	M	DC
Signal Plan 3	N	DC
System Cont/AZ Reset	P	DC
External Start	R	DC
Remote Flash (AC)	S	120 VAC
Interconnect Common	T	120 VAC
AC – (Common)	U	AC
Chassis Ground	V	Earth Ground
Logic Ground	W	DC Reference
Output 1	X	DC
Output 2	Y	DC
Output 3	Z	DC
Output 4	a	DC
Output 5	b	DC
Output 6	c	DC
Output 7	d	DC
Output 8	e	DC
Output 9	f	DC
Output 10	g	DC
Output 11	h	DC
Output 12	i	DC
Output 13	j	DC
Output 14	k	DC
Output 15	m	DC
Output 16	n	DC
AC+ input	p	120 VAC
Output 17	q	DC
Output 18	r	DC
Output 19	s	DC
Output 20	t	DC
Output 21	u	DC
Spare Output	v	DC
Spare Output	w	DC
Spare Output	x	DC
Cycle 2 (User Defined)	y	120 VAC
Cycle 3 (User Defined)	z	120 VAC
Split 2	AA	120 VAC
Split 3	BB	120 VAC
Output 22	CC	120 VAC
Output 23	DD	120 VAC
Offset 1	EE	120 VAC
Offset 2	FF	120 VAC
Offset 3 (user def 1)	GG	120 VAC
Output 24	HH	DC

LMD40 MSB	Pin	Voltage
Output 25	A	DC
Output 26	B	DC
Output 27	C	DC
Output 28	D	DC
Output 29	E	DC
Output 30	F	DC
Output 31	G	DC
Output 32	H	DC
Output 33	J	DC
Output 34	K	DC
Output 35	L	DC
Output 36	M	DC
Output 37	N	DC
Output 38	P	DC
Output 39	R	DC
Output 40	S	DC
Actuation 4	T	DC
Hold	U	DC
Force Off	V	DC

LMD40 MSD	Pin	Voltage
Flash Monitor 1	1	120 VAC
Cycle 5	2	120 VAC
PE Clear 1	3	DC
PE Clear 3	4	DC
Flash Monitor 2	5	120 VAC
Spare Input 4	6	120 VAC
System Input	7	120 VAC
AZ Reset (Absolute Zero)	8	DC
PE Clear 2	9	DC
UD 6 Input	10	DC
Call to week 10	11	DC
Signal Plan 6	12	DC
Signal Plan 7	13	DC
Signal Plan 8	14	DC
Actuation 5	15	DC
Actuation 6	16	DC
Actuation 7	17	DC
Spare input 1	18	DC
UD 7 Input	19	DC
Actuation 8	20	DC
Actuation 9	21	DC
Actuation 10	22	DC
Spare input 2	23	DC
UD 8 input	24	DC

LMD40 MSD	Pin	Voltage
Sys Command (Ckt 13)	25	DC
Flash Attained	26	DC
PE Active	27	DC
Polarization	28	DC
System Out	29	DC
Preempt input 3	30	DC
Preempt input 4	31	DC
Preempt input 5	32	DC
Signal Plan 5 in	33	DC
Call to FREE op	34	DC
Output 41	35	DC
Output 42	36	DC
Interconnect Inhibit	37	DC
Spare input 3	38	DC
Sync Inhibit	39	DC
Dimming	40	DC
Added Time inhibit	41	DC
Time Clock Sync	42	DC
Output 43	43	DC
Polarization	44	DC
Output 44	45	DC
Output 45	46	DC
Output 46	47	DC
Output 47	48	DC
Signal Plan 4	49	DC
Aux 1 (Ckt 9)	50	DC
Aux 2 (Ckt 10)	51	DC
Aux 3 (Ckt 11)	52	DC
Aux 4 (Ckt 12)	53	DC
Output 48 (FF Enable)	54	DC
Flash Out (Ckt 8)	55	DC
Offset 1 (Ckt 3)	56	DC
Offset 2 (Ckt 4)	57	DC
Offset 3 (Ckt 5)	58	DC
Cycle 2 (Ckt 1)	59	DC
Cycle 3 (Ckt 2)	60	DC
Split 2 (Ckt 6)	61	DC
Split 3 (Ckt 7)	62	DC
Fast Flash Image	63	DC

LMD40 Communication Connector (15 pin sub-D)	PIN	Voltage
System Detector 11	1	DC
System Detector 12	2	DC
System Detector 13	3	DC

LMD40 Communication Connector (15 pin sub-D)	PIN	Voltage
System Detector 14	4	DC
System Detector 15	5	DC
System Detector 16	6	DC
System Detector 17	7	DC
System Detector 18	8	DC
Monitor Status bit B	9	DC
Monitor Status bit A	10	DC
Monitor Status bit C	11	DC
DC User Defined in #1	12	DC
Logic Ground	13	DC
DC User Defined in #2	14	DC
DC User Defined in #3	15	DC

- (4) The Setcon I/O connector will be resident on the HMC1000 version of the ASTC I/O.

Setcon Clock Connector	PIN	Voltage
Output 1	1	DC
Output 2 (Dial 2)	2	DC
Output 3 (Dial 3)	3	DC
Output 4 (Dial 4)	4	DC
Output 5 (Offset 1)	5	DC
Output 6 (Offset 2)	6	DC
Output 7 (Offset 3)	7	DC
Output 8 (Flash)	8	DC
Sync Output	9	DC
Sync Input	10	DC
Not used	11	N/A
Logic Ground	12	DC
Not Used	13	N/A
Not Used	14	N/A
Not Used	15	N/A
Not Used	16	N/A

2.16 Communication.

- (1) NTCIP (National Transportation Communications for ITS Protocol).
 - a. The controller must be compliant with NTCIP Standards as outlined in NEMA TS2 – 2003 and must be tested and documented for compliance.
 - b. Global objects must be compliant to NTCIP 1201 v2.26 or later.
 - c. Actuated Signal Controller objects must be compliant to NTCIP 1202 v2.19f or later.
- (2) Serial ports, one of which must be set as either RS-232 or RS-485.
- (3) Ability to add an internal GPS module.
- (4) Ethernet. The controller must be equipped with a minimum of two front panel mounted 10/100Mb Ethernet ports.
- (5) A single port USB interface must be provided to facilitate database transfers, re-flashing of operation software and log transfer.
- (6) The unit must be fully compatible with, and fully functional within, the City's existing MIST system (Management Information System for Transportation). All available functions and capabilities that exist within existing MIST controllers must be available within this unit. Any additional software or hardware necessary to fully integrate the controller into the MIST system must be provided by the bidder and will be considered as part of the requirements of this specification.
- (7) A Windows based laptop utility software must be provided for data transfers and monitoring of controller operation.
- (8) A fiber-optic modem must be provided, if required. The modem must be compatible with existing City fiber interconnect systems. The modem may be internal or external to the controller.

2.17 Software operation.

- (1) The controller must have the ability to re-synch a minimum of 8 cycle lengths to an "absolute zero" reference point. It must be possible to set absolute zero by either global command or individual cycle length.
- (2) In addition to hardware input, it must be possible to set Absolute Zero via keyboard command or fiber optic communication.

- (3) The controller must have the ability to operate in two modes of operation, selectable by time of day:
 - a. Actuated control per NEMA TS2 – 2003.
 - b. Pretimed Interval based control per NEMA TS2 – 2003.
- (4) The controller must have the ability to transfer between actuated control and interval based control by time of day schedule.
- (5) The controller will have 32 Pre-timed plans
 - a. Each plan will allow for up to 32 timing intervals
 - b. Each plan will allow for 48 circuit outputs. Each output must be individually programmable per interval.
- (6) The controller must have 100 coordination plans.
- (7) The controller must provide 6 preempts per NEMA TS2-2003.
- (8) The controller will offer security as follows:
 - a. Two 4 digit security codes can be programmed (one for timing data, one for signal plan data), which when activated, allow data changes. These codes must automatically de-activate 10 minutes after the last user keystroke. It will be possible to re-program the security codes if the previous security code is known or has been defeated.
 - b. It will not be possible to read the security code from the controller's display.
 - c. It will be possible to access the controller in the case of a lost security code through a "back door" which is provided only by the controller manufacturer. This "back door" security code must change based upon the controller's internal calendar.

2.18 Pre Shipment Testing. The manufacturer of the controller must perform at his manufacturing facilities a one hundred (100) hour burn-in test on every controller, conflict monitor unit, and appurtenant devices. This test period must be certified by the manufacturer with supportive documentation and must include the device serial number, dates and times of test periods, and results. Any failed, or nonconforming components must be replaced at this time. The 72 hour function test described in this specification, must be performed on each complete controller system. After each of the components has passed the burn-in test, they may be used in the assembly of the complete controller unit. Each completed unit must be subjected to the 72 hour function test as described in this specification. Should the controller fail to complete this test for any reason, the failed portion(s) of the unit must be replaced and the test repeated in its entirety. Certification of these tests must be attached to the outside of the shipping container. Any containers without this attached certification will be returned to the manufacturer at his sole expense. This certification is in addition to any other documentation and/or testing required by these specifications.

3. **CONFLICT MONITOR**

3.1 General. Each controller must be furnished with a NEMA conflict monitor unit for checking for conflicts in the signal output circuits. The conflict monitor must be capable of monitoring a minimum of twelve (12) distinct channels. It must be a self-contained unit with its own power supply and not be located within the timer housing.

3.2 Programming Board. A removable programming board must be supplied with the monitor for programming signal compatibility. The circuits for programming must be composed of soldered jumper wires. Diode or dip switch type programming will not be acceptable. The programming board must contain no circuitry or components other than the wire jumpers and the wire jumper soldering devices.

3.3 Flashing Circuit Energizing. The conflict monitor must be programmed to put the controller in a flashing sequence upon detection of a failure or conflicting signal display. The controller must also be programmed to energize the flash circuit if the conflict monitor is removed or loses its supply voltage. The conflict monitor must have a manual reset button to return the controller to normal operation after conflict circuit operation is no longer necessary.

3.4 Stop Time Circuit. A stop-time control circuit must be supplied from the conflict monitor to force the timer unit to stop timing upon detection of a conflict.

3.5 Indicator. The front panel of the conflict monitor housing must have an indicator which will be activated when a conflict or failure occurs as per Section 6 of NEMA Spec. TS1-1983.

3.6 Latch Circuit. The conflict monitor must have a latch circuit, insuring that if a voltage monitor failure occurs, the intersection remains in conflict until reset.

3.7 Memory. The conflict monitor must have the ability to store, in memory, a minimum of ninety-nine (99) conflict events, including date of conflict and channels conflicting.

3.8 Conflict Monitor Assignments

(1) Conflict monitor channels must be assigned as follows:

Channel 1	Load Switch 1	Phase 1 Vehicle
Channel 2	Load Switch 2	Phase 2 Vehicle
Channel 3	Load Switch 3	Phase 3 Vehicle
Channel 4	Load Switch 4	Phase 4 Vehicle
Channel 5	Load Switch 5	Phase 5 Vehicle
Channel 6	Load Switch 6	Phase 6 Vehicle
Channel 7	Load Switch 7	Phase 7 Vehicle
Channel 8	Load Switch 8	Phase 8 Vehicle
Channel 2W	Load Switch 9	Phase 2 Ped
Channel 4W	Load Switch 10	Phase 4 Ped
Channel 6W	Load Switch 11	Phase 6 Ped
Channel 8W	Load Switch 12	Phase 8 Ped
Channel 9	Load Switch 13	Overlap A
Channel 10	Load Switch 14	Overlap B
Channel 11	Load Switch 15	Overlap C
Channel 12	Load Switch 16	Overlap D

- (2) It must be possible for the user to change conflict assignments without unsoldering any connections.
- (3) All unused channels - vehicle or pedestrian - must be neatly tied or terminal mounted in such a manner that they are readily available in front of the panel. If tied, the harness wires must be labeled. If terminal mounted, the terminations must be labeled.
- (4) A terminal must be provided for the red enable feature.
- (5) A terminal must be provided for the hook up of any unused red channels to AC.
- (6) Controller monitoring must consist of; voltage monitor, 24 VDC I, 24 VDC II.
- (7) The output relay must operate a sixty (60) ampere, normally open, "A" type mercury contactor without the use of an external or "cabinet interface" relay.

4. P TYPE CABINET

- 4.1 Housing. Each controller must be furnished completely housed in a Type 5052-H32 aluminum housing of 0.125 inch thickness. All cabinets must be provided with factory installed 1 1/8" x 1/2" deep channels. Four channels must be provided for each cabinet side and back. All shelves, panels and individual equipment items must be mounted to these channels using 1.0" channel nuts with 1/4-20 bolts. All items mounted on panels must be securely fastened by bolting into drilled and tapped holes. No pop rivet or similar fastening methods will be accepted. Cabinets must be P Type with nominal dimensions of 55" high by 44" wide by 26" deep. Manufacturer will be Erpel, Hennessy, Southern Manufacturing Company, or approved equals.
- 4.2 Door. The cabinet must have a main door and a police door hinged with one-quarter inch (1/4") minimum, continuous, removable stainless steel pins. The doors must be closely fitted to a neoprene gasket making the doors dust, water and weather resistant. The doors must be interchangeable with any other doors from any other controller in this order.
- (1) Main Door. Opening of the main door must provide complete access to the cabinet interior. The door must be embossed, subject to approval, with the legend "CITY OF CHICAGO-TRAFFIC CONTROL" in letters at least one (1) inch high. The door must have stops at 90, 150 and 180 degrees, from the closed position. The door latch must have three (3) point locking with rollers at the ends of the latch rods. The latch handle must be capable of being padlocked. The key lock for the latch mechanism must be a Corbin cylinder lock with a #2 key. Two (2) keys must be furnished with each cabinet.
- (2) Police Panel Door. The police panel door must be furnished with a lock for a modified Chicago police key per sample to be furnished to the successful bidder. This key must have a shaft of at least one and three quarter inches (1-3/4") in length. Two keys must be furnished with each cabinet.
- 4.3 Cabinet Ventilation. A fan, having a minimum air movement capacity of 100 CFM, must be mounted in the air baffle in the top of the cabinet with an air outlet built into the roof overhang. The main door must be louvered and equipped with a removable, standard, commercially available aluminum dust filter. The ventilation openings must be equipped with removable covers for summer operation. No external fan housings or air outlets will be allowed. Any other method must be approved.
- 4.4 Shelf. The cabinet must contain a vertically adjustable shelf large enough to accept the solid state controller and all other shelf mounted devices.
- 4.5 Size. The exterior dimensions of the cabinets will be approximately fifty-five (55) inches high by forty-four (44) inches wide by twenty-six (26) inches deep for P Type cabinets, and must conform to N.E.M.A. 3R pad mounted specifications. The bolt pattern must be a four (4) point pattern with the bolt notches being in the center of each side.

4.6 Finish. The exterior surfaces of the cabinet must be smooth. All drilled, tapped, or punched holes on the outer surface must be filled with liquid metal and ground smooth, and slotted screw heads must be ground smooth flush with surface. Bolts extending through cabinet wall must be round head, carriage, square shoulder type and fastened on the inside of the cabinet with an Esna nut and necessary gaskets to insure the weatherproofing integrity of the cabinet. The finished cabinet must be thoroughly degreased in a wash process and dried in a heated chamber. A thermosetting, ultra violet resistant, polyester powder coat must be electrostatically applied to all cleaned and treated surfaces and cured to a hard, mar resistant finish in a heated chamber at a temperature recommended by the powder coat paint manufacturer. Exterior color must conform to Federal Standard 595, and either be City of Chicago green color No. 14110 or gloss black color. Exterior color must be as defined in the PROPOSAL or Contract Plans, and color samples must be submitted for approval prior to acceptance of cabinet. Cabinet interior must be glossy white and may be either baked enamel or thermosetting, polyester powder coat. For either process, the interior must be prepared as described above. If the baked enamel finish is used, it must be preceded by one (1) coat of primer.

5. **POWER SUPPLY**

- 5.1 A sixty (60) ampere main breaker must be inserted in series with the line.
- 5.2 An unfused terminal bus must be provided for ground side of the power supply and signal conductor commons.
- 5.3 Individual circuit breakers must be supplied for: (a) AC+ lights, 50 amperes; (b) AC+ control, 10 amperes; (c) duplex outlet supply, 15 amperes.
- 5.4 The incoming line must contain lightning protection devices consisting of, but not limited to, a metal oxide varistor and gas type arrester. The gas type arrester must be on the line side of the radio interference filter.
- 5.5 Contactor: A sixty (60) ampere Magnacraft, or approved equivalent, normally open, "A" type mercury contactor must be supplied for opening and closing the AC supply to the signal bus. This contactor must be mounted in such a manner on the power supply panel that accidental contact does not produce a safety hazard.
- 5.6 R.I.S. Filter: A radio interference suppression filter rated at sixty (60) amperes minimum must be installed in line with the main power supply, after the sixty (60) ampere circuit breaker.
- 5.7 Ground. The grounded side of the power supply must be continuous throughout the controller and must be grounded to the controller cabinet in an approved manner meeting OSHA requirements.

5.8 Polarity. The phase conductors of the signal circuits must have the same polarity as the phase side of the power supply, and the common conductor(s) must be of the same polarity as the grounded side of the power supply.

6. LOAD SWITCH BAY

6.1 General. A panel must be provided for mounting the load switch jacks, flash transfer relay jacks, flasher jack, auxiliary relays, time clock jacks, switches, flash change combination terminals, and terminals for field signal connections under non-interconnected operation. See Standard Drawings 964 and 965.

6.2 Wiring. Panel wiring must be neatly laced and properly terminated individual conductors. They must be insulated and properly sized for their application.

6.3 Load Circuits. Each load circuit must be capable of carrying fifteen (15) amperes continuously at a temperature of 74°C (165° F).

6.4 Bus Feeds. Bus feeds must be capable of carrying fifty (50) amperes continuously at a temperature of 74° C (165° F).

6.5 Equipment. The wiring panel must include, but not be limited to, the following:

- (1) Ten (10) ampere fuses with barrier type fuse holders must be installed between the load switch signal output circuits and field terminals for signal light conductors. Each terminal must be the barrier type with sufficiently long screws to accept four (4) #12 AWG solid conductors. The terminals must be located at least two inches (2") above the bottom of the cabinet.
- (2) Switching Device. The signal load switching device must be a three (3) circuit, solid state, jack mounted load switch which meets the N.E.M.A. Publication TS-1, Part 5 requirements. Each load switch must be rated for a minimum fifteen (15) ampere continuous resistive load and must mate with an S-2412-SB panel socket. Sixteen (16) load switches are to be provided with each cabinet, as defined in the PROPOSAL or Contract Plans.
- (3) User Programmable Interface. Two (2) sets of terminal blocks must be provided between the machine logic output and the input side of the load switches. By terminating all machine logic output on one set of terminals and all load switch input to the other set, an interface is thus created by which the machine logic can be readily connected to any of the load switches by means of a jumper wire. The two (2) sets of terminal blocks must be conveniently located in close proximity to each other and must be arranged such that, initially, each function will be factory wired directly from one set of terminals to the other without the need to criss-cross wires between blocks.

(4) Number of Signal Circuits:

- a. Sixteen (16) load bay panel. Each panel must be equipped with sixteen (16) load switch jacks for a minimum of forty-eight (48) signal circuits.
- b. All unused signal circuits must be neatly tied or terminated. If tied, the harness wire must be labeled. If terminated, each termination must be identified.

6.1 Identification. All field terminals must be suitably identified, subject to approval.

7. FLASHING FEATURE

7.1 General. The flasher must be a solid state device, with no contact points or moving parts, producing between 50 and 60 flashes per minute with a 40 to 50 percent duty cycle. The flasher mechanism must be mounted on a type P-406-SB plug which will mate with an S-406-SB socket on the controller panel. The flasher must utilize zero-point switching, with turn-on at the zero voltage point (± 5 degrees) of the power line sinusoid.

7.2 Flasher Panel. A panel must be provided with one (1) terminal wired to the flasher and marked "FL". The panel must be equipped with terminals to provide or omit flashing of all red and yellow outputs.

7.3 Flasher Circuits. Flashers must provide two (2) output circuits to permit alternate flashing of signal phases and must be capable of carrying a minimum of twenty (20) amperes per circuit at 120 volts. The flasher must operate continuously so that flashing power will be available at the field terminal marked "FL". The flasher wiring must divide the loads imposed on the two (2) circuit flasher alternately on each phase.

7.4 Manual Flash. A manual flash switch must provide flashing indication for all circuits. The flash change combination terminals must allow the selection of flashing either yellow or red on the main and/or cross streets, or complete omission of the flashing feature if required.

8. POLICE PANEL

8.1 Auto-Off Flash Switch. Each controller must be provided with an auto-off-flash switch. In the "AUTO" position the signals will be on and the controller timing unit will run normally. In the "OFF" position the signals will be OFF and the controller timing unit will continue to run. In the "FLASH" position the signals will flash and the controller timing unit will continue to run. The auto-off flash switch must be located on the side of the police switch panel that faces outward when the police door is open.

- 8.2 Auto-Hand Switch. Each controller will have an auto-hand switch on the back side of the police switch panel. This switch must be so arranged that the switch can be physically rotated 180 degrees to provide usage after opening the police panel door. It must be so mounted that the act of rotation does not affect the police switch panel. Switch terminals must not be exposed on either position. The auto-hand switch must provide a means of manually timing the signals by use of a separate, momentary contact, hand switch. Operation of the timer by manual control must provide the same color sequence as an automatic operation with no momentary undesirable indications appearing. Manual control must be possible with the door of the cabinet closed. The hand switch required for manual control must only be supplied when specified in the PROPOSAL. It must be of an approved weatherproof construction with a six (6) foot, retractable, flexible, extension cord to allow connection to the appropriate terminals on the panel of the controller. It must not be possible to manually step through a vehicle clearance interval.
- 8.3 Terminal Block. A two point terminal block must be mounted on the back side of the police switch panel and the hand control circuit terminated on this block. This will be for installation of a hand control cord by others, as required.
- 8.4 Space Requirement. Adequate room must be provided in the police panel section to store the manual switch and retractable cord.

9. RELAYS

- 9.1 Transfer Relays. Eight (8) double pole, double throw, flash transfer relays must be furnished with each controller. These relays must be jack mounted into an S-408-SB, or equivalent, socket mounted on the controller panel.
- 9.2 Contact Arm. Each contact arm must have over travel on the front and back contacts and be independent of any other contact arms. No adjustment of contact pressure or wipe must be necessary. Load capability must be a minimum of fifteen (15) amperes per contact continuously and thirty (30) amperes for one (1) minute. Contacts must be of coin or fine silver or an approved alternate.
- 9.3 Dust Cover. A suitable dust cover must be furnished for each relay.
- 9.4 Relay Mounting and Endurance. All relays supplied must meet their approved specified requirements and must have contacts which cannot be opened by unusual vibrations, shock, or momentary voltage excursions of up to 30%. All relays other than the flash and bus relay must be mounted on a molded base with eleven (11) or eight (8) pins for jack mounting to their respective panel or sub-base, and must be electrically interchangeable with those presently used by the City of Chicago ("MIDTEX", Model 158-92T200 or equal).

10. COMMUNICATIONS INTERFACE PANEL

10.1 Where a communications interface has been specified in the PROPOSAL or contract plans to allow a controller to function as a Master or Secondary controller, then one of the specified options must be provided:

- (1) Fiber Optic Communications Interfaces must meet the following requirements:
 - a. General. The fiber optic communications components must consist of, but not be limited to, an internal fiber optic modem within the controller or an external fiber optic modem, a fiber optic patch panel to interface the modem to field fiber optic cables, and fiber optic jumpers between the modem and patch panel.
 - b. The secondary fiber modules for the (local) controllers must either be the bi-directional type, as specified in the PROPOSAL or contract plans. All modems must be Electronic Industries Association (EIA) compatible for RS-232 data communications via fiber optic link. Modems must be multi-mode, operate at 850nm wavelength, and provide full-duplex, frequency modulated, asynchronous transmission at data rates of up to 38.4 kbps.
 - c. The fiber optic patch panel must consist of a 14" long by 5-3/4" wide by 3-1/4" high rack constructed in accordance with City of Chicago BOE Drawing #909. The rack must be designed to mount on the controller cabinet rails. "ST" type terminals, suitably labeled, must be provided for the connection of field fibers and Modem.
 - d. The fiber optic jumpers (i.e., optical patch cords) must consist of a single multi-mode fiber in 900 micron orange jacket, with "ST" type connectors factory installed on each end. The jumpers must be 3' long in Secondary (i.e., local) controller cabinets. The jumpers must be connected to the patch panel and supported in such a manner that the minimum bending radius is ten (10) times the diameter of the cable, and the cables exert no strain on the connectors. Each jumper must have a minimum tensile strength of 50 lbs.

- (2) Copper Wire Interconnect Panels (Seven Wire, VAC) must meet the following requirements:
- a. General. The interconnect panel must serve to isolate interconnect VAC from the controller. The panel must consist of, but not be limited to, seven (7) relays. Each relay interconnect circuit must include an M.O.V. properly rated for protection against lightning and switching surges injurious to the controller and a barrier type 3AG fuse receptacle and fuse not to exceed five (5) amperes. Each panel must provide a seven (7) wire interface with the T.B.C. functions described below and must provide barrier type terminals suitably labeled for these functions.
 - b. The secondary interconnect panel must be wired in such a manner that an VAC input activates a relay sending an input from that relay to the controller. It must have a minimum of seven (7) relays for the following functions; Dial 2, Dial 3, Dial 4, Offset 1, Offset 2, Offset 3, M.U.T.C.D. flash.
 - c. The master interconnect panel must provide a means to establish outgoing VAC for a seven (7) wire interconnect system using eight (8) relays. The relays must have 24 VDC coils and be designated as, Dial 2, Dial 3, Dial 4, Sync, Offset 1, Offset 2, Offset 3, M.U.T.C.D. flash. The sync relay must be wired in such a manner that it provides the offset pulse to the contacts of the three (3) Offset relays.
 - d. Each relay must be a double pole type, with one pole designated as field interconnect output, and the other designated as controller input. Relay coils must be rated for continuous duty. Relay contacts must be rated for a continuous fifteen (15) AMP resistive load.
 - e. A terminal strip must be mounted on the top of the master interconnect panel for controller interface.f. The master panel must interface with the T.B.C. terminals as described above.
 - g. Each output must be fused as outlined above.

11. WIRING

- 11.1 General. All electrical conductors must be stranded copper, with a minimum of nineteen (19) strands per conductor, and a concentrically applied 90° C insulation with a 600 VAC rating. Wiring from the fuse block to the first distribution point, and to the controller bus, must be No. 10 AWG. Signal circuit wire must be No. 14 AWG. The wires must be provided with lugs or other approved terminal fittings for attachment to binding posts. All wiring between various parts of the controller must be neatly cabled. All wiring and terminal blocks must be tested for possible short circuits and resistance to ground by a high voltage dielectric test at 1,200 VAC. A wiring harness of adequate length must be provided to the timing device to allow the timer to be placed on top of the cabinet when required.

- 11.2 All VAC connections to load switches, flasher, and flash transfer relays must be soldered. All VAC connections on back of terminals must be soldered.
- 11.3 All VDC connections on back of terminals, and load switches must be soldered or connected with pre-approved terminations. All VDC connections to load switches are to be soldered or connected in a manner pre-approved by the City of Chicago's Bureau of Electricity.

12. TESTING REQUIREMENTS

- 12.1 General. In addition to the testing required in the ATC standard, the following test requirements must be utilized:
- 12.2 N.E.M.A. Environmental Test. One controller, the submitted sample unless approved otherwise, must be tested, at the manufacturer's expense, in accordance with Part 2 of NEMA Standards Publication TS1-1983. All of the tests listed must be performed with all data properly recorded and certified. If the manufacturer changes the design, fabrication or components of a previously tested and approved controller, then a sample of the controller containing the new design, fabrication or components must be retested at the manufacturer's expense. Any N.E.M.A. environmental test references to minimum recall must include but not be limited to: all forty-eight (48) output circuits must be programmed in a sequence to simulate the normal functioning of the entire controller cabinet assembly; the conflict monitor must have a test board with the allowable channel jumpers installed to simulate normal operation; all thirty-two (32) intervals must be programmed with a minimum of two (2) seconds per interval.
- 12.3 Functional "Burn In" Testing. The "burn in" requirement must include a test that uses all forty-eight (48) output circuits in "solid" burn as well as 1 pps and 5 pps for each circuit. All thirty-two (32) intervals must be programmed with a minimum of two (2) seconds per interval. The documentation for a test program to simulate the controller phasing must be supplied. A copy of the test program must be approved by the City of Chicago, Bureau of Electricity prior to testing.
- 12.4 Performance Testing Requirements. In addition to the NEMA environmental test and the requirements stated above, satisfactory performance of the traffic signal cabinet and its equipment must be demonstrated prior to shipment from the factory. The manufacturer must submit five (5) copies of his proposed "Test Procedure Document" for approval with the sample requested above. The test procedure must consist of two (2) sections; physical inspection and functional testing. If the test procedure is judged by the Commissioner or his duly authorized representative to be incomplete, inadequate or otherwise deficient, the contractor must revise and resubmit his "test procedure document" until it is approved. No contract can be awarded until the "test procedure document" has been approved.

- 12.5 Performance Testing Documentation. Upon completion of the performance testing, two (2) certified copies of the final results of the approved "Test Procedure Document" must be included with all traffic signal controller production shipments.
- 12.6 Testing, Certification and Observation. Each traffic signal controller ordered must be tested in accordance with the approved "Test Procedure" document. The City's representative(s) must observe the manufacturer's testing in progress. The City must be notified at least thirty (30) calendar days prior to testing, and no testing will be initiated without the presence of its representative(s). The representative(s) may observe all, or a portion, of the tests, as he (they) may deem necessary. Certification documents that the traffic signal controller has been tested in accordance with the Test Procedures documents, and the results of these tests, must be signed by the individual(s) performing the tests and their immediate engineering supervisor. Two (2) copies of each certification document must be delivered with each production traffic signal controller. The contractor must include in his bid the cost of travel, food and lodging for two (2) engineers. Travel for 150 miles or greater must utilize a major airline. Lodging accommodations must be equal to those provided at a Holiday Inn.
- 12.7 Physical Inspection. The "physical inspection" portion of the test procedure document must require the manufacturer to perform a physical inspection of workmanship and specification compliance for each traffic signal controller assembly. The inspection must be done using a detailed check list defining items to be inspected and criteria for acceptance. The inspection must include, but not be limited to, the following items:
- (1) Hardware installation.
 - (2) Assembly mounting.
 - (3) Dimensions.
 - (4) Presence of specified devices and materials.
 - (5) Presence of required documents.
 - (6) Labeling and required serial numbers.
 - (7) Wiring, including routing, covering, gauge, length, and soldering of terminations.
 - (8) Arrangement of equipment for safety and ease of calibration, reprogramming, troubleshooting and maintenance.
 - (9) Condition of cabinet body and finish.
 - (10) Condition and installation of doors, panels, gaskets and ventilation.
 - (11) High voltage test of insulation resistance to ground, with wires installed in cabinet and equipment disconnected.
- 12.8 Functional Testing. The "functional testing" portion of the Test Procedure must require the manufacturer to perform a complete room-temperature functional test of each complete traffic signal controller assembly for a minimum of seventy-two (72) hours. This test must be designed to concurrently check integrated hardware systems e.g., from simulated input to load switch output including conflict monitor and time base coordinator. All interface/controller interconnections must be tested. All load switch and interconnect relay positions must be tested, regardless of the number of load switches and interconnect relays being purchased. The functions tested must include, but not be limited to, the following:

- (1) Flash logic and operation (color, phases).
- (2) Conflict monitor logic and operation.
- (3) Police panel switch operation.
- (4) Auxiliary panel switches (including fans).
- (5) Interface panel.
- (6) Time switch operation.
- (7) Load switches (with a continuous ten (10) ampere load on each signal circuit).
- (8) Outputs.
- (9) Power interruptions of less than 500 ms.
- (10) Power interruptions of more than 1.0 sec.

13. SHIPMENT AND DELIVERY

13.1 Packaging. The cabinets must be shipped on individual pallets. Each cabinet must be individually wrapped and protected so that it can be handled without damage to the cabinet or its finish. If subassemblies or parts are ordered they must be suitably packaged to prevent damage during shipping and handling. All packages should be clearly labeled indicating the contents.

13.2 Delivery. The assembled cabinets, or subassemblies and parts, must be delivered to the Bureau of Electricity at 2451 South Ashland Avenue, unless otherwise directed. Assembled cabinets, or subassemblies or parts, must be available for testing and shipping within six (6) weeks of the placement of an order.

14. INSPECTION

14.1 An inspector representing the City must have free entry at all times, while the work on the contract is being performed, to all parts of the manufacturer's plant which concern the manufacture of the equipment. The manufacturer must afford the inspector, without charge, all reasonable facilities to satisfy the inspector that the equipment is being furnished in accord with these specifications.

CHICAGO ATC MATRIX - TABLE A

Since the ATC standard specifies a “family” of controllers, the following options have been selected from the ATC standard to meet the City’s needs.

Functional Requirement	ATC Clause #	Status	Details
Shelf Mounted	2.2.1 4.3.2.1	Required	(Shelf mount only)
Use of ATC Engine Board	2.2.2 4.3.2.2 5.1.1 5.1.2 5.3.2 5.3.4 5.3.5 5.3.5.1 5.4.2 5.4.3 5.4.4 5.4.5	Required	
Use of ATC Engine Board	5.2.1	Required	<ul style="list-style-type: none"> Allowed component height below Engine Board PCB provided that the overall envelope remains unchanged, the clearance between the Host Board and Engine Board remains as specified, and the Engine Board still fits into a compliant Host Board
Use of ATC Engine Board	5.2.2 5.4.5	Required	<p>In order to show the Ethernet communications to the Engine Board, the following “Reserved” pins can assume the following legacy functions:</p> <ul style="list-style-type: none"> P1-34: ENET2 Speed P1-35: ENET2 Link/Activity P1-36: ENET1 Speed P1-37: ENET1 Link/Activity
Use of ATC Engine Board	5.3.1	Required	Minimum CPU capability of 500 MIPS
Use of ATC Engine Board	5.3.3	Required	Additionally, must provide a minimum of 16 MB of Flash total to accommodate future applications.
Use of ATC Engine Board	5.4.1	Required	<ul style="list-style-type: none"> Engine Board shall not draw more than 4W of power from VPRIMARY (due to battery backup in Chicago)

Functional Requirement	ATC Clause #	Status	Details
			<ul style="list-style-type: none"> Engine may supplement VSTANDBY_5 with on-board storage for its standby power.
Use of ATC Engine Board	5.4.3	Required	<ul style="list-style-type: none"> All optional baud rates shall be supported
Modem Slot	2.2.3 4.3.2.3 6.1 6.1.1 6.1.2 6.2.2 6.3.1.3	Required	<ul style="list-style-type: none"> Only one modem slot to be provided (due to space restrictions) and not labeled Reduced modem slot pin-out +12VDC ISO and DCGND2 are not required to be supported
Modem Slot	6.2.1 6.3.1 6.3.1.1 6.3.1.2 6.3.1.5	Required	<ul style="list-style-type: none">
Parallel I/O	2.2.4	Required	<ul style="list-style-type: none"> No support required for TS2 Type 1 or ITS cabinets Must provide parallel I/O for TS2 Type 2 cabinets and legacy parallel I/O interfaces via interchangeable modules
Linux O/S and ATC BSP	2.2.5 4.3.1 4.3.3	Required	
Linux O/S and ATC BSP	2.2.5 4.3.1 4.3.3	Required	
Linux Kernel	Annex A	Required	
Parallel I/O	3.4	Required	Not required to support ITS Cabinet standard (NEMA cabinets are used)
Manage Clock/Calendar functions and synchronize with external source	3.5.1.3	Required	Must also support synchronization with absolute zero.
Manage Clock / Calendar functions and synchronize with External Source	4.1.3	Required	<ul style="list-style-type: none"> BSP RTC driver shall automatically update the RTC with the OST time once per second with an accuracy of 0.1 seconds

Functional Requirement	ATC Clause #	Status	Details
			<ul style="list-style-type: none"> Successive interruptions (e.g. on for 5 minutes, off for 3 minutes over a period of 8 hours) shall not introduce cumulative error
Configure and Verify Parameters	3.5.1.4 4.1.4	Required	
Upload/Download blocks of data	3.5.1.5 4.1.5	Required	
Monitor & Verify Application Status	3.5.1.6 4.1.6	Required	
Operator Control of Application Execution	3.5.1.7	Required	<u>Only</u> a local operator is allowed to manage the starting, stopping and scheduling of one or more applications on the ATC.
Operator Control of Application Execution	4.1.7	Required	
Long Term Storage of Log Data, etc	3.5.1.8 4.1.8	Required	
Support Diagnostics	3.5.3.3 4.3.4	Required	
Modes of Operation	3.7	Required	(Must support Standalone, Direct, and Distributed modes of operation)
Manage/Control a Variety of External Devices	4.2.1	Required	<ul style="list-style-type: none"> Fixed Ports on the front panel shall be specified by the City Only SP1 and SP2 are required to be supported on the modem slot The dedicated synchronous serial port (SP5) is to be used exclusively for supporting a parallel I/O module (NEMA TS2 or legacy interface)
Monitor the Status of External Devices	4.2.2	Required	<ul style="list-style-type: none"> Fixed Ports on the front panel shall be specified by the City Only SP1 and SP2 and required to be supported on the modem slot The dedicated synchronous serial port (SP5) is to be used exclusively for supporting a parallel I/O module (NEMA TS2 or legacy interface)
Support future Hardware Upgrades	4.3.2	Required	

Functional Requirement	ATC Clause #	Status	Details
Environmental Requirements	5.2.3	Required	
Front Panel Serial Ports	6.2.3.1 6.1.3 6.3.2.1	Required	One serial port on the front panel shall satisfy this section as an EIA-574 (9-pin) and be labeled "Port 2".
Front Panel Serial Ports	6.2.3.1 6.3.2.1	Required	One serial port shall satisfy this section as an EIA-574 (9-pin) with a reduced pin-out (TXD, RXD, and DC Reference at a minimum) and be labeled "C50S". C50_ENABLE shall not be supported. A second serial port shall fully satisfy this section as an EIA-574 (9-pin) and be labeled Port 3.
Front Panel Serial Ports	6.2.3.2 6.1.3 6.3.2.2	Required	One serial port shall satisfy this section as an EIA-485 (15-pin) with the TS2 Type 1 Port 1 pin-out and be labeled "Port 1".
Front Panel Ethernet Ports	6.2.3.9 6.3.2.9 7.1.4.4	Required	There shall be a minimum of two Ethernet ports on the Front Panel (one for ENET1, one for ENET2)
User Interface	7.1 7.1.1.2 7.1.4.4 7.1.4.5 7.1.4.7	Required	(See "Port 2" under "Front Panel Serial Ports")
User Interface	7.1.1	Required	Must meet City's Minimum requirements
User Interface	7.1.1.1 7.1.2.1 7.1.3 7.1.4.1 7.1.5	Required	<ul style="list-style-type: none"> • Data key is not required • Front Panel Interface is to be integral to the controller (i.e. not removable, no SP6 connector) • "Option 1" to be selected but AUX switch is optional • Keypad shall have a minimum of 24 keys • LCD Display shall be graphical with a minimum resolution of 128 rows x 240 columns (up to 16 lines x 40 characters). • LCD pixel size shall be a minimum of 0.32mm x 0.32mm with a minimum pitch of 0.325mm with character size defined as 6 pixels wide x 8 pixels high

Functional Requirement	ATC Clause #	Status	Details
			<ul style="list-style-type: none"> • Refresh rate is a minimum of 10 times per second (due to larger display requirements) • LCD heater is mandatory to ensure sub-second LCD display response over full temperature range. Heater shall only be active when needed and User is interacting with the controller locally (due to battery backup requirements). • Heater Power shall be up to 15V at 1A current maximum
Power Supply	7.2 7.2.1 7.2.2 7.2.3 7.2.4 7.2.5 7.2.5.1 7.2.5.2 7.2.6.1 7.2.6.2 7.2.6.3 7.2.6.4 7.2.6.6	Required	As applicable for NEMA cabinets only
Power Supply	7.2.6 7.2.6.5	Required	<ul style="list-style-type: none"> • Optional Display (LCD) Heater is required • 24VDC, 12VDC, and -12VDC shall also satisfy the holdup time requirements within their respective output specifications
Mechanical/Chassis	7.3.1.3 7.3.1.4	Required	<ul style="list-style-type: none"> • Only Shelf mounted units are acceptable • Only components / connectors specified by the City shall be located on either the Front or Rear panels. No C1 Type Connectors allowed.
I/O Interfaces	8.1.1 8.2.2	Required	<ul style="list-style-type: none"> • Support for TS2 Type 2 and TS1 Interfaces

Functional Requirement	ATC Clause #	Status	Details
	8.2.2.1 8.2.2.2 8.2.2.3 8.2.2.4 8.4 8.4.1 8.4.2 8.4.3 8.5		<ul style="list-style-type: none"> Only provided Ethernet ports shall be subject to ESD requirements
I/O Interfaces	8.1.2 8.2.2.5	Required	<ul style="list-style-type: none"> Support is only required for NEMA TS2 Type 2, TS1, and other similar legacy interfaces NEMA TS2 Port 1 shall also be provided (for detectors only)
I/O Interfaces	8.2.3	Required	Port 1 Connector shall be provided as specified within this section (only used for detectors)
I/O Interfaces	8.2.1.13	Required	Legacy I/O interfaces shall respond as required.
I/O Interfaces not required	8.2.1	Required	<ul style="list-style-type: none"> No support for Model 332 Cabinets or ITS Cabinets & devices is to be provided
Serial I/O	8.3	Required	<ul style="list-style-type: none"> Only two Ethernet ports are required and they shall be located on the Front Panel (one for ENET1, one for ENET2) If Hub1 is provided, it shall have three external RJ-45 jacks and also connect to the Modem slot along with ENET1 on the Engine Board Hub2 is not required Serial Port Usage is as follows: <ul style="list-style-type: none"> SP1: Modem Slot & NEMA Port 3 (front) as TIA-574 instead of FSK SP2: Modem Slot SP3: TS2 Port 1 SP5: TS2 Parallel I/O SP6: Integrated User Interface (i.e. no

Functional Requirement	ATC Clause #	Status	Details
			external connector) <ul style="list-style-type: none"> ○ SP8: EIA-574 (front) as TS2 Port 2 (but with ATC v5.2b limited pins) ○ SPI: No external interface ○ USB: USB port (front) ○ ENET1: At least 1 RJ45 ○ ENET2: At least 1 RJ45
Environmental & Test Procedures	9	Required	All subsections are required
Performance & Material Requirements	10	Required	All subsections are required
Performance & Material Requirements	10.1.15	Required	All PCBs and similar construction mechanisms shall be mounted vertically (i.e. no horizontal PCBs are allowed).
Quality Control	11	Required	All subsections are required

**ELECTRICAL SPECIFICATION 1620
DIVISION OF ELECTRICAL OPERATIONS
DEPARTMENT OF TRANSPORTATION
CITY OF CHICAGO
MAY 20, 2022**

**FIELD CABINET INTEGRATION EQUIPMENT AND DETECTION PROCESSOR WITH VIDEO
CAMERA**

1. SUBJECT

This specification states the requirements for video camera and integration equipment to enhance the technological functions at a signalized intersection that does not have a City fiber network connection. The set of equipment shall include a hemispherical video detection camera and integration device for video detection processing, video streaming, Ethernet networking, and cellular communications. The technology enhancement equipment shall collectively interface with the existing or proposed traffic signal controllers and cabinets, enable remote monitoring and control of the signal operations, support continuous data collection and signal performance monitoring, provide vehicle actuation, enable Web-based real-time and recorded video from the intersection, provide local area network connectivity for equipment in the cabinet, interface with the City's central signal system, and provide forward compatibility with future systems. The integration device and video detection processor shall be physically located in a traffic signal control cabinet. The camera shall be mounted to a City pole or extension arm with a mounting bracket specifically manufactured for that purpose.

2. GENERAL

2.1 Specifications. The intersection technology equipment shall conform in detail to the requirements herein stated and to the latest referenced specifications of the following:

Electronic Industries Alliance (EIA)
Federal Communications Commission (FCC)
National Electrical Manufacturers Association (NEMA)
National Transportation Communications for ITS Protocol (NTCIP)
Restriction of Hazardous Substances (RoHS)
Telecommunications Industry Association (TIA)
Underwriters Laboratories (UL)

- 2.2 Acceptance. Intersection enhancement equipment not conforming to this specification will not be accepted. The equipment shall be approved by the selected wireless carrier for use on their network.
- 2.3 Sample. If requested by the Chief Procurement Officer, a sample of the technology enhancement equipment intended to be provided under this specification, shall be submitted to the Division of Electrical Operations within fifteen (15) business days after receipt of the request. The samples shall be delivered to the Division of Electrical Operations, 2451 South Ashland Avenue, Chicago, Illinois 60608.
- 2.4 Compatibility
1. Traffic signal controller. The technology enhancement equipment must be compatible with the City's traffic control equipment and the City's communications equipment.
 2. Future technology. The technology enhancement equipment shall be forward compatible to support technologies through the integrated standard Layer 2 network interface including adaptive traffic signal controls.
- 2.5 Documentation. All equipment shall include the manufacturer's installation and operations manuals in hardcopy and electronic PDF formats. Contractor shall provide documentation of exact equipment model and serial numbers in hardcopy and electronic PDF formats.
- 2.6 Warranty. The manufacturer shall warrant the technology enhancement equipment against defects in material and workmanship for a period of three (3) years from the date of the City's final acceptance. The manufacturer's local distributor shall provide a replacement of any failed technology enhancement equipment at no cost to the City.
- 2.7 Support
1. Support shall include software updates and phone support, Monday through Friday, 7:00 AM to 7:00 PM, for the duration of the warranty period.
 2. Equipment shall have ability to receive Over-The-Air (OTA) upgrades for enhancements to capabilities and security.
- 2.8 License
1. The technology enhancement equipment shall include licensed software use and full maintenance and support services for the software for a minimum period of 10 years from the date of the City's official receipt for commodity contracts or from the date of City's final written acceptance for construction contracts.

2. The software license shall be fully transferable to CDOT. Transfer shall be completed upon purchase for commodity contracts and prior to City's final written acceptance for construction contracts.
3. The software license provided by the vendor shall be subject to the City of Chicago Data Protection Requirements for Contractors, Vendors and Third Parties. A copy of this document is provided in the Appendix.
4. In no event shall the software license include an obligation by the licensee to indemnify the licensor.
5. Software license shall allow a minimum of 100 concurrent users for any client based or cloud services.
6. Written evidence of the transfer shall be certified by an authorized representative of the software vendor and provided to the City.
7. The software license shall grant the City full use of the Web-based software including access to the data collected by the technology enhancement equipment and all data analytic tools of the Web portal software. The capabilities of the software may be enhanced but shall not be reduced.

3. ENVIRONMENTAL

- 3.1 All technology enhancement equipment inside the traffic signal cabinet, including the SIM card, shall be manufacturer-hardened to withstand the elements and fully operate in the field without a dependency on external environmental conditioning equipment.
- 3.2 The technology enhancement equipment shall meet the environmental and operating requirements of the NEMA TS2 standard for controller units, including temperature, humidity, shock, vibration, and voltage. Testing shall comply with NEMA TS2 2.2.7 through 2.2.11.
 1. Operating temperature: -30° F to 165° F.
 2. Storage temperature: -30° F to 165° F.
 3. Operating relative humidity: 5% to 95% non-condensing.

4. INTEGRATION DEVICE

- 4.1 General.
 1. Provide multiple backhaul communications options including hardwired Ethernet and cellular communications backhaul.
 2. Provide local network Ethernet, serial, or I/O connectivity for field devices at the signalized intersection.
 3. Provide an "always-on" connection, without dialing.
 4. Support local and remote management access
 5. Support Virtual Private Network (VPN) connections

6. Communicate with an NTCIP compliant controller over Ethernet providing auto-negotiation to 10/100 Mbps, half or full duplex.
7. SIM card shall have a static IP address assigned by City, and shall be provisioned on the City's cellular provider's (currently Verizon) private network for City of Chicago.
8. Support direct communication between City systems and the devices connected to the integration device (and through an interface hardware adapter for legacy controllers) for remote monitoring and control.
9. Provide all required components, including power supply, cables, mounting hardware, and all accessories required to make the system fully operational in accordance with these specifications.
10. Provide data buffering of all telemetry and alert data for at least 12 minutes of communications loss at least 5 seconds of power loss.
11. Support vertical and horizontal installation.
12. Shall support the collection and transmission of telemetry data, video data, alert data, and vehicle identification data to the server via the communications network.
13. Include light-emitting diode (LED) indicators for health heartbeat, network connectivity, and device status.

4.2 Integrated Layer 2 Ethernet switch.

1. Minimum six Gigabit Ethernet ports (RJ-45) including one WAN port and minimum three PoE+ ports (802.3af and 802.3at compliant).
2. Support Transmission Control Protocol (TCP)/IP and User Datagram Protocol (UDP).
3. For each RJ-45 port, include a 6-foot Category 6 network cable that is Electronic Industries Alliance (EIA) / Telecommunications Industry Association (TIA)-568-A compliant.
4. One non-PoE+ port shall be used for the traffic signal controller, one PoE+ port shall be used for the video camera, and the remaining ports shall remain unused and reserved for the City's approved other uses.
5. Each port shall have auto-resetting in-line surge protection, compliant with IEC 61000-4-5 Class 4.

4.3 Connection ports

1. Minimum two serial ports (EIA RS-232).
2. Minimum one Universal Serial Bus (USB-A) port (USB 2.0 or higher).
3. Minimum one general purpose input/output (I/O) port with four signal pins, 0~30V, 200 mA, sinking, digital input.
4. Minimum one NEMA-rated I/O port for detector actuation (24)
5. Minimum one NEMA-rated I/O port for signal priority control (8)
6. Minimum one SDLC port

4.4 Data storage

1. Solid State Drive (SSD)
2. Minimum 240 GB
3. SATA III compliant
4. Support Self-Monitoring, Analysis, and Reporting Technology (SMART) command feature set
5. Rugged. 1500 G/0.5ms shock-resistance, 5~800 Hz at 5G peak vibration-resistance

4.5 Wireless communications

1. Frequency band and cellular network interface shall be fully compatible with the City's cellular data service provider.
2. Shall support 4G LTE cellular connectivity with MiMo and diversity (Bands 2, 4, 5, 12, 13, 14, 66, 71), UMTS/HSPA+ and GSM/GPRS/EDGE with peak downlink of 150 Mbps and peak uplink of 50Mbps.
3. Shall support 802.11 a/b/g/n with MiMo and Diversity antennas with security of at least 64/128 bits WEP, WPA, WPA2.
4. Shall support GPS for location service.

4.6 NTCIP controller interface

1. Communicate with an NTCIP compliant controller over Ethernet providing auto-negotiation to 10/100 Mbps, half or full duplex
2. Provide an ethernet cable for interfacing with NEMA TS2 type A1N, A2N, P1N, or P2N controllers.
3. Ethernet cable shall meet NEMA operating temperature specification -30 °F to 165 °F and be shielded with a UL-certified jacket.
4. Communicate to the controller over TCP/IP
5. Communicate over SNMP v1, v2c, and v3 protocols
6. Communicate over STMP NTCIP protocols reading all objects defined in NTCIP 1201 and 1202 supported by the controller
7. Acquire and record phase, channel, detector, pedestrian detector, pre-emption, alarm and overlap statuses at a frequency of no less than 10 times per second including whether a phase is next or has a call for service on it
8. Read and distinguish information from all detector, pedestrian detection and pre-emption devices wired into the cabinet
9. Detect failure of a detector, pedestrian detector or pre-emption device in either always high or always low mode based on user configuration.
10. Detect all controller-defined failures of a detector defined in NTCIP-1202::ASC.vehicleDetectorAlarms

11. Detect all detector-defined failures of a detector defined in NTCIP-1202::ASC.vehicleDetectorReportedAlarms
 12. Detect the free mode status of the controller
 13. Read coordination information including cycle and sync status and current and future coordination plan parameters when provided by controller
 14. Distinguish between minimum green, extension, maximum, green rest, yellow change, red clearance and red rest intervals of a phase.
 15. Identify flash status, stop time, external start, power restart, low battery, a serviceable call exists and has not been serviced for two cycles, or SDLC response fault.
 16. Measure the existing sequence selected
 17. Read the phase table, sequence table, channel table, and overlap table
 18. Re-synch controller clock
 19. Place a call on a phase if a detector is in fault
 20. Run the traffic controller in free mode through force, hold, and omit directions
 21. Set the current timing plan dial, split, or offset
 22. Set coordination plan parameters including splits, offsets, and cycle length
 23. Set phase table parameters.
 24. Capture and report controller faults based on controller reported flash status reasons of 'other', 'automatic', 'localManual', 'faultMonitor', 'mmu', 'startup', and 'preempt'
- 4.7 SDLC controller interface
1. Provide all necessary cabling to connect to a cabinet's existing Port 1/SDLC bus
 2. Read terminal and facility input & outputs at a frequency of at least 10 times per second
 3. Read channel state at a frequency of at least 10 times per second
 4. Acquire MMU fault status including conflict, red failure and clearance failure
 5. Read information from all detectors wired into the cabinet supporting up to 100 millisecond resolution between detection events
 6. Detect detector failure in either always high or always low mode
 7. Support capturing and reporting controller faults based on MMU status bits of 'in conflict', 'red failure', 'diagnostic failure', 'in failure state', and 'local flash'
 8. Function as multiple SDLC detector racks for actuation

4.8 Video processor

1. The integration device shall include real-time multimodal (vehicle, cyclist, pedestrian) video detection.
2. Support Real Time Streaming Protocol (RTSP).
3. Support live video streaming through remote network access. The live video shall be accessible from a browser and/or through third-party software used by the operating agency.
4. The cameras system at each intersection should Shall locally record camera video streams continuously at the intersection and store recordings for at least 14 days.
5. Shall allow the locally stored video recordings at the intersection to be recalled, downloaded, and viewed remotely for up to 14 days.
6. Detection accuracy shall be 90% for each lane at the intersection in clear weather conditions for any 1-hour period and 95% for any 24-hour period of real-time video processing.
7. Shall include a display showing status information of signal phases, detection channels, cameras, SDLC bus, and operational state.
8. Shall support multimodal detection and counting
 - a. Process simultaneous feeds from multiple intersection video cameras
 - b. Process at least 150 detection zones at intersection
 - c. Allow irregular polygon shaped zones
 - d. Support conditional detection based on directional movement of object
 - e. Differentiate between vehicle and cyclist at stop bar detection
 - f. Support conditional stop bar detection based on object type
 - g. Auto adjust settings in response to viewing conditions for improved detection accuracy
 - h. Support approach and departure detection zones
 - i. Support automated OTA software updates
 - j. Process turning movement count data for all visible movements at the intersection at all times
 - k. Classify in real-time all detected objects passing through an intersection including bicycles, light vehicles, single-unit trucks, articulated trucks, and buses
 - l. Process crosswalk movement count data for pedestrians
 - m. Track objects for video analytics applications
 - n. Auto-validate detection accuracy for each configured presence zone in the intersection
 - o. Distinguish between lanes for all vehicle movements
 - p. Count large groups of pedestrians
 - q. Adjustable enhanced detection sensitivity per detection zone

9. Actuation.
 - a. Support the option of actuation via SDLC or direct wiring into traffic cabinet
 - b. Support 64 actuation outputs over SDLC
 - c. Support 16 actuation outputs over general purpose I/O direct wiring with constant-call fail active capability
 - d. Support 8 actuation outputs over general purpose I/O without constant-call fail active capability
 - e. Support multiple detection zones per lane in any combination of pulse or presence configuration
 - f. Support constant detection channel call output when no video signal detected (1 second response time).
 - g. Support automatically switching individual detection zones into alternate detection mode when poor visibility is detected
 - h. Support delay and extend functionality per detection zone
 - i. Support local and remote manual override of detection to force actuated channels into constant call
 - j. Support virtual actuation channels for signal performance measures without actuating controller channels

4.9 Device data access

1. Support data access by third-party devices via TCP/IP
2. Provide local live data access via an open standard interface for third-party device integration
 - a. Signal indication status change on each channel
 - b. Detector status change on each channel
 - c. Preemption status change on each channel
 - d. Active timing plan change for NTCIP controllers
 - e. Video detection object presence
 - f. Movement data for detected objects
3. Provide updated status with 100 millisecond resolution.

5. VIDEO CAMERA

- 5.1 Hemispherical (fisheye) lens shall provide an ultra-wide, 360-degree, fixed field of view of all approaches of a signalized intersection at a maximum of 125 feet from the farthest stop bar. A second camera shall be provided at no additional cost to the City if the maximum distance is exceeded.
1. 180-degrees horizontal
 2. 180-degrees vertical
- 5.2 4K video resolution.
- 5.3 Shall support at least 9 megapixel (MP) capture
- 5.4 Shall support configuration in both spherical “fisheye” configuration, and rectangular “quad view”
- 5.5 Support a minimum of 10 concurrent video streams
- 5.6 Shall support pan, tilt, and zoom of the video feed by users
- 5.7 Camera shall be powered over Ethernet cable (PoE) in compliance with IEEE 802.3af
- 5.8 Shall provide H.264 and MJPEG image compression
- 5.9 Shall support RTSP streaming and H.265 compression
- 5.10 Shall support integration of RTSP video streams into third-party video management systems
- 5.11 Shall be rated to IP66 (NEMA 4X compliant)
- 5.12 Shall include an electronic de-humidification device for use in various weather conditions
- 5.13 Shall include a lens defrost function
- 5.14 The camera shall be fully compatible with the video processor and be provided by the same manufacturer. The camera quality and performance shall support the detection requirements of the video processor.

- 5.15 The camera shall provide full visibility of the intersection as required to achieve the performance requirements of this special provision.
- 5.16 Shall include Cat-5e / 6 surge protection capable of being mounted to the sidewall mounting channel of the traffic signal controller cabinet for protection of the camera and video processor. The surge must not interfere or degrade the quality of the video signals on the line.
- 5.17 Shall be compatible with in-line Ethernet repeater or other solution recommended by the manufacturer for cable runs exceeding standard Ethernet distance at no additional cost to the City.
- 5.18 Mounting hardware.
1. Support vertical and horizontal mounting
 2. Constructed of aluminum or stainless steel
 3. Compatible for securing a minimum 6-foot extension mast, 1.5-inch diameter
 4. Shall be shipped fully assembled within secured package and ready to attach to pole or extension arm
 5. A hole for cable of a minimum of 1" shall be located where the bracket shall be attached to City infrastructure. Bracket shall allow for banding to City mast arm.
 6. Shall meet the structural requirements of ASSTHO's Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, First Edition. The entire assembly shall be able to withstand wind gusts up to 150 MPH.

6. ANTENNA

- 6.1 The low-profile, omnidirectional external antenna rated for outdoor use shall be fully compatible with the integration device and shall provide optimal signal reception at each site as recommended by the equipment manufacturer.
- 6.2 Antenna shall be able to be easily mounted to cabinet. Antenna housing shall require only one penetration in the mounting surface to route all internal antenna cabling. The antenna shall be an environmentally hardened, vandal-resistant antenna that protrudes no more than 1-1/2 inch from the cabinet. A watertight sealing bushing shall be included to prevent cable fraying and the ingress of water into the cabinet. All mounting hardware shall be included.

6.3 For the cellular modem integrated in the integration device, the antenna housing shall have multiple antennas inside with one threaded opening for all cabling and shall support:

1. Global Positioning System (GPS) (qty: 1)
2. 3G/LTE MIMO (qty: 2)
3. 2.4GHz/5GHz WiFi MIMO (qty: 2)

6.4 Shall include antenna cables with required manufacturer-terminated connectors for full compatibility with corresponding ports on the integration device.

6.5 Shall have labeled antenna terminations for easy installation.

6.6 Shall not exceed 1-1/2 inch in height.

6.7 Shall be IP67 rated and include a water-tight seal made of a closed cell rubber type foam and medium-firm acrylic adhesive with bonding features including a high initial adhesion and excellent high/low temperature holding power with excellent peel strength.

7. **POWER**

Technology enhancement equipment inside the traffic signal controller cabinet shall meet the following power requirements.

7.1 Include compatible UL-certified power supply and connections as recommended by the technology enhancement equipment manufacturer.

7.2 Provide galvanic isolation between earth ground and logical ground.

7.3 Shall support power source via NEMA 5-15R or direct-wire terminal block.

7.4 Shall include power backup to maintain device operation for at least 5 seconds of brownout. System shall shutdown safely with power loss.

7.5 Shall include a separate circuit breaker of sufficient amperage rating (minimum 10 amperes) for powering the technology enhancement equipment inside the cabinet. Breaker shall be at a minimum, a thermal magnetic type, UL listed with a minimum of 10,000 amp interrupting capacity.

8. SOFTWARE

8.1 Web-based management client software shall be included by the equipment manufacturer with Graphical User Interface (GUI) and secured through Secure Sockets Layer (SSL) encryption.

8.2 Shall provide access to field data from the integration device and provide all functions from a single software platform with a single sign-on.

8.3 Shall support an unlimited number of concurrent logins by authenticated users.

8.4 Shall be fully accessible via desktop, tablet, and mobile products on Chrome, Edge and Safari.

8.5 Shall support the full set of software features without interfering with the traffic signal controller to communicate with third-party software used by the operating agency.

8.6 System server

1. Professional cloud server hosting facility with fault-tolerant redundancy, automated load-balancing, and scalability to meet the service levels specified herein.
2. Storage of all telemetry, alert, and vehicle data with no age limit.
3. Polling, storage, and support for at least 3,000 signal controllers
4. Performance of at least 95% uptime

8.7 Security features

1. User login through credentials and OAuth protocol
2. Authentication and encryption with public key infrastructure (PKI) and Datagram/Transport Layer Security (DTLS/TLS1.0+) protocol
3. Account verification through email
4. Secure password reset
5. Administrative management of user profiles and customizable privileges for users internal and external to operating agency
6. Secure Virtual Private Network (VPN) connection
7. HTTPS/SSL communication to the server from the public Internet

8.8 Signal equipment monitoring

1. Shall support live display of all telemetry data with latency not to exceed 1 second with at least LTE connectivity.
2. Shall support historical display for at least 3 months of all telemetry data on-demand with load latency not to exceed 1 second.
3. Shall support a viewing mode in which all telemetry data is displayed overlaid onto a diagram of the intersection.
4. Shall support a viewing mode in which all telemetry data is displayed in a timing diagram format in which interval length is displayed in seconds for each signal phase.
5. Shall support display of environmental weather conditions, including precipitation and temperature, as part of live and historical viewing of telemetry data.
6. Shall provide networking support for secure monitoring by operating agency's third-party software of equipment connected via serial communications
7. Shall provide reporting on signal telemetry, detector, and alert data.

8.9 Data reports and Automated Traffic Signal Performance Measures (ATSPM) on metrics enabled by monitored detection implemented at intersection

1. Secure remote access to dashboard for traffic count data
2. Available data in at least 15-minute intervals
3. Summary charts and trend reporting with user-selectable parameters
 - a. Turning movement counts
 - b. Vehicle type
 - c. Percentiles
 - d. Historical date range selection
 - e. Delay per vehicle and per approach
 - f. Approach volume and speed
 - g. Red light runners
 - h. Arrivals on green
 - i. Arrivals on red
 - j. Split failures
 - k. Platoon ratios
 - l. Pedestrian actuations
 - m. Pedestrian delay
 - n. Detector count and duration
 - o. Queue length
 - p. Queue spillback
 - q. Intersection level of service
 - r. Total cost

- s. CO₂ emissions
 - t. Travel time
 - u. Purdue phase termination, split failures, adjustment optimization, and predicted coordination diagrams
4. Exportable data summary formats, including Portable Document Format (pdf), MS Excel (xlsx), and Comma-Separated Values (csv)

8.10 Video viewing

- 1. Access from Web browsers to live video streams without third-party plugins and additional software installation
- 2. Access from tablet Web browsers with HTTP Live Streaming (HLS)
- 3. Support a minimum of 300 total simultaneous video streams among all cameras
- 4. Allows users to virtually pan, tilt, and zoom the video feed
- 5. Support live video streaming of any third-party camera connected over Ethernet to the integration device that supports non-proprietary codecs and RTSP streaming
- 6. Support live video streaming with an initial load time of no more than 10 seconds
- 7. Support live video streaming with a latency of no more than 10 seconds at a frame rate of at least 15 fps
- 8. Support at least 10 concurrent video streams from a single camera to be viewed in multiple browsers
- 9. Allow users to recall, download, and view intersection video recorded and stored at the intersection for up to 14 days

8.11 Video detection configuration

- 1. Web-based user interface for configuration of detection zones
- 2. Configuration of rectangular and irregular polygon shaped zones and pulse or presence detection zones
- 3. Secure remote configuration of system without additional connectivity costs
- 4. Full configuration history for remote changes
- 5. Local roadside configuration of all detection zones

8.12 External data interface

- 1. Support external data access by shared open protocol or documented network-based Application Programming Interface (API)
 - a. Turning movement count data in minimum 15-minute intervals
 - b. Crosswalk bi-directional pedestrian counts in minimum 15-minute intervals
 - c. Intersection information including geographic coordinates
 - d. Active alert data

2. Open data interface format including JSON and XML
3. Support administrative management and security of data interface
4. Provide API documentation and testing support
5. Secure access to all stored multimodal count data

8.13 Management functions

1. Signal assessment information on signal operations and maintenance, signal configuration, signal performance, input data quality, and alert volume
2. Condition detection and alerting
 - a. Power outage
 - b. Signal flash operation
 - c. Digital I/O signals
 - d. Detector failure
 - e. Preemption failure
 - f. Controller failure
 - g. Support
3. Issue reporting with prioritization, acknowledgement, comment, assignment, resolution, recipients, and user-customizable SMS text and email alerting functions
4. Viewing of information in tabular and geographic format with user-selectable filtering
5. Data query by date and time
6. Record retention for at least 5 years
7. Exportable data formats, including MS Excel (xlsx) and Comma-Separated Values (csv)
8. Asset management features
 - a. Create geographical placeholders for intersections without a device installed
 - b. Record cabinet equipment inventory information for each intersection
 - c. Upload and store reference files (up to 1 GB) with each node in the network
 - d. View all asset information and uploaded reference files

8.14 Cellular communications

1. Fully communicate with the integration device over 4G LTE cellular data service and local network of the operating agency
2. Provide at least 1 GB per month per location for 4G LTE cellular data usage, pooled collectively among all monitored intersections of the operating agency
3. Support failover from 4G to 3G with incremental fallback
4. Provide cellular signal strength readings with field unit to support integration device deployment (RSSI or Received Signal Strength Indicator for 3G, CDMA/UTMS/, and RSRP for Reference Signal Received Power for 4G LTE)

5. Provide cellular signal quality readings with field unit to support integration device deployment (ECIO or Energy to Interference Ratio for 3G, CDMA/UMTS/, RSRQ or Reference Signal Received Quality for 4G LTE, and SINR or Signal to Interference-plus-Noise-Ratio for 4G LTE)

9. SHIPPING

All technology enhancement equipment and hardware shall be packed to provide protection during shipping. Instructions must be included in each package. Packages shall be labeled indicating contents and shall include the manufacturer and model numbers.

DRILLED SHAFTS

Effective: October 5, 2015

Revised: October 27, 2023

Revise Section 516 of the Standard Specifications to read:

“SECTION 516. DRILLED SHAFTS

516.01 Description. This work shall consist of constructing drilled shaft foundations.

516.02 Materials. Materials shall be according to the following.

Item	Article/Section
(a) Portland Cement Concrete (Note 1)	1020
(b) Reinforcement Bars.....	1006.10
(c) Grout (Note 2).....	1024.01
(d) Permanent Steel Casing.....	1006.05(d)
(e) Slurry (Note 3)	

Note 1. When the soil contains sulfate contaminates, ASTM C 1580 testing will be performed to assess the severity of sulfate exposure to the concrete. If the sulfate contaminate is >0.10 to < 0.20 percent by mass, a Type II (MH) cement shall be used. If the sulfate contaminate is >0.20 to < 2.0 percent by mass, a Type V cement shall be used. If the sulfate contaminate is \geq 2.0 percent by mass, refer to ACI 201.2R for guidance.

Note 2. The sand-cement grout mix shall be according to Section 1020 and shall be two to five parts sand and one part Type I or II cement. The maximum water cement ratio shall be sufficient to provide a flowable mixture with a typical slump of 10 in. (250 mm).

Note 3. Slurry shall be bentonite, emulsified polymer, or dry polymer, and shall be approved by the Engineer.

516.03 Equipment. Equipment shall be according to the following.

Item	Article/Section
(a) Concrete Equipment	1020.03
(b) Drilling Equipment (Note 1)	
(c) Hand Vibrator	1103.17(a)
(d) Underwater Concrete Placement Equipment	1103.18

Note 1. The drilling equipment shall have adequate capacity, including power, torque and down thrust, to create a shaft excavation of the maximum diameter specified to a depth of 20 percent beyond the depths shown on the plans.

516.04 Submittals. The following information shall be submitted on form BBS 133.

- (a) Qualifications. At the time of the preconstruction conference, the Contractor shall provide the following documentation.
- (1) References. A list containing at least three projects completed within the three years prior to this project's bid date which the Contractor performing this work has installed drilled shafts of similar diameter, length, and site conditions to those shown in the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractor's participation on those projects.
 - (2) Experience. Name and experience record of the drilled shaft supervisor, responsible for all facets of the shaft installation, and the drill operator(s) who will be assigned to this project. The supervisor and operator(s) shall each have a minimum of three years experience in the construction of drilled shafts.
- (b) Installation Procedure. A detailed installation procedure shall be submitted to the Engineer for acceptance at least 28 days prior to drilled shaft construction and shall address each of the following items unless otherwise directed by the Engineer in writing.
- (1) Equipment List. List of proposed equipment to be used including cranes, drill rigs, augers, belling tools, casing, vibratory hammers, core barrels, bailing buckets, final cleaning equipment, slurry equipment, tremies, or concrete pumps, etc.
 - (2) General Sequence. Details of the overall construction operation sequence, equipment access, and the sequence of individual shaft construction within each substructure bent or footing group. The submittal shall address the Contractor's proposed time delay and/or the minimum concrete strength necessary before initiating a shaft excavation adjacent to a recently installed drilled shaft.

- (3) Shaft Excavation. A site specific step by step description of how the Contractor anticipates the shaft excavation to be advanced based on their evaluation of the subsurface data and conditions expected to be encountered. This sequence shall note the method of casing advancement, anticipated casing lengths, tip elevations and diameters, the excavation tools used and drilled diameters created. The Contractor shall indicate whether wet or dry drilling conditions are expected and if groundwater will be sealed from the excavation.
- (4) Slurry. When the use of slurry is proposed, details on the types of additives to be used and their manufacturers shall be provided. In addition, details covering the measurement and control of the hardness of the mixing water, agitation, circulation, de-sanding, sampling, testing, and chemical properties of the slurry shall be submitted.
- (5) Shaft Cleaning. Method(s) and sequence proposed for the shaft cleaning operation.
- (6) Reinforcement Cage and Permanent Casing. Details of reinforcement placement including rolling spacers to be used and method to maintain proper elevation and location of the reinforcement cage within the shaft excavation during concrete placement. The method(s) of adjusting the reinforcement cage length and permanent casing if rock is encountered at an elevation other than as shown on the plans. As an option, the Contractor may perform soil borings and rock cores at the drilled shaft locations to determine the required reinforcement cage and permanent casing lengths.
- (7) Concrete Placement. Details of concrete placement including proposed operational procedures for free fall, tremie or pumping methods. The sequence and method of casing removal shall also be stated along with the top of pour elevation, and method of forming through water above streambed.
- (8) Mix Design. The proposed concrete mix design(s).
- (9) Disposal Plan. Containment and disposal plan for slurry and displaced water. Containment and disposal plan for contaminated concrete pushed out of the top of the shaft by uncontaminated concrete during concrete placement.
- (10) Access and Site Protection Plan. Details of access to the drilled shafts and safety measures proposed. This shall include a list of casing, scaffolding, work platforms, temporary walkways, railings, and other items needed to provide safe access to the drilled shafts. Provisions to protect open excavations during non-working hours shall be included.

The Engineer will evaluate the drilled shaft installation procedure and notify the Contractor of acceptance, need for additional information, or concerns with the installation's effect on the existing or proposed structure(s).

CONSTRUCTION REQUIREMENTS

516.05 General. Excavation for drilled shaft(s) shall not proceed until written authorization is received from the Engineer. The Contractor shall be responsible for verification of the dimensions and alignment of each shaft excavation as directed by the Engineer.

Unless otherwise approved in the Contractor's installation procedure, no shaft excavation, casing installation, or casing removal with a vibratory hammer shall be made within four shaft diameters center to center of a shaft with concrete that has a compressive strength less than 1500 psi (10,300 kPa). The site-specific soil strengths and installation methods selected will determine the actual required minimum spacing, if any, to address vibration and blow out concerns.

Lost tools shall not remain in the shaft excavation without the approval of the Engineer.

Blasting shall not be used as a method of shaft excavation.

516.06 Shaft Excavation Protection Methods. The construction of drilled shafts may involve the use of one or more of the following methods to support the excavation during the various phases of shaft excavation, cleaning, and concrete placement dependent on the site conditions encountered. Surface water shall not flow uncontrolled into the shaft excavation, however water may be placed into the shaft excavation in order to meet head pressure requirements according to Articles 516.06(c) and 516.13.

The following are general descriptions indicating the conditions when these methods may be used.

(a) **Dry Method.** The dry construction method shall only be used at sites where the groundwater and soil conditions are suitable to permit the drilling and dewatering of the excavation without causing subsidence of adjacent ground, boiling of the base soils, squeezing, or caving of the shaft side walls. The dry method shall consist of drilling the shaft excavation, removing accumulated water, cleaning the shaft base, and placing the reinforcement cage and concrete in a predominately dry excavation.

Slurry Method. The slurry construction method may be used at sites where dewatering the excavation would cause collapse of the shaft sidewalls or when the volume and head of water flowing into the shaft is likely to contaminate the concrete during placement resulting in a shaft defect. This method uses slurry, or in rare cases water, to maintain stability of the shaft sidewall while advancing the shaft excavation. After the shaft excavation is completed, the slurry level in the shaft shall be kept at an elevation to maintain stability of the shaft sidewall, maintain stability of the shaft base, and prevent additional groundwater from entering the shaft. The shaft base shall be cleaned, the reinforcement cage shall be set, and the concrete shall be discharged at the bottom of the shaft excavation, displacing the slurry upwards.

- (b) Temporary Casing Method. Temporary casing shall be used when either the dry or slurry methods provide inadequate support to prevent sidewall caving or excessive deformation of the shaft excavation. Temporary casing may be used with slurry or be used to reduce the flow of water into the excavation to allow dewatering and concrete placement in a dry shaft excavation. Temporary casing shall not be allowed to remain permanently without the approval of the Engineer.

During removal of the temporary casing, the level of concrete in the casing shall be maintained at a level such that the head pressure inside the casing is a minimum of 1.25 times the head pressure outside the casing, but in no case is less than 5 ft (1.5 m) above the bottom of the casing. Casing removal shall be at a slow, uniform rate with the pull in line with the shaft axis. Excessive rotation of the casing shall be avoided to limit deformation of the reinforcement cage. In addition, the slump requirements during casing removal shall be according to Article 516.12.

When called for on the plans, the Contractor shall install a permanent casing as specified. Permanent casing may be used as a shaft excavation support method or may be installed after shaft excavation is completed using one of the above methods. After construction, if voids are present between the permanent casing and the drilled excavation, the voids shall be filled with grout by means of tremie(s) or concrete pump which shall be lowered to the bottom of the excavation. The contractor's means and methods for grout placement shall fill the annular void(s) between the permanent casing and the surrounding earth material to restore and provide lateral earth resistance to the shaft. Grout yield checks shall be performed by the contractor for submittal to the Engineer. Permanent casing shall not remain in place beyond the limits shown on the plans without the specific approval of the Engineer.

When the shaft extends above the streambed through a body of water and permanent casing is not shown, the portion above the streambed shall be formed with removable casings, column forms, or other forming systems as approved by the Engineer. The forming system shall not scar or spall the finished concrete or leave in place any forms or casing within the removable form limits as shown on the plans unless approved as part of the installation procedure. The forming system shall not be removed until the concrete has attained a minimum compressive strength of 2500 psi (17,200 kPa) and cured for a minimum of 72 hours. For shafts extending through water, the concrete shall be protected from water action after placement for a minimum of seven days.

516.07 Slurry. When slurry is used, the Contractor shall provide a technical representative of the slurry additive manufacturer at the site prior to introduction of the slurry into the first shaft where slurry will be used, and during drilling and completion of a minimum of one shaft to adjust the slurry mix to the specific site conditions. During construction, the level of the slurry shall be maintained a minimum of 5 feet (1.5 m) above the height required to prevent caving of the shaft excavation. In the event of a sudden or significant loss of slurry in the shaft excavation, the construction of that foundation shall be stopped and the shaft excavation backfilled or supported by temporary casing, until a method to stop slurry loss, or an alternate construction procedure, has been approved by the Engineer.

- (a) General Properties. The material used to make the slurry shall not be detrimental to the concrete or surrounding ground. Mineral slurries shall have both a mineral grain size that remains in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Polymer slurries shall have sufficient viscosity and gel characteristics to transport excavated material to suitable screening systems or settling tanks. The percentage and specific gravity of the material used to make the slurry shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement.

If approved by the Engineer, the Contractor may use water and excavated soils as drilling slurry. In this case, the range of acceptable values for density, viscosity and pH, as shown in the following table for bentonite slurry shall be met.

When water is used as the slurry to construct rock sockets in limestone, dolomite, sandstone or other formations that are not erodible, the requirements for slurry testing shall not apply if the entire fluid column is replaced with fresh water after drilling. To do so, fresh water shall be introduced at the top of the shaft excavation and existing water used during drilling shall be pumped out of the shaft excavation from the bottom of the shaft excavation until the entire volume of fluid has been replaced.

- (b) Preparation. Prior to introduction into the shaft excavation, the manufactured slurry admixture shall be pre-mixed thoroughly with clean, fresh water and for adequate time in accordance with the slurry admixture manufacturer's recommendations. Slurry tanks of adequate capacity shall be used for slurry mixing, circulation, storage and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without approval from the Engineer. Adequate desanding equipment shall be provided to control slurry properties during the drilled shaft excavation in accordance with the values provided in Table 1.
- (c) Quality Control. Quality control tests shall be performed on the slurry to determine density, viscosity, sand content and pH of freshly mixed slurry, recycled slurry and slurry in the shaft excavation. Tests of slurry samples from within two feet of the bottom and at mid-height of the shaft excavation shall be conducted in each shaft excavation during the excavation process to measure the consistency of the slurry. A minimum of four sets of tests shall be conducted during the first eight hours of slurry use on the project. When a series of four test results do not change more than 1% from the initial test, the testing frequency may be decreased to one set every four hours of slurry use. Reports of all tests, signed by an authorized representative of the Contractor, shall be furnished to the Engineer upon completion of each drilled shaft. The physical properties of the slurry shall be as shown in Table 1.

The slurry shall be sampled and tested less than 1 hour before concrete placement. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be removed. The contractor shall perform final shaft bottom cleaning after suspended solids have settled from the slurry. Concrete shall not be placed if the slurry does not have the required physical properties.

Table 1 – SLURRY PROPERTIES				
	Bentonite	Emulsified Polymer	Dry Polymer	Test Method
Density, lb/cu ft (kg/cu m) (at introduction)	65.2 ± 1.6 ¹ (1043.5 ± 25.6)	63 (1009.0) max.	63 (1009.0) max.	ASTM D 4380
Density, lb/cu ft (kg/cu m) (prior to concrete placement)	67.0 ± 3.5 ¹ (1073.0 ± 56.0)	63 (1009.0) max.	63 (1009.0) max.	ASTM D 4380
Viscosity ² , sec/qt (sec/L)	46 ± 14 (48 ± 14)	38 ± 5 (40 ± 5)	65 ± 15 (69 ± 16)	ASTM D 6910
pH	9.0 ± 1.0	9.5 ± 1.5	9.0 ± 2.0	ASTM D 4972
Sand Content, percent by volume (at introduction)	4 max.	1 max.	1 max.	ASTM D 4381
Sand Content, percent by volume (prior to concrete placement)	10 max.	1 max.	1 max.	ASTM D 4381
Contact Time ³ , hours	4 max.	72 max.	72 max	

Note 1. When the slurry consists of only water and excavated soils, the density shall not exceed 70 lb/cu ft (1121 kg/cu m).

Note 2. Higher viscosities may be required in loose or gravelly sand deposits.

Note 3. Contact time is the time without agitation and sidewall cleaning.

516.08 Obstructions. An obstruction is an unknown isolated object that causes the shaft excavation method to experience a significant decrease in the actual production rate and requires the Contractor to core, break up, push aside, or use other means to mitigate the obstruction. Subsurface conditions such as boulders, cobbles, or logs and buried infrastructure such as footings, piling, or abandoned utilities, when shown on the plans, shall not constitute an obstruction. When an obstruction is encountered, the Contractor shall notify the Engineer immediately and upon concurrence of the Engineer, the Contractor shall mitigate the obstruction with an approved method.

516.09 Top of Rock. The top of rock will be considered as the point where rock, defined as bedded deposits and conglomerate deposits exhibiting the physical characteristics and difficulty of rock removal as determined by the Engineer, is encountered which cannot be drilled with augers and/or underreaming tools configured to be effective in the soils indicated in the contract documents.

516.10 Design Modifications. If the top of rock elevation differs from that shown on the plans by more than 10 percent of the length of the drilled shaft above the rock, the Engineer shall be contacted to determine if any drilled shaft design changes may be required. In addition, if the type of soil or rock encountered is not similar to that shown in the subsurface exploration data, the Contractor may be required to extend the drilled shaft length(s) beyond those specified in the plans. In either case, the Engineer will determine if revisions are necessary and the extent of the modifications required.

516.11 Excavation Cleaning and Inspection. Materials removed or generated from the shaft excavations shall be disposed of according to Article 202.03.

After excavation, each shaft shall be cleaned. For a drilled shaft terminating in soil, the depth of sediment or debris shall be a maximum of 1 1/2 in. (38 mm). For a drilled shaft terminating in rock, the depth of sediment or debris shall be a maximum of 1/2 in. (13 mm).

A shaft excavation shall be overreamed when, in the opinion of the Engineer, the sidewall has softened, swelled, or has a buildup of slurry cake. Overreaming may also be required to correct a shaft excavation which has been drilled out of tolerance. Overreaming may be accomplished with a grooving tool, overreaming bucket, or other approved equipment. Overreaming thickness shall be a minimum of 1/2 in. (13 mm) and a maximum of 3 in. (75 mm).

516.12 Reinforcement. This work shall be according to Section 508 and the following.

The shaft excavation shall be cleaned and inspected prior to placing the reinforcement cage. The reinforcement cage shall be completely assembled prior to drilling and be ready for adjustment in length as required by the conditions encountered. The reinforcement cage shall be lifted using multiple point sling straps or other approved methods to avoid reinforcement cage distortion or stress. Cross frame stiffeners may be required for lifting or to keep the reinforcement cage in proper position during lifting and concrete placement.

The Contractor shall attach rolling spacers to keep the reinforcement cage centered within the shaft excavation during concrete placement and to ensure that at no point will the finished shaft have less than the minimum concrete cover(s) shown on the plans. The rolling spacers or other approved non-corrosive spacing devices shall be installed within 2 ft (0.6 m) of both the top and bottom of the drilled shaft and at intervals not exceeding 10 ft (3 m) throughout the length of the shaft to ensure proper reinforcement cage alignment and clearance for the entire shaft. The number of rolling spacers at each level shall be one for each 1.0 ft (300 mm) of shaft diameter, with a minimum of four rolling spacers at each level. For shafts with different shaft diameters throughout the length of the excavation, different sized rolling spacers shall be provided to ensure the reinforcement cage is properly positioned throughout the entire length of the shaft.

When a specific concrete cover between the base of the drilled shaft and the reinforcement cage is shown on the plans, the bottom of the reinforcement cage shall be supported so that the proper concrete cover is maintained.

If the conditions differ such that the length of the shaft is increased, additional longitudinal bars shall be either mechanically spliced or lap spliced to the lower end of the reinforcement cage and confined with either hoop ties or spirals. The Contractor shall have additional reinforcement available or fabricate the reinforcement cages with additional length as necessary to make the required adjustments in a timely manner as dictated by the encountered conditions. The additional reinforcement may be non-epoxy coated.

516.13 Concrete Placement. Concrete work shall be performed according to the following.

Throughout concrete placement the head pressure inside the drilled shaft shall be at least 1.1 times the head pressure outside the drilled shaft.

Concrete placement shall begin within 1 hour of shaft cleaning and inspection. The pour shall be made in a continuous manner from the bottom to the top elevation of the shaft as shown on the contract plan or as approved in the Contractor's installation procedure. Concrete placement shall continue after the shaft excavation is full and until 18 in. (450 mm) of good quality, uncontaminated concrete is expelled at the top of shaft. Vibration of the concrete will not be allowed when the concrete is displacing slurry or water. In dry excavations, the concrete in the top 10 ft (3 m) of the shaft shall be vibrated.

When using temporary casing or placing concrete under water or slurry, a minimum of seven days prior to concrete placement, a 4 cu yd (3 cu m) trial batch of the concrete mixture shall be performed to evaluate slump retention. Temporary casing shall be withdrawn before the slump of the concrete drops below 6 in. (150 mm). For concrete placed using the slurry method of construction, the slump of all concrete placed shall be a minimum of 6 in. (150 mm) at the end of concrete placement.

Devices used to place concrete shall have no aluminum parts in contact with concrete.

When the top of the shaft is at the finished elevation and no further concrete placement above the finished elevation is specified, the top of the shaft shall be level and finished according to Article 503.15(a).

Concrete shall be placed by free fall, tremie, or concrete pump subject to the following conditions.

- (a) Free Fall Placement. Concrete shall only be placed by free fall when the rate of water infiltration into the shaft excavation is less than 12 in. (300 mm) per hour and the depth of water in the shaft excavation is less than 3 in. (75 mm) at the time of concrete placement.

Concrete placed by free fall shall fall directly to the base without contacting the reinforcement cage, cross frame stiffeners, or shaft sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

Drop chutes used to direct placement of free fall concrete shall consist of a smooth tube. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. The drop chute shall be supported so that free fall does not exceed 60 ft (18.3 m) for conventional concrete or 30 ft (9.1 m) for self-consolidating concrete. If placement cannot be satisfactorily accomplished by free fall in the opinion of the Engineer, either a tremie or pump shall be used to accomplish the pour.

- (b) Tremie and Concrete Pump Placement. Concrete placement shall be according to Article 503.08, except the discharge end of the steel pipe shall remain embedded in the concrete a minimum of 10 ft (3.0 m) throughout concrete placement when displacing slurry or water.

516.14 Construction Tolerances. The following construction tolerances shall apply to all drilled shafts.

- (a) Center of Shaft. The center of the drilled shaft shall be within 3 in. (75 mm) of the plan station and offset at the top of the shaft.
- (b) Center of Reinforcement Cage. The center of the reinforcement cage shall be within 1 1/2 in. (40 mm) of plan station and offset at the top of the shaft.
- (c) Vertical Plumbness of Shaft. The out of vertical plumbness of the shaft shall not exceed 1.5 percent.
- (d) Vertical Plumbness of Reinforcement Cage. The out of vertical plumbness of the shaft reinforcement cage shall not exceed 0.83 percent.

- (e) Top of Shaft. The top of the shaft shall be no more than 1 in. (25 mm) above and no more than 3 in. (75 mm) below the plan elevation.
- (f) Top of Reinforcement Cage. The top of the reinforcement cage shall be no more than 1 in. (25 mm) above and no more than 3 in. (75 mm) below the plan elevation.
- (g) Bottom of shaft. Excavation equipment and methods used to complete the shaft excavation shall have a nearly planar bottom. The cutting edges of excavation equipment used to create the bottom of shafts in rock shall be normal to the vertical axis of the shaft within a tolerance of 6.25 percent.

516.15 Method of Measurement. This work will be measured for payment in place and the volume computed in cubic yards (cubic meters). The volume will be computed using the plan diameter of the shaft multiplied by the measured length of the shaft. The length of shaft in soil will be computed as the difference in elevation between the top of the drilled shaft shown on the plans, or as installed as part of the Contractor's installation procedure, and the bottom of the shaft or the top of rock (when present) whichever is higher. The length of shaft in rock will be computed as the difference in elevation between the measured top of rock and the bottom of the shaft.

When permanent casing is specified, it will be measured for payment in place, in feet (meters). Permanent casing installed at the Contractor's option will not be measured for payment.

Reinforcement furnished and installed will be measured for payment according to Article 508.07.

516.16 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for DRILLED SHAFT IN SOIL, and/or DRILLED SHAFT IN ROCK.

Permanent casing will be paid for at the contract unit price per foot (meter) for PERMANENT CASING.

Reinforcement furnished and installed will be paid for according to Article 508.08. Obstruction mitigation will be paid for according to Article 109.04."

CEMENT, TYPE IL (BDE)

Effective: August 1, 2023

Add the following to Article 302.02 of the Standard Specifications:

“(k) Type IL Portland-Limestone Cement1001”

Revise Note 2 of Article 352.02 of the Standard Specifications to read:

“Note 2. Either Type I or Type IA portland cement or Type IL portland-limestone cement shall be used.”

Revise Note 1 of Article 404.02 of the Standard Specifications to read:

“Note 1. The cement shall be Type I portland cement or Type IL portland-limestone cement.”

Revise Article 1019.02(a) of the Standard Specifications to read:

“(a) Cement, Type I or IL1001”

COMPENSABLE DELAY COSTS (BDE)

Effective: June 2, 2017

Revised: April 1, 2019

Revise Article 107.40(b) of the Standard Specifications to read:

“(b) Compensation. Compensation will not be allowed for delays, inconveniences, or damages sustained by the Contractor from conflicts with facilities not meeting the above definition; or if a conflict with a utility in an unanticipated location does not cause a shutdown of the work or a documentable reduction in the rate of progress exceeding the limits set herein. The provisions of Article 104.03 notwithstanding, compensation for delays caused by a utility in an unanticipated location will be paid according to the provisions of this Article governing minor and major delays or reduced rate of production which are defined as follows.

- (1) Minor Delay. A minor delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two hours, but not to exceed two weeks.
- (2) Major Delay. A major delay occurs when the work in conflict with the utility in an unanticipated location is completely stopped for more than two weeks.
- (3) Reduced Rate of Production Delay. A reduced rate of production delay occurs when the rate of production on the work in conflict with the utility in an unanticipated location decreases by more than 25 percent and lasts longer than seven calendar days.”

Revise Article 107.40(c) of the Standard Specifications to read:

“(c) Payment. Payment for Minor, Major, and Reduced Rate of Production Delays will be made as follows.

- (1) Minor Delay. Labor idled which cannot be used on other work will be paid for according to Article 109.04(b)(1) and (2) for the time between start of the delay and the minimum remaining hours in the work shift required by the prevailing practice in the area.

Equipment idled which cannot be used on other work, and which is authorized to standby on the project site by the Engineer, will be paid for according to Article 109.04(b)(4).

- (2) Major Delay. Labor will be the same as for a minor delay.

Equipment will be the same as for a minor delay, except Contractor-owned equipment will be limited to two weeks plus the cost of move-out to either the Contractor's yard or another job and the cost to re-mobilize, whichever is less. Rental equipment may be paid for longer than two weeks provided the Contractor presents adequate support to the Department (including lease agreement) to show retaining equipment on the job is the most economical course to follow and in the public interest.

- (3) Reduced Rate of Production Delay. The Contractor will be compensated for the reduced productivity for labor and equipment time in excess of the 25 percent threshold for that portion of the delay in excess of seven calendar days. Determination of compensation will be in accordance with Article 104.02, except labor and material additives will not be permitted.

Payment for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be determined according to Article 109.13.”

Revise Article 108.04(b) of the Standard Specifications to read:

“(b) No working day will be charged under the following conditions.

- (1) When adverse weather prevents work on the controlling item.
- (2) When job conditions due to recent weather prevent work on the controlling item.
- (3) When conduct or lack of conduct by the Department or its consultants, representatives, officers, agents, or employees; delay by the Department in making the site available; or delay in furnishing any items required to be furnished to the Contractor by the Department prevents work on the controlling item.

- (4) When delays caused by utility or railroad adjustments prevent work on the controlling item.
- (5) When strikes, lock-outs, extraordinary delays in transportation, or inability to procure critical materials prevent work on the controlling item, as long as these delays are not due to any fault of the Contractor.
- (6) When any condition over which the Contractor has no control prevents work on the controlling item.”

Revise Article 109.09(f) of the Standard Specifications to read:

“(f) **Basis of Payment.** After resolution of a claim in favor of the Contractor, any adjustment in time required for the work will be made according to Section 108. Any adjustment in the costs to be paid will be made for direct labor, direct materials, direct equipment, direct jobsite overhead, direct offsite overhead, and other direct costs allowed by the resolution. Adjustments in costs will not be made for interest charges, loss of anticipated profit, undocumented loss of efficiency, home office overhead and unabsorbed overhead other than as allowed by Article 109.13, lost opportunity, preparation of claim expenses and other consequential indirect costs regardless of method of calculation.

The above Basis of Payment is an essential element of the contract and the claim cost recovery of the Contractor shall be so limited.”

Add the following to Section 109 of the Standard Specifications.

“**109.13 Payment for Contract Delay.** Compensation for escalated material costs, escalated labor costs, extended project overhead, and extended traffic control will be allowed when such costs result from a delay meeting the criteria in the following table.

Contract Type	Cause of Delay	Length of Delay
Working Days	Article 108.04(b)(3) or Article 108.04(b)(4)	No working days have been charged for two consecutive weeks.
Completion Date	Article 108.08(b)(1) or Article 108.08(b)(7)	The Contractor has been granted a minimum two week extension of contract time, according to Article 108.08.

Payment for each of the various costs will be according to the following.

- (a) **Escalated Material and/or Labor Costs.** When the delay causes work, which would have otherwise been completed, to be done after material and/or labor costs have increased, such increases will be paid. Payment for escalated material costs will be limited to the increased costs substantiated by documentation furnished by the Contractor. Payment for escalated labor costs will be limited to those items in Article 109.04(b)(1) and (2), except the 35 percent and 10 percent additives will not be permitted.

(b) Extended Project Overhead. For the duration of the delay, payment for extended project overhead will be paid as follows.

(1) Direct Jobsite and Offsite Overhead. Payment for documented direct jobsite overhead and documented direct offsite overhead, including onsite supervisory and administrative personnel, will be allowed according to the following table.

Original Contract Amount	Supervisory and Administrative Personnel
Up to \$5,000,000	One Project Superintendent
Over \$ 5,000,000 - up to \$25,000,000	One Project Manager, One Project Superintendent or Engineer, and One Clerk
Over \$25,000,000 - up to \$50,000,000	One Project Manager, One Project Superintendent, One Engineer, and One Clerk
Over \$50,000,000	One Project Manager, Two Project Superintendents, One Engineer, and One Clerk

(2) Home Office and Unabsorbed Overhead. Payment for home office and unabsorbed overhead will be calculated as 8 percent of the total delay cost.

(c) Extended Traffic Control. Traffic control required for an extended period of time due to the delay will be paid for according to Article 109.04.

When an extended traffic control adjustment is paid under this provision, an adjusted unit price as provided for in Article 701.20(a) for increase or decrease in the value of work by more than ten percent will not be paid.

Upon payment for a contract delay under this provision, the Contractor shall assign subrogation rights to the Department for the Department's efforts of recovery from any other party for monies paid by the Department as a result of any claim under this provision. The Contractor shall fully cooperate with the Department in its efforts to recover from another party any money paid to the Contractor for delay damages under this provision."

CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)

Effective: June 1, 2010

Revised: November 1, 2014

The reduction of emissions of particulate matter (PM) for off-road equipment shall be accomplished by installing retrofit emission control devices. The term “equipment” refers to diesel fuel powered devices rated at 50 hp and above, to be used on the jobsite in excess of seven calendar days over the course of the construction period on the jobsite (including rental equipment).

Contractor and subcontractor diesel powered off-road equipment assigned to the contract shall be retrofitted using the phased in approach shown below. Equipment that is of a model year older than the year given for that equipment’s respective horsepower range shall be retrofitted:

Effective Dates	Horsepower Range	Model Year
June 1, 2010 ^{1/}	600-749	2002
	750 and up	2006
June 1, 2011 ^{2/}	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 ^{2/}	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

- 1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.
- 2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

- a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (<http://www.epa.gov/cleandiesel/verification/verif-list.htm>), or verified by the California Air Resources Board (CARB) (<http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>); or
- b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

Diesel Retrofit Deficiency Deduction

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be \$1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected. Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (DBE)

Effective: September 1, 2000

Revised: March 2, 2019

FEDERAL OBLIGATION. The Department of Transportation, as a recipient of federal financial assistance, is required to take all necessary and reasonable steps to ensure nondiscrimination in the award and administration of contracts. Consequently, the federal regulatory provisions of 49 CFR Part 26 apply to this contract concerning the utilization of disadvantaged business enterprises. For the purposes of this Special Provision, a disadvantaged business enterprise (DBE) means a business certified by the Department in accordance with the requirements of 49 CFR Part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory.

STATE OBLIGATION. This Special Provision will also be used by the Department to satisfy the requirements of the Business Enterprise for Minorities, Females, and Persons with Disabilities Act, 30 ILCS 575. When this Special Provision is used to satisfy state law requirements on 100 percent state-funded contracts, the federal government has no involvement in such contracts (not a federal-aid contract) and no responsibility to oversee the implementation of this Special Provision by the Department on those contracts. DBE participation on 100 percent state-funded contracts will not be credited toward fulfilling the Department's annual overall DBE goal required by the US Department of Transportation to comply with the federal DBE program requirements.

CONTRACTOR ASSURANCE. The Contractor makes the following assurance and agrees to include the assurance in each subcontract the Contractor signs with a subcontractor.

The Contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of contracts funded in whole or in part with federal or state funds. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (a) Withholding progress payments;
- (b) Assessing sanctions;
- (c) Liquidated damages; and/or
- (d) Disqualifying the Contractor from future bidding as non-responsible.

OVERALL GOAL SET FOR THE DEPARTMENT. As a requirement of compliance with 49 CFR Part 26, the Department has set an overall goal for DBE participation in its federally assisted contracts. That goal applies to all federal-aid funds the Department will expend in its federally assisted contracts for the subject reporting fiscal year. The Department is required to make a good faith effort to achieve the overall goal. The dollar amount paid to all approved DBE companies performing work called for in this contract is eligible to be credited toward fulfillment of the Department's overall goal.

CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. This contract includes a specific DBE utilization goal established by the Department. The goal has been included because the Department has determined the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies. The determination is based on an assessment of the type of work, the location of the work, and the availability of DBE companies to do a part of the work. The assessment indicates, in the absence of unlawful discrimination and in an arena of fair and open competition, DBE companies can be expected to perform **0.00%** of the work. This percentage is set as the DBE participation goal for this contract. Consequently, in addition to the other award criteria established for this contract, the Department will only award this contract to a bidder who makes a good faith effort to meet this goal of DBE participation in the performance of the work. A bidder makes a good faith effort for award consideration if either of the following is done in accordance with the procedures set for in this Special Provision:

- (a) The bidder documents enough DBE participation has been obtained to meet the goal or,
- (b) The bidder documents a good faith effort has been made to meet the goal, even though the effort did not succeed in obtaining enough DBE participation to meet the goal.

DBE LOCATOR REFERENCES. Bidders shall consult the IL UCP DBE Directory as a reference source for DBE-certified companies. In addition, the Department maintains a letting and item specific DBE locator information system whereby DBE companies can register their interest in providing quotes on particular bid items advertised for letting. Information concerning DBE companies willing to quote work for particular contracts may be obtained by contacting the Department's Bureau of Small Business Enterprises at telephone number (217) 785-4611, or by visiting the Department's website at:
<http://www.idot.illinois.gov/doing-business/certifications/disadvantaged-business-enterprise-certification/il-ucp-directory/index>.

BIDDING PROCEDURES. Compliance with this Special Provision is a material bidding requirement and failure of the bidder to comply will render the bid not responsive.

The bidder shall submit a DBE Utilization Plan (form SBE 2026), and a DBE Participation Statement (form SBE 2025) for each DBE company proposed for the performance of work to achieve the contract goal, with the bid. If the Utilization Plan indicates the contract goal will not be met, documentation of good faith efforts shall also be submitted. The documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor is selected over a DBE for work on the contract. The required forms and documentation must be submitted as a single .pdf file using the "Integrated Contractor Exchange (iCX)" application within the Department's "EBids System".

The Department will not accept a Utilization Plan if it does not meet the bidding procedures set forth herein and the bid will be declared not responsive. In the event the bid is declared not responsive, the Department may elect to cause the forfeiture of the penal sum of the bidder's proposal guaranty and may deny authorization to bid the project if re-advertised for bids.

GOOD FAITH EFFORT PROCEDURES. The contract will not be awarded until the Utilization Plan is approved. All information submitted by the bidder must be complete, accurate and adequately document enough DBE participation has been obtained or document the good faith efforts of the bidder, in the event enough DBE participation has not been obtained, before the Department will commit to the performance of the contract by the bidder. The Utilization Plan will be approved by the Department if the Utilization Plan documents sufficient commercially useful DBE work to meet the contract goal or the bidder submits sufficient documentation of a good faith effort to meet the contract goal pursuant to 49 CFR Part 26, Appendix A. This means the bidder must show that all necessary and reasonable steps were taken to achieve the contract goal. Necessary and reasonable steps are those which, by their scope, intensity and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not successful. The Department will consider the quality, quantity, and intensity of the kinds of efforts the bidder has made. Mere *pro forma* efforts, in other words efforts done as a matter of form, are not good faith efforts; rather, the bidder is expected to have taken genuine efforts that would be reasonably expected of a bidder actively and aggressively trying to obtain DBE participation sufficient to meet the contract goal.

- (a) The following is a list of types of action that the Department will consider as part of the evaluation of the bidder's good faith efforts to obtain participation. These listed factors are not intended to be a mandatory checklist and are not intended to be exhaustive. Other factors or efforts brought to the attention of the Department may be relevant in appropriate cases and will be considered by the Department.
 - (1) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBE companies that have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBE companies to respond to the solicitation. The bidder must determine with certainty if the DBE companies are interested by taking appropriate steps to follow up initial solicitations.
 - (2) Selecting portions of the work to be performed by DBE companies in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the Contractor might otherwise prefer to perform these work items with its own forces.
 - (3) Providing interested DBE companies with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.

- (4) a. Negotiating in good faith with interested DBE companies. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBE companies that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBE companies to perform the work.
 - b. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBE companies is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also the ability or desire of a bidder to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders are not, however, required to accept higher quotes from DBE companies if the price difference is excessive or unreasonable. In accordance with the above Bidding Procedures, the documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.
- (5) Not rejecting DBE companies as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.
 - (6) Making efforts to assist interested DBE companies in obtaining bonding, lines of credit, or insurance as required by the recipient or Contractor.
 - (7) Making efforts to assist interested DBE companies in obtaining necessary equipment, supplies, materials, or related assistance or services.
 - (8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBE companies.

- (b) If the Department determines the bidder has made a good faith effort to secure the work commitment of DBE companies to meet the contract goal, the Department will award the contract provided it is otherwise eligible for award. If the Department determines the bidder has failed to meet the requirements of this Special Provision or that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan that the bid is not responsive. The notification will also include a statement of reasons for the adverse determination. If the Utilization Plan is not approved because it is deficient as a technical matter, unless waived by the Department, the bidder will be notified and will be allowed no more than a five calendar day period to cure the deficiency.
- (c) The bidder may request administrative reconsideration of an adverse determination by emailing the Department at "DOT.DBE.UP@illinois.gov" within the five calendar days after the receipt of the notification of the determination. The determination shall become final if a request is not made on or before the fifth calendar day. A request may provide additional written documentation or argument concerning the issues raised in the determination statement of reasons, provided the documentation and arguments address efforts made prior to submitting the bid. The request will be reviewed by the Department's Reconsideration Officer. The Reconsideration Officer will extend an opportunity to the bidder to meet in person to consider all issues of documentation and whether the bidder made a good faith effort to meet the goal. After the review by the Reconsideration Officer, the bidder will be sent a written decision within ten working days after receipt of the request for reconsideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid not responsive.

CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work anticipated to be performed and paid for upon satisfactory completion. The Department is only able to count toward the achievement of the overall goal and the contract goal the value of payments made for the work actually performed by DBE companies. In addition, a DBE must perform a commercially useful function on the contract to be counted. A commercially useful function is generally performed when the DBE is responsible for the work and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The Department and Contractor are governed by the provisions of 49 CFR Part 26.55(c) on questions of commercially useful functions as it affects the work. Specific counting guidelines are provided in 49 CFR Part 26.55, the provisions of which govern over the summary contained herein.

- (a) DBE as the Contractor: 100 percent goal credit for that portion of the work performed by the DBE's own forces, including the cost of materials and supplies. Work that a DBE subcontracts to a non-DBE does not count toward the DBE goals.
- (b) DBE as a joint venture Contractor: 100 percent goal credit for that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work performed by the DBE's own forces.

- (c) DBE as a subcontractor: 100 percent goal credit for the work of the subcontract performed by the DBE's own forces, including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the DBE subcontractor from the Contractor or its affiliates. Work that a DBE subcontractor in turn subcontracts to a non-DBE does not count toward the DBE goal.
- (d) DBE as a trucker: 100 percent goal credit for trucking participation provided the DBE is responsible for the management and supervision of the entire trucking operation for which it is responsible. At least one truck owned, operated, licensed, and insured by the DBE must be used on the contract. Credit will be given for the following:
 - (1) The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
 - (2) The DBE may also lease trucks from a non-DBE firm, including from an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission it receives as a result of the lease arrangement.
- (e) DBE as a material supplier:
 - (1) 60 percent goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.
 - (2) 100 percent goal credit for the cost of materials or supplies obtained from a DBE manufacturer.
 - (3) 100 percent credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a DBE regular dealer or DBE manufacturer.

CONTRACT COMPLIANCE. Compliance with this Special Provision is an essential part of the contract. The Department is prohibited by federal regulations from crediting the participation of a DBE included in the Utilization Plan toward either the contract goal or the Department's overall goal until the amount to be applied toward the goals has been paid to the DBE. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan. After approval of the Utilization Plan and award of the contract, the Utilization Plan and individual DBE Participation Statements become part of the contract. If the Contractor did not succeed in obtaining enough DBE participation to achieve the advertised contract goal, and the Utilization Plan was approved and contract awarded based upon a determination of good faith, the total dollar value of DBE work calculated in the approved Utilization Plan as a percentage of the awarded contract value shall become the amended contract goal. All work indicated for performance by an approved DBE shall be performed, managed, and supervised by the DBE executing the DBE Participation Commitment Statement.

- (a) NO AMENDMENT. No amendment to the Utilization Plan may be made without prior written approval from the Department's Bureau of Small Business Enterprises. All requests for amendment to the Utilization Plan shall be emailed to the Department at DOT.DBE.UP@illinois.gov.
- (b) CHANGES TO WORK. Any deviation from the DBE condition-of-award or contract plans, specifications, or special provisions must be approved, in writing, by the Department as provided elsewhere in the Contract. The Contractor shall notify affected DBEs in writing of any changes in the scope of work which result in a reduction in the dollar amount condition-of-award to the contract. Where the revision includes work committed to a new DBE subcontractor, not previously involved in the project, then a Request for Approval of Subcontractor, Department form BC 260A or AER 260A, must be signed and submitted. If the commitment of work is in the form of additional tasks assigned to an existing subcontract, a new Request for Approval of Subcontractor will not be required. However, the Contractor must document efforts to assure the existing DBE subcontractor is capable of performing the additional work and has agreed in writing to the change.
- (c) SUBCONTRACT. The Contractor must provide copies of DBE subcontracts to the Department upon request. Subcontractors shall ensure that all lower tier subcontracts or agreements with DBEs to supply labor or materials be performed in accordance with this Special Provision.
- (d) ALTERNATIVE WORK METHODS. In addition to the above requirements for reductions in the condition of award, additional requirements apply to the two cases of Contractor-initiated work substitution proposals. Where the contract allows alternate work methods which serve to delete or create underruns in condition of award DBE work, and the Contractor selects that alternate method or, where the Contractor proposes a substitute work method or material that serves to diminish or delete work committed to a DBE and replace it with other work, then the Contractor must demonstrate one of the following:
- (1) The replacement work will be performed by the same DBE (as long as the DBE is certified in the respective item of work) in a modification of the condition of award; or
 - (2) The DBE is aware its work will be deleted or will experience underruns and has agreed in writing to the change. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so; or
 - (3) The DBE is not capable of performing the replacement work or has declined to perform the work at a reasonable competitive price. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so.

- (e) TERMINATION AND REPLACEMENT PROCEDURES. The Contractor shall not terminate or replace a DBE listed on the approved Utilization Plan, or perform with other forces work designated for a listed DBE except as provided in this Special Provision. The Contractor shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the Contractor obtains the Department's written consent as provided in subsection (a) of this part. Unless Department consent is provided for termination of a DBE subcontractor, the Contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the DBE in the Utilization Plan.

As stated above, the Contractor shall not terminate or replace a DBE subcontractor listed in the approved Utilization Plan without prior written consent. This includes, but is not limited to, instances in which the Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm. Written consent will be granted only if the Bureau of Small Business Enterprises agrees, for reasons stated in its concurrence document, that the Contractor has good cause to terminate or replace the DBE firm. Before transmitting to the Bureau of Small Business Enterprises any request to terminate and/or substitute a DBE subcontractor, the Contractor shall give notice in writing to the DBE subcontractor, with a copy to the Bureau, of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor shall give the DBE five days to respond to the Contractor's notice. The DBE so notified shall advise the Bureau and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Bureau should not approve the Contractor's action. If required in a particular case as a matter of public necessity, the Bureau may provide a response period shorter than five days.

For purposes of this paragraph, good cause includes the following circumstances:

- (1) The listed DBE subcontractor fails or refuses to execute a written contract;
- (2) The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the Contractor;
- (3) The listed DBE subcontractor fails or refuses to meet the Contractor's reasonable, nondiscriminatory bond requirements;
- (4) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
- (5) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1200 or applicable state law.
- (6) The Contractor has determined the listed DBE subcontractor is not a responsible contractor;

- (7) The listed DBE subcontractor voluntarily withdraws from the projects and provides written notice to the Contractor of its withdrawal;
- (8) The listed DBE is ineligible to receive DBE credit for the type of work required;
- (9) A DBE owner dies or becomes disabled with the result that the listed DBE subcontractor is unable to complete its work on the contract;
- (10) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the Contractor seeks to terminate a DBE it relied upon to obtain the contract so that the Contractor can self-perform the work for which the DBE contractor was engaged or so that the Contractor can substitute another DBE or non-DBE contractor after contract award.

When a DBE is terminated or fails to complete its work on the Contract for any reason, the Contractor shall make a good faith effort to find another DBE to substitute for the original DBE to perform at least the same amount of work under the contract as the terminated DBE to the extent needed to meet the established Contract goal. The good faith efforts shall be documented by the Contractor. If the Department requests documentation under this provision, the Contractor shall submit the documentation within seven days, which may be extended for an additional seven days if necessary at the request of the Contractor. The Department will provide a written determination to the Contractor stating whether or not good faith efforts have been demonstrated.

- (f) FINAL PAYMENT. After the performance of the final item of work or delivery of material by a DBE and final payment therefore to the DBE by the Contractor, but not later than 30 calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Agreement on Department form SBE 2115 to the Resident Engineer. If full and final payment has not been made to the DBE, the DBE Payment Agreement shall indicate whether a disagreement as to the payment required exists between the Contractor and the DBE or if the Contractor believes the work has not been satisfactorily completed. If the Contractor does not have the full amount of work indicated in the Utilization Plan performed by the DBE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages. The Contractor may request an administrative reconsideration of any amount deducted as damages pursuant to subsection (h) of this part.
- (g) ENFORCEMENT. The Department reserves the right to withhold payment to the Contractor to enforce the provisions of this Special Provision. Final payment shall not be made on the contract until such time as the Contractor submits sufficient documentation demonstrating achievement of the goal in accordance with this Special Provision or after liquidated damages have been determined and collected.

- (h) RECONSIDERATION. Notwithstanding any other provision of the contract, including but not limited to Article 109.09 of the Standard Specifications, the Contractor may request administrative reconsideration of a decision to deduct the amount of the goal not achieved as liquidated damages. A request to reconsider shall be delivered to the Contract Compliance Section and shall be handled and considered in the same manner as set forth in paragraph (c) of “Good Faith Effort Procedures” of this Special Provision, except a final decision that a good faith effort was not made during contract performance to achieve the goal agreed to in the Utilization Plan shall be the final administrative decision of the Department. The result of the reconsideration process is not administratively appealable to the U.S. Department of Transportation.

HOT-MIX ASPHALT (BDE)

Effective: January 1, 2024

Revise the second paragraph of Articles 1030.07(a)(11) and 1030.08(a)(9) of the Standard Specifications to read:

“When establishing the target density, the HMA maximum theoretical specific gravity (G_{mm}) will be based on the running average of four available Department test results for that project. If less than four G_{mm} test results are available, an average of all available Department test results for that project will be used. The initial G_{mm} will be the last available Department test result from a QMP project. If there is no available Department test result from a QMP project, the Department mix design verification test result will be used as the initial G_{mm} .”

In the Supplemental Specifications, replace the revision for the end of the third paragraph of Article 1030.09(h)(2) with the following:

“When establishing the target density, the HMA maximum theoretical specific gravity (G_{mm}) will be the Department mix design verification test result.”

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

“Production is not required to stop after a test strip has been constructed.”

PERFORMANCE GRADED ASPHALT BINDER (BDE)

Effective: January 1, 2023

Revise Article 1032.05 of the Standard Specifications to read:

“1032.05 Performance Graded Asphalt Binder. These materials will be accepted according to the Bureau of Materials Policy Memorandum, “Performance Graded Asphalt Binder Qualification Procedure.” The Department will maintain a qualified producer list. These materials shall be free from water and shall not foam when heated to any temperature below the actual flash point. Air blown asphalt, recycle engine oil bottoms (ReOB), and polyphosphoric acid (PPA) modification shall not be used.

When requested, producers shall provide the Engineer with viscosity/temperature relationships for the performance graded asphalt binders delivered and incorporated in the work.

- (a) Performance Graded (PG) Asphalt Binder. The asphalt binder shall meet the requirements of AASHTO M 320, Table 1 “Standard Specification for Performance Graded Asphalt Binder” for the grade shown on the plans and the following.

Test	Parameter
Small Strain Parameter (AASHTO PP 113) BBR, ΔT_c , 40 hrs PAV (40 hrs continuous or 2 PAV at 20 hrs)	-5 °C min.

- (b) Modified Performance Graded (PG) Asphalt Binder. The asphalt binder shall meet the requirements of AASHTO M 320, Table 1 “Standard Specification for Performance Graded Asphalt Binder” for the grade shown on the plans.

Asphalt binder modification shall be performed at the source, as defined in the Bureau of Materials Policy Memorandum, “Performance Graded Asphalt Binder Qualification Procedure.”

Modified asphalt binder shall be safe to handle at asphalt binder production and storage temperatures or HMA construction temperatures. Safety Data Sheets (SDS) shall be provided for all asphalt modifiers.

- (1) Polymer Modification (SB/SBS or SBR). Elastomers shall be added to the base asphalt binder to achieve the specified performance grade and shall be either a styrene-butadiene diblock, triblock copolymer without oil extension, or a styrene-butadiene rubber. The polymer modified asphalt binder shall be smooth, homogeneous, and be according to the requirements shown in Table 1 or 2 for the grade shown on the plans.

Table 1 - Requirements for Styrene-Butadiene Copolymer (SB/SBS) Modified Asphalt Binders		
Test	Asphalt Grade SB/SBS PG 64-28 SB/SBS PG 70-22	Asphalt Grade SB/SBS PG 64-34 SB/SBS PG 70-28 SB/SBS PG 76-22 SB/SBS PG 76-28
Separation of Polymer ITP, "Separation of Polymer from Asphalt Binder" Difference in °F (°C) of the softening point between top and bottom portions	4 (2) max.	4 (2) max.
TESTS ON RESIDUE FROM ROLLING THIN FILM OVEN TEST (AASHTO T 240)		
Elastic Recovery ASTM D 6084, Procedure A, 77 °F (25 °C), 100 mm elongation, %	60 min.	70 min.

Table 2 - Requirements for Styrene-Butadiene Rubber (SBR) Modified Asphalt Binders		
Test	Asphalt Grade SBR PG 64-28 SBR PG 70-22	Asphalt Grade SB/SBS PG 64-34 SB/SBS PG 70-28 SBR PG 76-22 SBR PG 76-28
Separation of Polymer ITP, "Separation of Polymer from Asphalt Binder" Difference in °F (°C) of the softening point between top and bottom portions	4 (2) max.	4 (2) max.
Toughness ASTM D 5801, 77 °F (25 °C), 20 in./min. (500 mm/min.), in.-lbs (N-m)	110 (12.5) min.	110 (12.5) min.
Tenacity ASTM D 5801, 77 °F (25 °C), 20 in./min. (500 mm/min.), in.-lbs (N-m)	75 (8.5) min.	75 (8.5) min.
TESTS ON RESIDUE FROM ROLLING THIN FILM OVEN TEST (AASHTO T 240)		
Elastic Recovery ASTM D 6084, Procedure A, 77 °F (25 °C), 100 mm elongation, %	40 min.	50 min.

- (2) Ground Tire Rubber (GTR) Modification. GTR modification is the addition of recycled ground tire rubber to liquid asphalt binder to achieve the specified performance grade. GTR shall be produced from processing automobile and/or truck tires by the ambient grinding method or micronizing through a cryogenic process. GTR shall not exceed 1/16 in. (2 mm) in any dimension and shall not contain free metal particles, moisture that would cause foaming of the asphalt, or other foreign materials. A mineral powder (such as talc) meeting the requirements of AASHTO M 17 may be added, up to a maximum of four percent by weight of GTR to reduce sticking and caking of the GTR particles. When tested in accordance with Illinois Modified AASHTO T 27 "Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates" or AASHTO PP 74 "Standard Practice for Determination of Size and Shape of Glass Beads Used in Traffic Markings by Means of Computerized Optical Method", a 50 g sample of the GTR shall conform to the following gradation requirements.

Sieve Size	Percent Passing
No. 16 (1.18 mm)	100
No. 30 (600 µm)	95 ± 5
No. 50 (300 µm)	> 20

GTR modified asphalt binder shall be tested for rotational viscosity according to AASHTO T 316 using spindle S27. GTR modified asphalt binder shall be tested for original dynamic shear and RTFO dynamic shear according to AASHTO T 315 using a gap of 2 mm.

The GTR modified asphalt binder shall meet the requirements of Table 3.

Table 3 - Requirements for Ground Tire Rubber (GTR) Modified Asphalt Binders		
Test	Asphalt Grade GTR PG 64-28 GTR PG 70-22	Asphalt Grade GTR PG 76-22 GTR PG 76-28 GTR PG 70-28
TESTS ON RESIDUE FROM ROLLING THIN FILM OVEN TEST (AASHTO T 240)		
Elastic Recovery ASTM D 6084, Procedure A, 77 °F (25 °C), 100 mm elongation, %	60 min.	70 min.

- (3) Softener Modification (SM). Softener modification is the addition of organic compounds, such as engineered flux, bio-oil blends, modified vegetable oils, glycol amines, and fatty acid derivatives, to the base asphalt binder to achieve the specified performance grade. Softeners shall be dissolved, dispersed, or reacted in the asphalt binder to enhance its performance and shall remain compatible with the asphalt binder with no separation. Softeners shall not be added to modified PG asphalt binder as defined in Articles 1032.05(b)(1) or 1032.05(b)(2).

An Attenuated Total Reflectance-Fourier Transform Infrared spectrum (ATR-FTIR) shall be collected for both the softening compound as well as the softener modified asphalt binder at the dose intended for qualification. The ATR-FTIR spectra shall be collected on unaged softener modified binder, 20-hour Pressurized Aging Vessel (PAV) aged softener modified binder, and 40-hour PAV aged softener modified binder. The ATR-FTIR shall be collected in accordance with Illinois Test Procedure 601. The electronic files spectral files (in one of the following extensions or equivalent: *.SPA, *.SPG, *.IRD, *.IFG, *.CSV, *.SP, *.IRS, *.GAML, *. [0-9], *.IGM, *.ABS, *.DRT, *.SBM, *.RAS) shall be submitted to the Central Bureau of Materials.

Softener modified asphalt binders shall meet the requirements in Table 4.

Table 4 - Requirements for Softener Modified Asphalt Binders	
Test	Asphalt Grade
	SM PG 46-28 SM PG 46-34 SM PG 52-28 SM PG 52-34 SM PG 58-22 SM PG 58-28 SM PG 64-22
Small Strain Parameter (AASHTO PP 113) BBR, ΔT_c , 40 hrs PAV (40 hrs continuous or 2 PAV at 20 hrs)	-5°C min.
Large Strain Parameter (Illinois Modified AASHTO T 391) DSR/LAS Fatigue Property, $\Delta G^* _{peak}$, 40 hrs PAV (40 hrs continuous or 2 PAV at 20 hrs)	$\geq 54\%$

The following grades may be specified as tack coats.

Asphalt Grade	Use
PG 58-22, PG 58-28, PG 64-22	Tack Coat"

Revise Article 1031.06(c)(1) and 1031.06(c)(2) of the Standard Specifications to read:

“(1) RAP/RAS. When RAP is used alone or RAP is used in conjunction with RAS, the percentage of virgin ABR shall not exceed the amounts listed in the following table.

HMA Mixtures - RAP/RAS Maximum ABR % ^{1/2/}			
Ndesign	Binder	Surface	Polymer Modified Binder or Surface ^{3/}
30	30	30	10
50	25	15	10
70	15	10	10
90	10	10	10

- 1/ For Low ESAL HMA shoulder and stabilized subbase, the RAP/RAS ABR shall not exceed 50 percent of the mixture.
 - 2/ When RAP/RAS ABR exceeds 20 percent, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent ABR would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).
 - 3/ The maximum ABR percentages for ground tire rubber (GTR) modified mixes shall be equivalent to the percentages specified for SBS/SBR polymer modified mixes.
- (2) FRAP/RAS. When FRAP is used alone or FRAP is used in conjunction with RAS, the percentage of virgin asphalt binder replacement shall not exceed the amounts listed in the following table.

HMA Mixtures - FRAP/RAS Maximum ABR % ^{1/ 2/}			
Ndesign	Binder	Surface	Polymer Modified Binder or Surface ^{3/}
30	55	45	15
50	45	40	15
70	45	35	15
90	45	35	15
SMA	--	--	25
IL-4.75	--	--	35

- 1/ For Low ESAL HMA shoulder and stabilized subbase, the FRAP/RAS ABR shall not exceed 50 percent of the mixture.
- 2/ When FRAP/RAS ABR exceeds 20 percent for all mixes, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 percent ABR would require a virgin asphalt binder grade of PG 64-22 to be reduced to a PG 58-28).
- 3/ The maximum ABR percentages for GTR modified mixes shall be equivalent to the percentages specified for SBS/SBR polymer modified mixes.”

Add the following to the end of Note 2 of Article 1030.03 of the Standard Specifications.

“A dedicated storage tank for the ground tire rubber (GTR) modified asphalt binder shall be provided. This tank shall be capable of providing continuous mechanical mixing throughout and/or recirculation of the asphalt binder to provide a uniform mixture. The tank shall be heated and capable of maintaining the temperature of the asphalt binder at 300 °F to 350 °F (149 °C to 177 °C). The asphalt binder metering systems of dryer drum plants shall be calibrated with the actual GTR modified asphalt binder material with an accuracy of ±0.40 percent.”

PORTLAND CEMENT CONCRETE (BDE)

Effective: August 1, 2023

Revise the second paragraph of Article 1103.03(a)(4) the Standard Specifications to read:

“The dispenser system shall provide a visual indication that the liquid admixture is actually entering the batch, such as via a transparent or translucent section of tubing or by independent check with an integrated secondary metering device. If approved by the Engineer, an alternate indicator may be used for admixtures dosed at rates of 25 oz/cwt (1630 mL/100 kg) or greater, such as accelerating admixtures, corrosion inhibitors, and viscosity modifying admixtures.”

REMOVAL AND DISPOSAL OF REGULATED SUBSTANCES (BDE)

Effective: January 1, 2024

Revised: April 1, 2024

Revise the first paragraph of Article 669.04 of the Standard Specifications to read:

“669.04 Regulated Substances Monitoring. Regulated substances monitoring includes environmental observation and field screening during regulated substances management activities. The excavated soil and groundwater within the work areas shall be managed as either uncontaminated soil, hazardous waste, special waste, or non-special waste.

As part of the regulated substances monitoring, the monitoring personnel shall perform and document the applicable duties listed on form BDE 2732 “Regulated Substances Monitoring Daily Record (RSMDR)”.

Revise the first two sentences of the nineteenth paragraph of Article 669.05 of the Standard Specifications to read:

“The Contractor shall coordinate waste disposal approvals with the disposal facility and provide the specific analytical testing requirements of that facility. The Contractor shall make all arrangements for collection, transportation, and analysis of landfill acceptance testing.”

Revise the last paragraph of Article 669.05 of the Standard Specifications to read:

“The Contractor shall select a permitted landfill facility or CCDD/USFO facility meeting the requirements of 35 Ill. Admin. Code Parts 810-814 or Part 1100, respectively. The Department will review and approve or reject the facility proposed by the Contractor based upon information provided in BDE 2730. The Contractor shall verify whether the selected facility is compliant with those applicable standards as mandated by their permit and whether the facility is presently, has previously been, or has never been, on the United States Environmental Protection Agency (U.S. EPA) National Priorities List or the Resource Conservation and Recovery Act (RCRA) List of Violating Facilities. The use of a Contractor selected facility shall in no manner delay the construction schedule or alter the Contractor's responsibilities as set forth.”

Revise the first paragraph of Article 669.07 of the Standard Specifications to read:

“669.07 Temporary Staging. Soil classified according to Articles 669.05(a)(2), (b)(1), or (c) may be temporarily staged at the Contractor’s option. All other soil classified according to Articles 669.05(a)(1), (a)(3), (a)(4), (a)(5), (a)(6), or (b)(2) shall be managed and disposed of without temporary staging to the greatest extent practicable. If circumstances beyond the Contractor’s control require temporary staging of these latter materials, the Contractor shall request approval from the Engineer in writing.

Topsoil for re-use as final cover which has been field screened and found not to exhibit PID readings over daily background readings as documented on the BDE 2732, visual staining or odors, and is classified according to Articles 669.05(a)(2), (a)(3), (a)(4), (b)(1), or (c) may be temporarily staged at the Contractor’s option.”

Add the following paragraph after the sixth paragraph of Article 669.11 of the Standard Specifications.

“The sampling and testing of effluent water derived from dewatering discharges for priority pollutants volatile organic compounds (VOCs), priority pollutants semi-volatile organic compounds (SVOCs), or priority pollutants metals, will be paid for at the contract unit price per each for VOCS GROUNDWATER ANALYSIS using EPA Method 8260B, SVOCs GROUNDWATER ANALYSIS using EPA Method 8270C, or RCRA METALS GROUNDWATER ANALYSIS using EPA Methods 6010B and 7471A. This price shall include transporting the sample from the job site to the laboratory.”

Revise the first sentence of the eight paragraph of Article 669.11 of the Standard Specifications to read:

“Payment for temporary staging of soil classified according to Articles 669.05(a)(1), (a)(3), (a)(4), (a)(5), (a)(6), or (b)(2) to be managed and disposed of, if required and approved by the Engineer, will be paid according to Article 109.04.”

SHORT TERM AND TEMPORARY PAVEMENT MARKINGS (BDE)

Effective: April 1, 2024

Revised: April 2, 2024

Revise Article 701.02(d) of the Standard Specifications to read:

“(d) Pavement Marking Tapes (Note 3) 1095.06”

Add the following Note to the end of Article 701.02 of the Standard Specifications:

“Note 3. White or yellow pavement marking tape that is to remain in place longer than 14 days shall be Type IV tape.”

Revise Article 703.02(c) of the Standard Specifications to read:

“(c) Pavement Marking Tapes (Note 1) 1095.06”

Add the following Note to the end of Article 703.02 of the Standard Specifications:

“Note 1. White or yellow pavement marking tape that is to remain in place longer than 14 days shall be Type IV tape.”

Revise Article 1095.06 of the Standard Specifications to read:

1095.06 Pavement Marking Tapes. Type I white or yellow marking tape shall consist of glass spheres embedded into a binder on a foil backing that is precoated with a pressure sensitive adhesive. The spheres shall be of uniform gradation and distributed evenly over the surface of the tape.

Type IV tape shall consist of white or yellow tape with wet reflective media incorporated to provide immediate and continuing retroreflection in wet and dry conditions. The wet retroreflective media shall be bonded to a durable polyurethane surface. The patterned surface shall have approximately 40 ± 10 percent of the surface area raised and presenting a near vertical face to traffic from any direction. The channels between the raised areas shall be substantially free of exposed reflective elements or particles.

Blackout tape shall consist of a matte black, non-reflective, patterned surface that is precoated with a pressure sensitive adhesive.

- (a) Color. The white and yellow markings shall meet the following requirements for daylight reflectance and color, when tested, using a color spectrophotometer with 45 degrees circumferential/zero degree geometry, illuminant D65, and two degree observer angle. The color instrument shall measure the visible spectrum from 380 to 720 nm with a wavelength measurement interval and spectral bandpass of 10 nm.

Color	Daylight Reflectance %Y
White	65 min.
Yellow *	36 - 59

*Shall match Aerospace Material Specification Standard 595 33538 (Orange Yellow) and the chromaticity limits as follows.

x	0.490	0.475	0.485	0.530
y	0.470	0.438	0.425	0.456

- (b) Retroreflectivity. The white and yellow markings shall be retroreflective. Reflective values measured in accordance with the photometric testing procedure of ASTM D 4061 shall not be less than those listed in the table below. The coefficient of retroreflected luminance, R_L , shall be expressed as average millicandelas/footcandle/sq ft (millicandelas/lux/sq m), measured on a 3.0 x 0.5 ft (900 mm x 150 mm) panel at 86 degree entrance angle.

Coefficient of Retroreflected Luminance, R_L , Dry					
Type I			Type IV		
Observation Angle	White	Yellow	Observation Angle	White	Yellow
0.2°	2700	2400	0.2°	1300	1200
0.5°	2250	2000	0.5°	1100	1000

Wet retroreflectance shall be measured for Type IV under wet conditions according to ASTM E 2177 and meet the following.

Wet Retroreflectance, Initial R_L	
Color	R_L 1.05/88.76
White	300
Yellow	200

- (c) Skid Resistance. The surface of Type IV and blackout markings shall provide a minimum skid resistance of 45 BPN when tested according to ASTM E 303.
- (d) Application. The pavement marking tape shall have a precoated pressure sensitive adhesive and shall require no activation procedures. Test pieces of the tape shall be applied according to the manufacturer's instructions and tested according to ASTM D 1000, Method A, except that a stiff, short bristle roller brush and heavy hand pressure will be substituted for the weighted rubber roller in applying the test pieces to the metal test panel. Material tested as directed above shall show a minimum adhesion value of 750 g/in. (30 g/mm) width at the temperatures specified in ASTM D 1000. The adhesive shall be resistant to oils, acids, solvents, and water, and shall not leave objectionable stains or residue after removal. The material shall be flexible and conformable to the texture of the pavement.
- (e) Durability. Type IV and blackout tape shall be capable of performing for the duration of a normal construction season and shall then be capable of being removed intact or in large sections at pavement temperatures above 40 °F (4 °C) either manually or with a roll-up device without the use of sandblasting, solvents, or grinding. The Contractor shall provide a manufacturer's certification that the material meets the requirements for being removed after the following minimum traffic exposure based on transverse test decks with rolling traffic.

- (1) Time in place - 400 days
- (2) ADT per lane - 9,000 (28 percent trucks)
- (3) Axle hits - 10,000,000 minimum

Samples of the material applied to standard specimen plates will be measured for thickness and tested for durability in accordance with ASTM D 4060, using a CS-17 wheel and 1000-gram load, and shall meet the following criteria showing no significant change in color after being tested for the number of cycles indicated.

Test	Type I	Type IV	Blackout
Minimum Initial Thickness, mils (mm)	20 (0.51)	65 (1.65) ^{1/} 20 (0.51) ^{2/}	65 (1.65) ^{1/} 20 (0.51) ^{2/}
Durability (cycles)	5,000	1,500	1,500

- 1/ Measured at the thickest point of the patterned surface.
- 2/ Measured at the thinnest point of the patterned surface.

The pavement marking tape, when applied according to the manufacturer's recommended procedures, shall be weather resistant and shall show no appreciable fading, lifting, or shrinkage during the useful life of the marking. The tape, as applied, shall be of good appearance, free of cracks, and edges shall be true, straight, and unbroken.

(f) Sampling and Inspection.

- (1) Sample. Prior to approval and use of Type IV pavement marking tape, the manufacturer shall submit a notarized certification from an independent laboratory, together with the results of all tests, stating that the material meets the requirements as set forth herein. The independent laboratory test report shall state the lot tested, the manufacturer's name, and the date of manufacture.

After initial approval by the Department, samples and certification by the manufacturer shall be submitted for each subsequent batch of Type IV tape used. The manufacturer shall submit a certification stating that the material meets the requirements as set forth herein and is essentially identical to the material sent for qualification. The certification shall state the lot tested, the manufacturer's name, and the date of manufacture.

- (2) Inspection. The Contractor shall provide a manufacturer's certification to the Engineer stating the material meets all requirements of this specification. All material samples for acceptance tests shall be taken or witnessed by a representative of the Bureau of Materials and shall be submitted to the Engineer of Materials, 126 East Ash Street, Springfield, Illinois 62704-4766 at least 30 days in advance of the pavement marking operations."

SOURCE OF SUPPLY AND QUALITY REQUIREMENTS (BDE)

Effective: January 2, 2023

Add the following to Article 106.01 of the Standard Specifications:

“The final manufacturing process for construction materials and the immediately preceding manufacturing stage for construction materials shall occur within the United States. Construction materials shall include an article, material, or supply that is or consists primarily of the following.

- (a) Non-ferrous metals;
- (b) Plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
- (c) Glass (including optic glass);
- (d) Lumber;
- (e) Drywall.

Items consisting of two or more of the listed construction materials that have been combined through a manufacturing process, and items including at least one of the listed materials combined with a material that is not listed through a manufacturing process shall be exempt.”

STEEL COST ADJUSTMENT (BDE)

Effective: April 2, 2004

Revised: January 1, 2022

Description. Steel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in steel prices when optioned by the Contractor. The bidder shall indicate with their bid whether or not this special provision will be part of the contract. Failure to indicate “Yes” for any item of work will make that item of steel exempt from steel cost adjustment.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

- Metal Piling (excluding temporary sheet piling)
- Structural Steel
- Reinforcing Steel

Other steel materials such as dowel bars, tie bars, welded reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), and frames and grates will be subject to a steel cost adjustment when the pay items they are used in have a contract value of \$10,000 or greater.

The adjustments shall apply to the above items when they are part of the original proposed construction, or added as extra work and paid for by agreed unit prices. The adjustments shall not apply when the item is added as extra work and paid for at a lump sum price or by force account.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

- (a) The dates and quantity of steel, in lb (kg), shipped from the mill to the fabricator.
- (b) The quantity of steel, in lb (kg), incorporated into the various items of work covered by this special provision. The Department reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

$$SCA = Q \times D$$

Where: SCA = steel cost adjustment, in dollars
Q = quantity of steel incorporated into the work, in lb (kg)
D = price factor, in dollars per lb (kg)

$$D = MPI_M - MPI_L$$

Where: MPI_M = The Materials Cost Index for steel as published by the Engineering News-Record for the month the steel is shipped from the mill. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

MPI_L = The Materials Cost Index for steel as published by the Engineering News-Record for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price,. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

The unit weights (masses) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the MPI_M will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the MPI_L and MPI_M in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(MPI_L - MPI_M) \div MPI_L\} \times 100$$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the items of work are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

Attachment

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling)	
Furnishing Metal Pile Shells 12 in. (305 mm), 0.179 in. (3.80 mm) wall thickness)	23 lb/ft (34 kg/m)
Furnishing Metal Pile Shells 12 in. (305 mm), 0.250 in. (6.35 mm) wall thickness)	32 lb/ft (48 kg/m)
Furnishing Metal Pile Shells 14 in. (356 mm), 0.250 in. (6.35 mm) wall thickness)	37 lb/ft (55 kg/m)
Other piling	See plans
Structural Steel	See plans for weights (masses)
Reinforcing Steel	See plans for weights (masses)
Dowel Bars and Tie Bars	6 lb (3 kg) each
Welded Reinforcement	63 lb/100 sq ft (310 kg/sq m)
Guardrail	
Steel Plate Beam Guardrail, Type A w/steel posts	20 lb/ft (30 kg/m)
Steel Plate Beam Guardrail, Type B w/steel posts	30 lb/ft (45 kg/m)
Steel Plate Beam Guardrail, Types A and B w/wood posts	8 lb/ft (12 kg/m)
Steel Plate Beam Guardrail, Type 2	305 lb (140 kg) each
Steel Plate Beam Guardrail, Type 6	1260 lb (570 kg) each
Traffic Barrier Terminal, Type 1 Special (Tangent)	730 lb (330 kg) each
Traffic Barrier Terminal, Type 1 Special (Flared)	410 lb (185 kg) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms	
Traffic Signal Post	11 lb/ft (16 kg/m)
Light Pole, Tenon Mount and Twin Mount, 30 - 40 ft (9 - 12 m)	14 lb/ft (21 kg/m)
Light Pole, Tenon Mount and Twin Mount, 45 - 55 ft (13.5 - 16.5 m)	21 lb/ft (31 kg/m)
Light Pole w/Mast Arm, 30 - 50 ft (9 - 15.2 m)	13 lb/ft (19 kg/m)
Light Pole w/Mast Arm, 55 - 60 ft (16.5 - 18 m)	19 lb/ft (28 kg/m)
Light Tower w/Luminaire Mount, 80 - 110 ft (24 - 33.5 m)	31 lb/ft (46 kg/m)
Light Tower w/Luminaire Mount, 120 - 140 ft (36.5 - 42.5 m)	65 lb/ft (97 kg/m)
Light Tower w/Luminaire Mount, 150 - 160 ft (45.5 - 48.5 m)	80 lb/ft (119 kg/m)
Metal Railings (excluding wire fence)	
Steel Railing, Type SM	64 lb/ft (95 kg/m)
Steel Railing, Type S-1	39 lb/ft (58 kg/m)
Steel Railing, Type T-1	53 lb/ft (79 kg/m)
Steel Bridge Rail	52 lb/ft (77 kg/m)
Frames and Grates	
Frame	250 lb (115 kg)
Lids and Grates	150 lb (70 kg)

SUBCONTRACTOR AND DBE PAYMENT REPORTING (BDE)

Effective: April 2, 2018

Add the following to Section 109 of the Standard Specifications.

“109.14 Subcontractor and Disadvantaged Business Enterprise Payment Reporting.
 The Contractor shall report all payments made to the following parties:

- (a) first tier subcontractors;
- (b) lower tier subcontractors affecting disadvantaged business enterprise (DBE) goal credit;
- (c) material suppliers or trucking firms that are part of the Contractor’s submitted DBE utilization plan.

The report shall be made through the Department’s on-line subcontractor payment reporting system within 21 days of making the payment.”

SUBCONTRACTOR MOBILIZATION PAYMENTS (BDE)

Effective: November 2, 2017

Revised: April 1, 2019

Replace the second paragraph of Article 109.12 of the Standard Specifications with the following:

“This mobilization payment shall be made at least seven days prior to the subcontractor starting work. The amount paid shall be at the following percentage of the amount of the subcontract reported on form BC 260A submitted for the approval of the subcontractor’s work.

Value of Subcontract Reported on Form BC 260A	Mobilization Percentage
Less than \$10,000	25%
\$10,000 to less than \$20,000	20%
\$20,000 to less than \$40,000	18%
\$40,000 to less than \$60,000	16%
\$60,000 to less than \$80,000	14%
\$80,000 to less than \$100,000	12%
\$100,000 to less than \$250,000	10%
\$250,000 to less than \$500,000	9%
\$500,000 to \$750,000	8%
Over \$750,000	7%”

SUBMISSION OF PAYROLL RECORDS (BDE)

Effective: April 1, 2021

Revised: November 2, 2023

FEDERAL AID CONTRACTS. Revise the following section of Check Sheet #1 of the Recurring Special Provisions to read:

“STATEMENTS AND PAYROLLS

The payroll records shall include the worker’s name, social security number, last known address, telephone number, email address, classification(s) of work actually performed, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof), daily and weekly number of hours actually worked in total, deductions made, and actual wages paid.

The Contractor and each subcontractor shall submit certified payroll records to the Department each week from the start to the completion of their respective work, except that full social security numbers, last known addresses, telephone numbers, and email addresses shall not be included on weekly submittals. Instead, the payrolls need only include an identification number for each employee (e.g., the last four digits of the employee’s social security number). The submittals shall be made using LCPTracker Pro software. The software is web-based and can be accessed at <https://lcptracker.com/>. When there has been no activity during a work week, a payroll record shall still be submitted with the appropriate option (“No Work”, “Suspended”, or “Complete”) selected.”

STATE CONTRACTS. Revise Item 3 of Section IV of Check Sheet #5 of the Recurring Special Provisions to read:

- “3. Submission of Payroll Records. The Contractor and each subcontractor shall, no later than the 15th day of each calendar month, file a certified payroll for the immediately preceding month to the Illinois Department of Labor (IDOL) through the Illinois Prevailing Wage Portal in compliance with the State Prevailing Wage Act (820 ILCS 130). The portal can be found on the IDOL website at <https://www2.illinois.gov/idol/Laws-Rules/CONMED/Pages/Prevailing-Wage-Portal.aspx>. Payrolls shall be submitted in the format prescribed by the IDOL.

In addition to filing certified payroll(s) with the IDOL, the Contractor and each subcontractor shall certify and submit payroll records to the Department each week from the start to the completion of their respective work, except that full social security numbers shall not be included on weekly submittals. Instead, the payrolls shall include an identification number for each employee (e.g., the last four digits of the employee’s social security number). In addition, starting and ending times of work each day may be omitted from the payroll records submitted. The submittals shall be made using LCPTracker Pro software. The software is web-based and can be accessed at <https://lcptracker.com/>. When there has been no activity during a work week, a payroll record shall still be submitted with the appropriate option (“No Work”, “Suspended”, or “Complete”) selected.”

TRAINING SPECIAL PROVISIONS (BDE)

Effective: October 15, 1975

Revised: September 2, 2021

This Training Special Provision supersedes Section 7b of the Special Provision entitled "Specific Equal Employment Opportunity Responsibilities," and is in implementation of 23 U.S.C. 140(a).

As part of the Contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The Contractor shall provide on-the-job training aimed at developing full journeyman in the type of trade or job classification involved. The number of trainees to be trained under this contract will be 4. In the event the Contractor subcontracts a portion of the contract work, it shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The Contractor shall also ensure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the Contractor's needs and the availability of journeymen in the various classifications within the reasonable area of recruitment. Prior to commencing construction, the Contractor shall submit to the Illinois Department of Transportation for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. The Contractor will be credited for each trainee it employs on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the Contractor shall make every effort to enroll minority trainees and women (e.g. by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps it has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he or she has successfully completed a training course leading to journeyman status or in which he or she has been employed as a journeyman. The Contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used, the Contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the Contractor and approved by the Illinois Department of Transportation and the Federal Highway Administration. The Illinois Department of Transportation and the Federal Highway Administration shall approve a program, if it is reasonably calculated to meet the equal employment opportunity obligations of the Contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved by not necessarily sponsored by the U.S. Department of Labor Employment Training Administration shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Illinois Department of Transportation and the Federal Highway Administration. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the Contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the Contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the Contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the Contractor and evidences a lack of good faith on the part of the Contractor in meeting the requirement of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program.

It is not required that all trainees be on board for the entire length of the contract. A Contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The Contractor shall furnish the trainee a copy of the program he will follow in providing the training. The Contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The Contractor shall provide for the maintenance of records and furnish periodic reports documenting its performance under this Training Special Provision.

For contracts with an awarded contract value of \$500,000 or more, the Contractor is required to comply with the Illinois Works Apprenticeship Initiative (30 ILCS 559/20-20 to 20-25) and all applicable administrative rules to the extent permitted by Section 20-20(g). For federally funded projects, the number of trainees to be trained under this contract, as stated in the Training Special Provisions, will be the established goal for the Illinois Works Apprenticeship Initiative 30 ILCS 559/20-20(g). The Contractor shall make a good faith effort to meet this goal. For federally funded projects, the Illinois Works Apprenticeship Initiative will be implemented using the FHWA approved OJT procedures. The Contractor must comply with the recordkeeping and reporting obligations of the Illinois Works Apprenticeship Initiative for the life of the project, including the certification as to whether the trainee/apprentice labor hour goals were met.

Method of Measurement. The unit of measurement is in hours.

Basis of Payment. This work will be paid for at the contract unit price of 80 cents per hour for TRAINEES. The estimated total number of hours, unit price, and total price have been included in the schedule of prices.

IDOT TRAINING PROGRAM GRADUATE ON-THE-JOB TRAINING SPECIAL PROVISION

Effective: August 1, 2012

Revised: February 2, 2017

In addition to the Contractor's equal employment opportunity (EEO) affirmative action efforts undertaken as required by this Contract, the Contractor is encouraged to participate in the incentive program described below to provide additional on-the-job training to certified graduates of the IDOT pre-apprenticeship training program, as outlined in this Special Provision.

IDOT funds, and various Illinois community colleges operate, pre-apprenticeship training programs throughout the State to provide training and skill-improvement opportunities to promote the increased employment of minority groups, disadvantaged persons and women in all aspects of the highway construction industry. The intent of this IDOT Pre-Apprenticeship Training Program Graduate (TPG) special provision (Special Provision) is to place these certified program graduates on the project site for this Contract in order to provide the graduates with meaningful on-the-job training. Pursuant to this Special Provision, the Contractor must make every reasonable effort to recruit and employ certified TPG trainees to the extent such individuals are available within a practicable distance of the project site.

Specifically, participation of the Contractor or its subcontractor in the Program entitles the participant to reimbursement for graduates' hourly wages at \$15.00 per hour per utilized TPG trainee, subject to the terms of this Special Provision. Reimbursement payment will be made even though the Contractor or subcontractor may also receive additional training program funds from other non-IDOT sources for other non-TPG trainees on the Contract, provided such other source does not specifically prohibit the Contractor or subcontractor from receiving reimbursement from another entity through another program, such as IDOT through the TPG program. With regard to any IDOT funded construction training program other than TPG, however, additional reimbursement for other IDOT programs will not be made beyond the TPG Program described in this Special Provision when the TPG Program is utilized.

No payment will be made to the Contractor if the Contractor or subcontractor fails to provide the required on-site training to TPG trainees, as solely determined by IDOT. A TPG trainee must begin training on the project as soon as the start of work that utilizes the relevant trade skill and the TPG trainee must remain on the project site through completion of the Contract, so long as training opportunities continue to exist in the relevant work classification. Should a TPG trainee's employment end in advance of the completion of the Contract, the Contractor must promptly notify the IDOT District EEO Officer for the Contract that the TPG's involvement in the Contract has ended. The Contractor must supply a written report for the reason the TPG trainee involvement terminated, the hours completed by the TPG trainee on the Contract, and the number of hours for which the incentive payment provided under this Special Provision will be, or has been claimed for the separated TPG trainee.

Finally, the Contractor must maintain all records it creates as a result of participation in the Program on the Contract, and furnish periodic written reports to the IDOT District EEO Officer that document its contractual performance under and compliance with this Special Provision. Finally, through participation in the Program and reimbursement of wages, the Contractor is not relieved of, and IDOT has not waived, the requirements of any federal or state labor or employment law applicable to TPG workers, including compliance with the Illinois Prevailing Wage Act.

Method of Measurement: The unit of measurement is in hours.

Basis of Payment: This work will be paid for at the contract unit price of \$15.00 per hour for each utilized certified TPG Program trainee (TRAINEES TRAINING PROGRAM GRADUATE). The estimated total number of hours, unit price, and total price must be included in the schedule of prices for the Contract submitted by Contractor prior to beginning work. The initial number of TPG trainees for which the incentive is available for this contract is 4.

The Department has contracted with several educational institutions to provide screening, tutoring and pre-training to individuals interested in working as a TPG trainee in various areas of common construction trade work. Only individuals who have successfully completed a Pre-Apprenticeship Training Program at these IDOT approved institutions are eligible to be TPG trainees. To obtain a list of institutions that can connect the Contractor with eligible TPG trainees, the Contractor may contact: HCCTP TPG Program Coordinator, Office of Business and Workforce Diversity (IDOT OBWD), Room 319, Illinois Department of Transportation, 2300 S. Dirksen Parkway, Springfield, Illinois 62764. Prior to commencing construction with the utilization of a TPG trainee, the Contractor must submit documentation to the IDOT District EEO Officer for the Contract that provides the names and contact information of the TPG trainee(s) to be trained in each selected work classification, proof that the TPG trainee(s) has successfully completed a Pre-Apprenticeship Training Program, proof that the TPG is in an Apprenticeship Training Program approved by the U.S. Department of Labor Bureau of Apprenticeship Training, and the start date for training in each of the applicable work classifications.

To receive payment, the Contractor must provide training opportunities aimed at developing a full journeyworker in the type of trade or job classification involved. During the course of performance of the Contract, the Contractor may seek approval from the IDOT District EEO Officer to employ additional eligible TPG trainees. In the event the Contractor subcontracts a portion of the contracted work, it must determine how many, if any, of the TPGs will be trained by the subcontractor. Though a subcontractor may conduct training, the Contractor retains the responsibility for meeting all requirements imposed by this Special Provision. The Contractor must also include this Special Provision in any subcontract where payment for contracted work performed by a TPG trainee will be passed on to a subcontractor.

Training through the Program is intended to move TPGs toward journeyman status, which is the primary objective of this Special Provision. Accordingly, the Contractor must make every effort to enroll TPG trainees by recruitment through the Program participant educational institutions to the extent eligible TPGs are available within a reasonable geographic area of the project. The Contractor is responsible for demonstrating, through documentation, the recruitment efforts it has undertaken prior to the determination by IDOT whether the Contractor is in compliance with this Special Provision, and therefore, entitled to the Training Program Graduate reimbursement of \$15.00 per hour.

Notwithstanding the on-the-job training requirement of this TPG Special Provision, some minimal off-site training is permissible as long as the offsite training is an integral part of the work of the contract, and does not compromise or conflict with the required on-site training that is central to the purpose of the Program. No individual may be employed as a TPG trainee in any work classification in which he/she has previously successfully completed a training program leading to journeyman status in any trade, or in which he/she has worked at a journeyman level or higher.

VEHICLE AND EQUIPMENT WARNING LIGHTS (BDE)

Effective: November 1, 2021
Revised: November 1, 2022

Add the following paragraph after the first paragraph of Article 701.08 of the Standard Specifications:

“The Contractor shall equip all vehicles and equipment with high-intensity oscillating, rotating, or flashing, amber or amber-and-white, warning lights which are visible from all directions. In accordance with 625 ILCS 5/12-215, the lights may only be in operation while the vehicle or equipment is engaged in construction operations.”

WEEKLY DBE TRUCKING REPORTS (BDE)

Effective: June 2, 2012 Revised: November 1, 2021

The Contractor shall submit a weekly report of Disadvantaged Business Enterprise (DBE) trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) that are used for DBE goal credit.

The report shall be submitted to the Engineer on Department form “SBE 723” within ten business days following the reporting period. The reporting period shall be Sunday through Saturday for each week reportable trucking activities occur.

Any costs associated with providing weekly DBE trucking reports shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

WORK ZONE TRAFFIC CONTROL DEVICES (BDE)

Effective: March 2, 2020

Add the following to Article 701.03 of the Standard Specifications:

“(q) Temporary Sign Supports 1106.02”

Revise the third paragraph of Article 701.14 of the Standard Specifications to read:

“For temporary sign supports, the Contractor shall provide a FHWA eligibility letter for each device used on the contract. The letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device. The signs shall be supported within 20 degrees of vertical. Weights used to stabilize signs shall be attached to the sign support per the manufacturer’s specifications.”

Revise the first paragraph of Article 701.15 of the Standard Specifications to read:

“701.15 Traffic Control Devices. For devices that must meet crashworthiness standards, the Contractor shall provide a manufacturer’s self-certification or a FHWA eligibility letter for each Category 1 device and a FHWA eligibility letter for each Category 2 and Category 3 device used on the contract. The self-certification or letter shall provide information for the set-up and use of the device as well as a detailed drawing of the device.”

Revise the first six paragraphs of Article 1106.02 of the Standard Specifications to read:

“1106.02 Devices. Work zone traffic control devices and combinations of devices shall meet crashworthiness standards for their respective categories. The categories are as follows.

Category 1 includes small, lightweight, channelizing and delineating devices that have been in common use for many years and are known to be crashworthy by crash testing of similar devices or years of demonstrable safe performance. These include cones, tubular markers, plastic drums, and delineators, with no attachments (e.g. lights). Category 1 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 1 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2024.

Category 2 includes devices that are not expected to produce significant vehicular velocity change but may otherwise be hazardous. These include vertical panels with lights, barricades, temporary sign supports, and Category 1 devices with attachments (e.g. drums with lights). Category 2 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 2 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2024.

Category 3 includes devices that are expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. These include crash cushions (impact attenuators), truck mounted attenuators, and other devices not meeting the definitions of Category 1 or 2. Category 3 devices manufactured after December 31, 2019 shall be MASH-16 compliant. Category 3 devices manufactured on or before December 31, 2019, and compliant with NCHRP 350 or MASH 2009, may be used on contracts let before December 31, 2029. Category 3 devices shall be crash tested for Test Level 3 or the test level specified.

Category 4 includes portable or trailer-mounted devices such as arrow boards, changeable message signs, temporary traffic signals, and area lighting supports. It is preferable for Category 4 devices manufactured after December 31, 2019 to be MASH-16 compliant; however, there are currently no crash tested devices in this category, so it remains exempt from the NCHRP 350 or MASH compliance requirement.

For each type of device, when no more than one MASH-16 compliant is available, an NCHRP 350 or MASH-2009 compliant device may be used, even if manufactured after December 31, 2019.”

Revise Articles 1106.02(g), 1106.02(k), and 1106.02(l) to read:

“(g) Truck Mounted/Trailer Mounted Attenuators. The attenuator shall be approved for use at Test Level 3. Test Level 2 may be used for normal posted speeds less than or equal to 45 mph.

(k) Temporary Water Filled Barrier. The water filled barrier shall be a lightweight plastic shell designed to accept water ballast and be on the Department’s qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings.

(l) Movable Traffic Barrier. The movable traffic barrier shall be on the Department’s qualified product list.

Shop drawings shall be furnished by the manufacturer and shall indicate the deflection of the barrier as determined by acceptance testing; the configuration of the barrier in that test; and the vehicle weight, velocity, and angle of impact of the deflection test. The Engineer shall be provided one copy of the shop drawings. The barrier shall be capable of being moved on and off the roadway on a daily basis.”

PROJECT LABOR AGREEMENT

Effective: May 18, 2007

Revised: August 1, 2019

Description. The Illinois Project Labor Agreements Act, 30 ILCS 571, states that the State of Illinois has a compelling interest in awarding public works contracts so as to ensure the highest standards of quality and efficiency at the lowest responsible cost. A project labor agreement (PLA) is a form of pre-hire collective bargaining agreement covering all terms and conditions of employment on a specific project that is intended to support this compelling interest. It has been determined by the Department that a PLA is appropriate for the project that is the subject of this contract. The PLA document, provided below, only applies to the construction site for this contract. It is the policy of the Department on this contract, and all construction projects, to allow all contractors and subcontractors to compete for contracts and subcontracts without regard to whether they are otherwise parties to collective bargaining agreements.

Execution of Letter of Assent. A copy of the PLA applicable to this project is included as part of this special provision. As a condition of the award of the contract, the successful bidder and each of its subcontractors shall execute a "Contractor Letter of Assent", in the form attached to the PLA as Exhibit A. The successful bidder shall submit a Subcontractor's Contractor Letter of Assent to the Department prior to the subcontractor's performance of work on the project. Upon request, copies of the applicable collective bargaining agreements will be provided by the appropriate signatory labor organization at the pre-job conference.

Quarterly Reporting. Section 37 of the Illinois Project Labor Agreements Act requires the Department to submit quarterly reports regarding the number of minorities and females employed under PLAs. To assist in this reporting effort, the Contractor shall provide a quarterly workforce participation report for all minority and female employees working under the PLA of this contract. The data shall be reported on Construction Form BC 820, Project Labor Agreement (PLA) Workforce Participation Quarterly Reporting Form available on the Department's website <http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BC/BC%20820.docx>.

The report shall be submitted no later than the 15th of the month following the end of each quarter (i.e., April 15 for the January – March reporting period). The form shall be emailed to DOT.PLA.Reporting@illinois.gov or faxed to (217) 524-4922.

Any costs associated with complying with this provision shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

Illinois Department of Transportation
PROJECT LABOR AGREEMENT

This Project Labor Agreement (“PLA” or “Agreement”) is entered into this _____ day of _____, 2024, by and between the Illinois Department of Transportation (“IDOT” or “Department”) in its proprietary capacity, and each relevant Illinois AFL-CIO Building Trades signatory hereto as determined by the Illinois AFL-CIO Statewide Project Labor Agreement Committee on behalf of each of its affiliated members (individually and collectively, the “Unions”). This PLA shall apply to Construction Work (as defined herein) to be performed by IDOT’s Prime Contractor and each of its subcontractors of whatever tier (“Subcontractor” or “Subcontractors”) on Contract No. 62N40 (hereinafter, the “Project”).

ARTICLE 1 - INTENT AND PURPOSES

- 1.1 This PLA is entered into in accordance with the Project Labor Agreement Act (“Act”, 30 ILCS 571). It is mutually understood and agreed that the terms and conditions of this PLA are intended to promote the public interest in obtaining timely and economical completion of the Project by encouraging productive and efficient construction operations; by establishing a spirit of harmony and cooperation among the parties; and by providing for peaceful and prompt settlement of any and all labor grievances or jurisdictional disputes of any kind without strikes, lockouts, slowdowns, delays, or other disruptions to the prosecution of the work. The parties acknowledge the obligations of the Contractors and Subcontractors to comply with the provisions of the Act. The parties will work with the Contractors and Subcontractors within the parameters of other statutory and regulatory requirements to implement the Act’s goals and objectives.
- 1.2 As a condition of the award of the contract for performance of work on the Project, IDOT’s Prime Contractor and each of its Subcontractors shall execute a “Contractor Letter of Assent”, in the form attached hereto as Exhibit A, prior to commencing Construction Work on the Project. The Contractor shall submit a Subcontractor’s Contractor Letter of Assent to the Department prior to the Subcontractor’s performance of Construction Work on the Project. Upon request copies of the applicable collective bargaining agreements will be provided by the appropriate signatory labor organization consistent with this Agreement and at the pre-job conference referenced in Article III, Section 3.1.

- 1.3 Each Union affiliate and separate local representing workers engaged in Construction Work on the Project in accordance with this PLA are bound to this agreement by the Illinois AFL-CIO Statewide Project Labor Agreement Committee which is the central committee established with full authority to negotiate and sign PLAs with the State on behalf of all respective crafts. Upon their signing the Contractor Letter of Assent, the Prime Contractor, each Subcontractor, and the individual Unions shall thereafter be deemed a party to this PLA. No party signatory to this PLA shall, contract or subcontract, nor permit any other person, firm, company, or entity to contract or subcontract for the performance of Construction Work for the Project to any person, firm, company, or entity that does not agree in writing to become bound for the term of this Project by the terms of this PLA prior to commencing such work and to the applicable area-wide collective bargaining agreement(s) with the Union(s) signatory hereto.
- 1.4 It is understood that the Prime Contractor(s) and each Subcontractor will be considered and accepted by the Unions as separate employers for the purposes of collective bargaining, and it is further agreed that the employees working under this PLA shall constitute a bargaining unit separate and distinct from all others. The parties hereto also agree that this PLA shall be applicable solely with respect to this Project, and shall have no bearing on the interpretation of any other collective bargaining agreement or as to the recognition of any bargaining unit other than for the specific purposes of this Project.
- 1.5 In the event of a variance or conflict, whether explicit or implicit, between the terms and conditions of this PLA and the provisions of any other applicable national, area, or local collective bargaining agreement, the terms and conditions of this PLA shall supersede and control. For any work performed under the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, the National Agreement of the International Union of Elevator Constructors, and for any instrument calibration work and loop checking performed under the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians, the preceding sentence shall apply only with respect to Articles I, II, V, VI, and VII.

- 1.6 Subject to the provisions of paragraph 1.5 of this Article, it is the parties' intent to respect the provisions of any other collective bargaining agreements that may now or hereafter pertain, whether between the Prime Contractor and one or more of the Unions or between a Subcontractor and one or more of the Unions. Accordingly, except and to the extent of any contrary provision set forth in this PLA, the Prime Contractor and each of its Subcontractors agrees to be bound and abide by the terms of the following in order of precedence: (a) the applicable collective bargaining agreement between the Prime Contractor and one or more of the Unions made signatory hereto; (b) the applicable collective bargaining agreement between a Subcontractor and one or more of the Unions made signatory hereto; or (c) the current applicable area collective bargaining agreement for the relevant Union that is the agreement certified by the Illinois Department of Labor for purposes of establishing the Prevailing Wage applicable to the Project. The Union will provide copies of the applicable collective bargaining agreements pursuant to part (c) of the preceding sentence to the Prime Contractor. Assignments by the Contractors or Subcontractors amongst the trades shall be consistent with area practices; in the event of unresolved disagreements as to the propriety of such assignments, the provisions of Article VI shall apply.
- 1.7 Subject to the limitations of paragraphs 1.4 to 1.6 of this Article, the terms of each applicable collective bargaining agreement as determined in accordance with paragraph 1.6 are incorporated herein by reference, and the terms of this PLA shall be deemed incorporated into such other applicable collective bargaining agreements only for purposes of their application to the Project.
- 1.8 To the extent necessary to comply with the requirements of any fringe benefit fund to which the Prime Contractor or Subcontractor is required to contribute under the terms of an applicable collective bargaining agreement pursuant to the preceding paragraph, the Prime Contractor or Subcontractor shall execute all "Participation Agreements" as may be reasonably required by the Union to accomplish such purpose; provided, however, that such Participation Agreements shall, when applicable to the Prime Contractor or Subcontractor solely as a result of this PLA, be amended as reasonably necessary to reflect such fact. Upon written notice in the form of a lien of a Contractor's or Subcontractor's delinquency from any applicable fringe benefit fund, IDOT will withhold from the Contractor's periodic pay request an amount sufficient to extinguish any delinquency obligation of the Contractor or Subcontractor arising out of the Project.
- 1.9 In the event that the applicable collective bargaining agreement between a Prime Contractor and the Union or between the Subcontractor and the Union expires prior to the completion of this Project, the expired applicable contract's terms will be maintained until a new applicable collective bargaining agreement is ratified. The wages and fringe benefits included in any new applicable collective bargaining agreement will apply on and after the effective date of the newly negotiated collective bargaining agreement, except to the extent wage and fringe benefit retroactivity is specifically agreed upon by the relevant bargaining parties.

ARTICLE II – APPLICABILITY, RECOGNITION, AND COMMITMENTS

- 2.1 The term Construction Work as used herein shall include all “construction, demolition, rehabilitation, renovation, or repair” work performed by a “laborer or mechanic” at the “site of the work” for the purpose of “building” the specific structures and improvements that constitute the Project. Terms appearing within quotation marks in the preceding sentence shall have the meaning ascribed to them pursuant to 29 CFR Part 5 and Illinois labor laws.
- 2.2 By executing the Letters of Assent, Prime Contractor and each of its Subcontractors recognizes the Unions signatory to this PLA as the sole and exclusive bargaining representatives for their craft employees employed on the jobsite for this Project. Unions who are signatory to this PLA will have recognition on the Project for their craft.
- 2.3 The Prime Contractor and each of its Subcontractors retains and shall be permitted to exercise full and exclusive authority and responsibility for the management of its operations, except as expressly limited by the terms of this PLA or by the terms and conditions of the applicable collective bargaining agreement.
- 2.4 Except to the extent contrary to an express provision of the relevant collective bargaining agreement, equipment or materials used in the Project may be pre-assembled or pre-fabricated, and there shall be no refusal by the Union to handle, transport, install, or connect such equipment or materials. Equipment or materials delivered to the job-site will be unloaded and handled promptly without regard to potential jurisdictional disputes; any such disputes shall be handled in accordance with the provisions of this PLA.
- 2.5 The parties are mutually committed to promoting a safe working environment for all personnel at the job-site. It shall be the responsibility of each employer to which this PLA applies to provide and maintain safe working conditions for its employees, and to comply with all applicable federal, state, and local health and safety laws and regulations.
- 2.6 The use or furnishing of alcohol or drugs and the conduct of any other illegal activity at the job-site is strictly prohibited. The parties shall take every practical measure consistent with the terms of applicable collective bargaining agreements to ensure that the job-site is free of alcohol and drugs.
- 2.7 All parties to this PLA agree that they will not discriminate against any employee based on race, creed, religion, color, national origin, union activity, age, gender or sexual orientation and shall comply with all applicable federal, state, and local laws.

- 2.8 In accordance with the Act and to promote diversity in employment, IDOT will establish, in cooperation with the other parties, the apprenticeship hours which are to be performed by minorities and females on the Project. IDOT shall consider the total hours to be performed by these underrepresented groups, as a percentage of the workforce, and create aspirational goals for each Project, based on the level of underutilization for the service area of the Project (together "Project Employment Objectives"). IDOT shall provide a quarterly report regarding the racial and gender composition of the workforce on the Project.

Persons currently lacking qualifications to enter apprenticeship programs will have the opportunity to obtain skills through basic training programs as have been established by the Department. The parties will endeavor to support such training programs to allow participants to obtain the requisite qualifications for the Project Employment Objectives.

The parties agree that all Contractors and Subcontractors working on the Project shall be encouraged to utilize the maximum number of apprentices as permitted under the terms of the applicable collective bargaining agreements to realize the Project Employment Objectives.

The Unions shall assist the Contractor and each Subcontractor in efforts to satisfy Project Employment Objectives. A Contractor or Subcontractor may request from a Union specific categories of workers necessary to satisfy Project Employment Objectives. The application of this section shall be consistent with all local Union collective bargaining agreements, and the hiring hall rules and regulations established for the hiring of personnel, as well as the apprenticeship standards set forth by each individual Union.

- 2.9 The parties hereto agree that engineering consultants and materials testing employees, to the extent subject to the terms of this PLA, shall be fully expected to objectively and responsibly perform their duties and obligations owed to the Department without regard to the potential union affiliation of such employees or of other employees on the Project.
- 2.10 This Agreement shall not apply to IDOT employees or employees of any other governmental entity.

ARTICLE III - ADMINISTRATION OF AGREEMENT

- 3.1 In order to assure that all parties have a clear understanding of the PLA, and to promote harmony, at the request of the Unions a post-award pre-job conference will be held among the Prime Contractor, all Subcontractors and Union representatives prior to the start of any Construction Work on the Project. No later than the conclusion of such pre-job conference, the parties shall, among other matters, provide to one another contact information for their respective representatives (including name, address, phone number, facsimile number, e-mail). Nothing herein shall be construed to limit the right of the Department to discuss or explain the purpose and intent of this PLA with prospective bidders or other interested parties prior to or following its award of the job.
- 3.2 Representatives of the Prime Contractor and the Unions shall meet as often as reasonably necessary following award until completion of the Project to assure the effective implementation of this PLA.
- 3.3 Any notice contemplated under Article VI and VII of this Agreement to a signatory labor organization shall be made in writing to the Local Union with copies to the local union's International Representative.

ARTICLE IV - HOURS OF WORK AND GENERAL CONDITIONS

- 4.1 The standard work day and work week for Construction Work on the Project shall be consistent with the respective collective bargaining agreements. In the event Project site or other job conditions dictate a change in the established starting time and/or a staggered lunch period for portions of the Project or for specific crafts, the Prime Contractor, relevant Subcontractors and business managers of the specific crafts involved shall confer and mutually agree to such changes as appropriate. If proposed work schedule changes cannot be mutually agreed upon between the parties, the hours fixed at the time of the pre-job meeting shall prevail.
- 4.2 Shift work may be established and directed by the Prime Contractor or relevant Subcontractor as reasonably necessary or appropriate to fulfill the terms of its contract with the Department. If used, shift hours, rates and conditions shall be as provided in the applicable collective bargaining agreement.
- 4.3 The parties agree that chronic and/or unexcused absenteeism is undesirable and must be controlled in accordance with procedures established by the applicable collective bargaining agreement. Any employee disciplined for absenteeism in accordance with such procedures shall be suspended from all work on the Project for not less than the maximum period permitted under the applicable collective bargaining agreement.

- 4.4 Except as may be otherwise expressly provided by the applicable collective bargaining agreement, employment begins and ends at the Project site; employees shall be at their place of work at the starting time; and employees shall remain at their place of work until quitting time.
- 4.5 Except as may be otherwise expressly provided by the applicable collective bargaining agreement, there shall be no limit on production by workmen, no restrictions on the full use of tools or equipment, and no restrictions on efficient use of manpower or techniques of construction other than as may be required by safety regulations.
- 4.6 The parties recognize that specialized or unusual equipment may be installed on the Project. In such cases, the Union recognizes the right of the Prime Contractor or Subcontractor to involve the equipment supplier or vendor's personnel in supervising the setting up of the equipment, making modifications and final alignment, and performing similar activities that may be reasonably necessary prior to and during the start-up procedure in order to protect factory warranties. The Prime Contractor or Subcontractor shall notify the Union representatives in advance of any work at the job-site by such vendor personnel in order to promote a harmonious relationship between the equipment vendor's personnel and other Project employees.
- 4.7 For the purpose of promoting full and effective implementation of this PLA, authorized Union representatives shall have access to the Project job-site during scheduled work hours. Such access shall be conditioned upon adherence to all reasonable visitor and security rules of general applicability that may be established for the Project site at the pre-job conference or from time to time thereafter.

ARTICLE V – GRIEVANCE PROCEDURES FOR DISPUTES ARISING UNDER A PARTICULAR COLLECTIVE BARGAINING AGREEMENT

- 5.1 In the event a dispute arises under a particular collective bargaining agreement specifically not including jurisdictional disputes referenced in Article VI below, said dispute shall be resolved by the Grievance/Arbitration procedure of the applicable collective bargaining agreement. The resulting determination from this process shall be final and binding on all parties bound to its process.
- 5.2 Employers covered under this Agreement shall have the right to discharge or discipline any employee who violates the provisions of this Agreement. Such discharge or discipline by a contractor or subcontractor shall be subject to Grievance/Arbitration procedure of the applicable collective bargaining agreement only as to the fact of such violation of this agreement. If such fact is established, the penalty imposed shall not be disturbed. Work at the Project site shall continue without disruption or hindrance of any kind as a result of a Grievance/Arbitration procedure under this Article.

- 5.3 In the event there is a deadlock in the foregoing procedure, the parties agree that the matter shall be submitted to arbitration for the selection and decision of an Arbitrator governed under paragraph 6.8.

ARTICLE VI –DISPUTES: GENERAL PRINCIPLES

- 6.1 This Agreement is entered into to prevent strikes, lost time, lockouts and to facilitate the peaceful adjustment of jurisdictional disputes in the building and construction industry and to prevent waste and unnecessary avoidable delays and expense, and for the further purpose of at all times securing for the employer sufficient skilled workers.
- 6.2 A panel of Permanent Arbitrators are attached as addendum (A) to this agreement. By mutual agreement between IDOT and the Unions, the parties can open this section of the agreement as needed to make changes to the list of permanent arbitrators.

The arbitrator is not authorized to award back pay or any other damages for a miss assignment of work. Nor may any party bring an independent action for back pay or any other damages, based upon a decision of an arbitrator.

- 6.3 The PLA Jurisdictional Dispute Resolution Process (“Process”) sets forth the procedures below to resolve jurisdictional disputes between and among Contractors, Subcontractors, and Unions engaged in the building and construction industry. Further, the Process will be followed for any grievance or dispute arising out of the interpretation or application of this PLA by the parties except for the prohibition on attorneys contained in 6.11. All decisions made through the Process are final and binding upon all parties.

DISPUTE PROCESS

- 6.4 Administrative functions under the Process shall be performed through the offices of the President and/or Secretary-Treasurer of the Illinois State Federation of Labor, or their designated representative, called the Administrator. In no event shall any officer, employee, agent, attorney, or other representative of the Illinois Federation of Labor, AFL- CIO be subject to any subpoena to appear or testify at any jurisdictional dispute hearing.
- 6.5 There shall be no abandonment of work during any case participating in this Process or in violation of the arbitration decision. All parties to this Process release the Illinois State Federation of Labor (“Federation”) from any liability arising from its action or inaction and covenant not to sue the Federation, nor its officers, employees, agents or attorneys.

- 6.6 In the event of a dispute relating to trade or work jurisdiction, all parties, including the employers, Contractors or Subcontractors, agree that a final and binding resolution of the dispute shall be resolved as follows:
- (a) Representatives of the affected trades and the Contractor or Subcontractor shall meet on the job site within two (2) business days after receiving written notice in an effort to resolve the dispute. (In the event there is a dispute between local unions affiliated with the same International Union, the decision of the General President, or his/her designee, as the internal jurisdictional authority of that International Union, shall constitute a final and binding decision and determination as to the jurisdiction of work.)
 - (b) If no settlement is achieved subsequent to the preceding Paragraph, the matter shall be referred to the local area Building & Construction Trades Council, which shall meet with the affected trades within two (2) business days subsequent to receiving written notice. In the event the parties do not wish to avail themselves of the local Building & Construction Trades Council, the parties may elect to invoke the services of their respective International Representatives with no extension of the time limitations. An agreement reached at this Step shall be final and binding upon all parties.
 - (c) If no settlement agreement is reached during the proceedings contemplated by Paragraphs "a" or "b" above, the matter shall be immediately referred to the Illinois Jurisdictional Dispute Process for final and binding resolution of said dispute. Said referral submission shall be in writing and served upon the Illinois State Federation of Labor, or the Administrator, pursuant to paragraph 6.4 of this agreement. The Administrator shall, within three (3) days, provide for the selection of an available Arbitrator to hear said dispute within this time period. Upon good cause shown and determined by the Administrator, an additional three (3) day extension for said hearing shall be granted at the sole discretion of the Administrator. Only upon mutual agreement of all parties may the Administrator extend the hearing for a period in excess of the time frames contemplated under this Paragraph. Business days are defined as Monday through Friday, excluding contract holidays.
- 6.7 The primary concern of the Process shall be the adjustment of jurisdictional disputes arising out of the Project. A sufficient number of Arbitrators shall be selected from list of approved Arbitrators as referenced Sec. 6.2 and shall be assigned per Sec. 6.8. Decisions shall be only for the Project and shall become effective immediately upon issuance and complied with by all parties. The authority of the Arbitrator shall be restricted and limited specifically to the terms and provisions of Article VI and generally to this Agreement as a whole.

- 6.8 Arbitrator chosen shall be randomly selected based on the list of Arbitrators in Sec. 6.2 and geographical location of the jurisdictional dispute and upon his/her availability, and ability to conduct a Hearing within two (2) business days of said notice. The Arbitrator may issue a “bench” decision immediately following the Hearing or he/she may elect to only issue a written decision, said decision must be issued within two (2) business days subsequent to the completion of the Hearing. Copies of all notices, pleadings, supporting memoranda, decisions, etc. shall be provided to all disputing parties and the Illinois State Federation of Labor.

Any written decision shall be in accordance with this Process and shall be final and binding upon all parties to the dispute and may be a “short form” decision. Fees and costs of the arbitrator shall be divided evenly between the contesting parties except that any party wishing a full opinion and decision beyond the short form decision shall bear the reasonable fees and costs of such full opinion. The decision of the Arbitrator shall be final and binding upon the parties hereto, their members, and affiliates.

In cases of jurisdictional disputes or other disputes between a signatory labor organization and another labor organization, both of which is an affiliate or member of the same International Union, the matter or dispute shall be settled in the manner set forth by their International Constitution and/or as determined by the International Union’s General President whose decision shall be final and binding upon all parties. In no event shall there be an abandonment of work.

- 6.9 In rendering a decision, the Arbitrator shall determine:
- (a) First, whether a previous agreement of record or applicable agreement, including a disclaimer agreement, between National or International Unions to the dispute or agreements between local unions involved in the dispute, governs;
 - (b) Only if the Arbitrator finds that the dispute is not covered by an appropriate or applicable agreement of record or agreement between the crafts to the dispute, he shall then consider the established trade practice in the industry and prevailing practice in the locality. Where there is a previous decision of record governing the case, the Arbitrator shall give equal weight to such decision of record, unless the prevailing practice in the locality in the past ten years favors one craft. In that case, the Arbitrator shall base his decision on the prevailing practice in the locality. Except, that if the Arbitrator finds that a craft has improperly obtained the prevailing practice in the locality through raiding, the undercutting of wages or by the use of vertical agreements, the Arbitrator shall rely on the decision of record and established trade practice in the industry rather than the prevailing practice in the locality; and,

- (c) Only if none of the above criteria is found to exist, the Arbitrator shall then consider that because efficiency, cost or continuity and good management are essential to the well being of the industry, the interests of the consumer or the past practices of the employer shall not be ignored.
 - (d) The arbitrator is not authorized to award back pay or any other damages for a mis-assignment of work. Nor may any party bring an independent action for back pay or any other damages, based upon a decision of an arbitrator.
- 6.10 The Arbitrator shall set forth the basis for his/her decision and shall explain his/her findings regarding the applicability of the above criteria. If lower ranked criteria are relied upon, the Arbitrator shall explain why the higher-ranked criteria were not deemed applicable. The Arbitrator's decision shall only apply to the Project. Agreements of Record, for other PLA projects, are applicable only to those parties signatory to such agreements. Decisions of Record are those that were either attested to by the former Impartial Jurisdictional Disputes Board or adopted by the National Arbitration Panel.
- 6.11 All interested parties, as determined by the Arbitrator, shall be entitled to make presentations to the Arbitrator. Any interested labor organization affiliated to the PLA Committee and party present at the Hearing, whether making a presentation or not, by such presence shall be deemed to accept the jurisdiction of the Arbitrator and to agree to be bound by its decision. In addition to the representative of the local labor organization, a representative of the labor organization's International Union may appear on behalf of the parties. Each party is responsible for arranging for its witnesses. In the event an Arbitrator's subpoena is required, the party requiring said subpoena shall prepare the subpoena for the Arbitrator to execute. Service of the subpoena upon any witness shall be the responsibility of the issuing party.

Attorneys shall not be permitted to attend or participate in any portion of a Hearing.

The parties are encouraged to determine, prior to Hearing, documentary evidence which may be presented to the Arbitrator on a joint basis.

- 6.12 The Order of Presentation in all Hearings before an Arbitrator shall be
- I. Identification and Stipulation of the Parties
 - II. Unions(s) claiming the disputed work presents its case
 - III. Union(s) assigned the disputed work presents its case
 - IV. Employer assigning the disputed work presents its case
 - V. Evidence from other interested parties (i.e., general contractor, project manager, owner)
 - VI. Rebuttal by union(s) claiming the disputed work
 - VII. Additional submissions permitted and requested by Arbitrator
 - VIII. Closing arguments by the parties

- 6.13 All parties bound to the provisions of this Process hereby release the Illinois State Federation of Labor and IDOT, their respective officers, agents, employees or designated representatives, specifically including any Arbitrator participating in said Process, from any and all liability or claim, of whatsoever nature, and specifically incorporating the protections provided in the Illinois Arbitration Act, as amended from time to time.
- 6.14 The Process, as an arbitration panel, nor its Administrator, shall have any authority to undertake any action to enforce its decision(s). Rather, it shall be the responsibility of the prevailing party to seek appropriate enforcement of a decision, including findings, orders or awards of the Arbitrator or Administrator determining non-compliance with a prior award or decision.
- 6.15 If at any time there is a question as to the jurisdiction of the Illinois Jurisdictional Dispute Resolution Process, the primary responsibility for any determination of the arbitrability of a dispute and the jurisdiction of the Arbitrator shall be borne by the party requesting the Arbitrator to hear the underlying jurisdictional dispute. The affected party or parties may proceed before the Arbitrator even in the absence or one or more stipulated parties with the issue of jurisdiction as an additional item to be decided by the Arbitrator. The Administrator may participate in proceedings seeking a declaration or determination that the underlying dispute is subject to the jurisdiction and process of the Illinois Jurisdictional Dispute Resolution Process. In any such proceedings, the non-prevailing party and/or the party challenging the jurisdiction of the Illinois Jurisdictional Dispute Resolution Process shall bear all the costs, expenses and attorneys' fees incurred by the Illinois Jurisdictional Dispute Resolution Process and/or its Administrator in establishing its jurisdiction.

ARTICLE VII - WORK STOPPAGES AND LOCKOUTS

- 7.1 During the term of this PLA, no Union or any of its members, officers, stewards, employees, agents or representatives shall instigate, support, sanction, maintain, or participate in any strike, picketing, walkout, work stoppage, slow down or other activity that interferes with the routine and timely prosecution of work at the Project site or at any other contractor's or supplier's facility that is necessary to performance of work at the Project site. Hand billing at the Project site during the designated lunch period and before commencement or following conclusion of the established standard workday shall not, in itself, be deemed an activity that interferes with the routine and timely prosecution of work on the Project.

7.2 Should any activity prohibited by paragraph 7.1 of this Article occur, the Union shall undertake all steps reasonably necessary to promptly end such prohibited activities.

7.2.A No Union complying with its obligations under this Article shall be liable for acts of employees for which it has no responsibility or for the unauthorized acts of employees it represents. Any employee who participates or encourages any activity prohibited by paragraph 7.1 shall be immediately suspended from all work on the Project for a period equal to the greater of (a) 60 days; or (b) the maximum disciplinary period allowed under the applicable collective bargaining agreement for engaging in comparable unauthorized or prohibited activity.

7.2.B Neither the PLA Committee nor its affiliates shall be liable for acts of employees for which it has no responsibility. The principal officer or officers of the PLA Committee will immediately instruct, order and use the best efforts of his office to cause the affiliated union or unions to cease any violations of this Article. The PLA Committee in its compliance with this obligation shall not be liable for acts of its affiliates. The principal officer or officers of any involved affiliate will immediately instruct, order or use the best effort of his office to cause the employees the union represents to cease any violations of this Article. A union complying with this obligation shall not be liable for unauthorized acts of employees it represents. The failure of the Contractor to exercise its rights in any instance shall not be deemed a waiver of its rights in any other instance.

During the term of this PLA, the Prime Contractor and its Subcontractors shall not engage in any lockout at the Project site of employees covered by this Agreement.

7.3 Upon notification of violations of this Article, the principal officer or officers of the local area Building and Construction Trades Council, and the Illinois AFL-CIO Statewide Project Labor Agreement Committee as appropriate, will immediately instruct, order and use their best efforts to cause the affiliated union or unions to cease any violations of this Article. A Trades Council and the Committee otherwise in compliance with the obligations under this paragraph shall not be liable for unauthorized acts of its affiliates.

7.4 In the event that activities in violation of this Article are not immediately halted through the efforts of the parties, any aggrieved party may invoke the special arbitration provisions set forth in paragraph 7.5 of this Article.

- 7.5 Upon written notice to the other involved parties by the most expeditious means available, any aggrieved party may institute the following special arbitration procedure when a breach of this Article is alleged:
- 7.5.A The party invoking this procedure shall notify the individual designated as the Permanent Arbitrator pursuant to paragraph 6.8 of the nature of the alleged violation; such notice shall be by the most expeditious means possible. The initiating party may also furnish such additional factual information as may be reasonably necessary for the Permanent Arbitrator to understand the relevant circumstances. Copies of any written materials provided to the arbitrator shall also be contemporaneously provided by the most expeditious means possible to the party alleged to be in violation and to all other involved parties.
 - 7.5.B Upon receipt of said notice the Permanent Arbitrator shall set and hold a hearing within twenty-four (24) hours if it is contended the violation is ongoing, but not before twenty-four (24) hours after the written notice to all parties involved as required above.
 - 7.5.C The Permanent Arbitrator shall notify the parties by facsimile or any other effective written means, of the place and time chosen by the Permanent Arbitrator for this hearing. Said hearing shall be completed in one session. A failure of any party or parties to attend said hearing shall not delay the hearing of evidence or issuance of an Award by the Permanent Arbitrator.
 - 7.5.D The sole issue at the hearing shall be whether a violation of this Article has, in fact, occurred. An Award shall be issued in writing within three (3) hours after the close of the hearing, and may be issued without a written opinion. If any party desires a written opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with, or enforcement of, the Award. The Permanent Arbitrator may order cessation of the violation of this Article, and such Award shall be served on all parties by hand or registered mail upon issuance.
 - 7.5.E Such Award may be enforced by any court of competent jurisdiction upon the filing of the Award and such other relevant documents as may be required. Facsimile or other hardcopy written notice of the filing of such enforcement proceedings shall be given to the other relevant parties. In a proceeding to obtain a temporary order enforcing the Permanent Arbitrator's Award as issued under this Article, all parties waive the right to a hearing and agree that such proceedings may be ex parte. Such agreement does not waive any party's right to participate in a hearing for a final order of enforcement. The Court's order or orders enforcing the Permanent Arbitrator's Award shall be served on all parties by hand or by delivery to their last known address or by registered mail.

- 7.6 Individuals found to have violated the provisions of this Article are subject to immediate termination. In addition, IDOT reserves the right to terminate this PLA as to any party found to have violated the provisions of this Article.
- 7.7 Any rights created by statute or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance therewith are hereby waived by parties to whom they accrue.
- 7.8 The fees and expenses of the Permanent Arbitrator shall be borne by the party or parties found in violation, or in the event no violation is found, such fees and expenses shall be borne by the moving party.

ARTICLE VIII – TERMS OF AGREEMENT

- 8.1 If any Article or provision of this Agreement shall be declared invalid, inoperative or unenforceable by operation of law or by any of the above mentioned tribunals of competent jurisdiction, the remainder of this Agreement or the application of such Article or provision to persons or circumstances other than those as to which it has been held invalid, inoperative or unenforceable shall not be affected thereby.
- 8.2 This Agreement shall be in full force as of and from the date of the Notice of Award until the Project contract is closed.
- 8.3 This PLA may not be changed or modified except by the subsequent written agreement of the parties. All parties represent that they have the full legal authority to enter into this PLA. This PLA may be executed by the parties in one or more counterparts.
- 8.4 Any liability arising out of this PLA shall be several and not joint. IDOT shall not be liable to any person or other party for any violation of this PLA by any other party, and no Contractor or Union shall be liable for any violation of this PLA by any other Contractor or Union.
- 8.5 The failure or refusal of a party to exercise its rights hereunder in one or more instances shall not be deemed a waiver of any such rights in respect of a separate instance of the same or similar nature.

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Addendum A

IDOT Slate of Permanent Arbitrators

1. Bruce Feldacker
2. Thomas F. Gibbons
3. Edward J. Harrick
4. Brent L. Motchan
5. Robert Perkovich
6. Byron Yaffee
7. Glenn A. Zipp

Execution Page

Illinois Department of Transportation

Stephen Travia, Director of Highways Project Implementation

Vicki L. Wilson, Director of Finance & Administration

Michael S. Prater, Chief Counsel

_____ (Date)
Omer Osman, Secretary

Illinois AFL-CIO Statewide Project Labor Agreement Committee, representing the Unions listed below:

_____ (Date)

List Unions:

Exhibit A - Contractor Letter of Assent

(Date)

To All Parties:

In accordance with the terms and conditions of the contract for Construction Work on [Contract No. 62N40], this Letter of Assent hereby confirms that the undersigned Prime Contractor or Subcontractor agrees to be bound by the terms and conditions of the Project Labor Agreement established and entered into by the Illinois Department of Transportation in connection with said Project.

It is the understanding and intent of the undersigned party that this Project Labor Agreement shall pertain only to the identified Project. In the event it is necessary for the undersigned party to become signatory to a collective bargaining agreement to which it is not otherwise a party in order that it may lawfully make certain required contributions to applicable fringe benefit funds, the undersigned party hereby expressly conditions its acceptance of and limits its participation in such collective bargaining agreement to its work on the Project.

(Authorized Company Officer)

(Company)

REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Non-segregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
- XI. Certification Regarding Use of Contract Funds for Lobbying
- XII. Use of United States-Flag Vessels:

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under title 23, United States Code, as required in 23 CFR 633.102(b) (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services). 23 CFR 633.102(e).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider. 23 CFR 633.102(e).

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services) in accordance with 23 CFR 633.102. The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in solicitation-for-bids or request-for-proposals documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract). 23 CFR 633.102(b).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work

performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract. 23 CFR 633.102(d).

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. 23 U.S.C. 114(b). The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors. 23 U.S.C. 101(a).

II. NONDISCRIMINATION (23 CFR 230.107(a); 23 CFR Part 230, Subpart A, Appendix A; EO 11246)

The provisions of this section related to 23 CFR Part 230, Subpart A, Appendix A are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR Part 60, 29 CFR Parts 1625-1627, 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR Part 60, and 29 CFR Parts 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with 23 U.S.C. 140, Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d et seq.), and related regulations including 49 CFR Parts 21, 26, and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR Part 230, Subpart A, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal Employment Opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (see 28 CFR Part 35, 29 CFR Part 1630, 29 CFR Parts 1625-1627, 41 CFR Part 60 and 49 CFR Part 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140, shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR Part 35 and 29 CFR Part 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract. 23 CFR 230.409 (g)(4) & (5).

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, sexual orientation, gender identity, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action or are substantially involved in such action, will be made fully cognizant of and will implement the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer or other knowledgeable company official.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to ensure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action

within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs (i.e., apprenticeship and on-the-job training programs for the geographical area of contract performance). In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. 23 CFR 230.409. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide

sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants /

Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established thereunder. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:

The contractor shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, gender identity, national origin, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors, suppliers, and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurances Required:

a. The requirements of 49 CFR Part 26 and the State DOT's FHWA-approved Disadvantaged Business Enterprise (DBE) program are incorporated by reference.

b. The contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (1) Withholding monthly progress payments;
- (2) Assessing sanctions;
- (3) Liquidated damages; and/or
- (4) Disqualifying the contractor from future bidding as non-responsible.

c. The Title VI and nondiscrimination provisions of U.S. DOT Order 1050.2A at Appendixes A and E are incorporated by reference. 49 CFR Part 21.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women.

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of more than \$10,000. 41 CFR 60-1.5.

As prescribed by 41 CFR 60-1.8, the contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location under the contractor's control where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size), in accordance with 29 CFR 5.5. The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. 23 U.S.C. 113. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. 23 U.S.C. 101. Where applicable law requires that projects be treated as a project on a Federal-aid highway, the provisions of this subpart will apply regardless of the location of the project. Examples include: Surface Transportation Block Grant Program projects funded under 23 U.S.C. 133 [excluding recreational trails projects], the Nationally Significant Freight and Highway

Projects funded under 23 U.S.C. 117, and National Highway Freight Program projects funded under 23 U.S.C. 167.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA- 1273 format and FHWA program requirements.

1. Minimum wages (29 CFR 5.5)

a. *Wage rates and fringe benefits.* All laborers and mechanics employed or working upon the site of the work (or otherwise working in construction or development of the project under a development statute), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act ([29 CFR part 3](#))), the full amount of basic hourly wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. As provided in paragraphs (d) and (e) of 29 CFR 5.5, the appropriate wage determinations are effective by operation of law even if they have not been attached to the contract. Contributions made or costs reasonably anticipated for bona fide fringe benefits under the Davis-Bacon Act ([40 U.S.C. 3141\(2\)\(B\)](#)) on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.e. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics must be paid the appropriate wage rate and fringe benefits on the wage determination for the classification(s) of work actually performed, without regard to skill, except as provided in paragraph 4. of this section. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph 1.c. of this section) and the Davis-Bacon poster (WH-1321) must be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. *Frequently recurring classifications.* (1) In addition to wage and fringe benefit rates that have been determined to be prevailing under the procedures set forth in [29 CFR part 1](#), a wage determination may contain, pursuant to § 1.3(f), wage and fringe benefit rates for classifications of laborers and mechanics for which conformance requests are regularly submitted pursuant to paragraph 1.c. of this section, provided that:

(i) The work performed by the classification is not performed by a classification in the wage determination for which a prevailing wage rate has been determined;

(ii) The classification is used in the area by the construction industry; and

(iii) The wage rate for the classification bears a reasonable relationship to the prevailing wage rates contained in the wage determination.

(2) The Administrator will establish wage rates for such classifications in accordance with paragraph 1.c.(1)(iii) of this section. Work performed in such a classification must be paid at no less than the wage and fringe benefit rate listed on the wage determination for such classification.

c. *Conformance.* (1) The contracting officer must require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract be classified in conformance with the wage determination. Conformance of an additional classification and wage rate and fringe benefits is appropriate only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is used in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) The conformance process may not be used to split, subdivide, or otherwise avoid application of classifications listed in the wage determination.

(3) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken will be sent by the contracting officer by email to DBAconformance@dol.gov. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer will, by email to DBAconformance@dol.gov, refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(5) The contracting officer must promptly notify the contractor of the action taken by the Wage and Hour Division

under paragraphs 1.c.(3) and (4) of this section. The contractor must furnish a written copy of such determination to each affected worker or it must be posted as a part of the wage determination. The wage rate (including fringe benefits where appropriate) determined pursuant to paragraph 1.c.(3) or (4) of this section must be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

d. *Fringe benefits not expressed as an hourly rate.*

Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor may either pay the benefit as stated in the wage determination or may pay another bona fide fringe benefit or an hourly cash equivalent thereof.

e. *Unfunded plans.* If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the contractor, in accordance with the criteria set forth in § 5.28, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

f. *Interest.* In the event of a failure to pay all or part of the wages required by the contract, the contractor will be required to pay interest on any underpayment of wages.

2. Withholding (29 CFR 5.5)

a. *Withholding requirements.* The contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for the full amount of wages and monetary relief, including interest, required by the clauses set forth in this section for violations of this contract, or to satisfy any such liabilities required by any other Federal contract, or federally assisted contract subject to Davis-Bacon labor standards, that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to Davis-Bacon labor standards requirements and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld. In the event of a contractor's failure to pay any laborer or mechanic, including any apprentice or helper working on the site of the work all or part of the wages required by the contract, or upon the contractor's failure to submit the required records as discussed in paragraph 3.d. of this section, the contracting agency may on its own initiative and after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with paragraph

2.a. of this section or Section V, paragraph 3.a., or both, over claims to those funds by:

- (1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- (2) A contracting agency for its procurement costs;
- (3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- (4) A contractor's assignee(s);
- (5) A contractor's successor(s); or
- (6) A claim asserted under the Prompt Payment Act, [31 U.S.C. 3901–3907](#).

3. Records and certified payrolls (29 CFR 5.5)

a. Basic record requirements (1) Length of record retention. All regular payrolls and other basic records must be maintained by the contractor and any subcontractor during the course of the work and preserved for all laborers and mechanics working at the site of the work (or otherwise working in construction or development of the project under a development statute) for a period of at least 3 years after all the work on the prime contract is completed.

(2) Information required. Such records must contain the name; Social Security number; last known address, telephone number, and email address of each such worker; each worker's correct classification(s) of work actually performed; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in [40 U.S.C. 3141\(2\)\(B\)](#) of the Davis-Bacon Act); daily and weekly number of hours actually worked in total and on each covered contract; deductions made; and actual wages paid.

(3) Additional records relating to fringe benefits. Whenever the Secretary of Labor has found under paragraph 1.e. of this section that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in [40 U.S.C. 3141\(2\)\(B\)](#) of the Davis-Bacon Act, the contractor must maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

(4) Additional records relating to apprenticeship. Contractors with apprentices working under approved programs must maintain written evidence of the registration of apprenticeship programs, the registration of the apprentices, and the ratios and wage rates prescribed in the applicable programs.

b. Certified payroll requirements (1) Frequency and method of submission. The contractor or subcontractor must submit weekly, for each week in which any DBA- or Related Acts-covered work is performed, certified payrolls to the contracting

agency. The prime contractor is responsible for the submission of all certified payrolls by all subcontractors. A contracting agency or prime contractor may permit or require contractors to submit certified payrolls through an electronic system, as long as the electronic system requires a legally valid electronic signature; the system allows the contractor, the contracting agency, and the Department of Labor to access the certified payrolls upon request for at least 3 years after the work on the prime contract has been completed; and the contracting agency or prime contractor permits other methods of submission in situations where the contractor is unable or limited in its ability to use or access the electronic system.

(2) Information required. The certified payrolls submitted must set out accurately and completely all of the information required to be maintained under paragraph 3.a.(2) of this section, except that full Social Security numbers and last known addresses, telephone numbers, and email addresses must not be included on weekly transmittals. Instead, the certified payrolls need only include an individually identifying number for each worker (e.g., the last four digits of the worker's Social Security number). The required weekly certified payroll information may be submitted using Optional Form WH-347 or in any other format desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division website at <https://www.dol.gov/sites/dolgov/files/WHDLegacy/files/wh347.pdf> or its successor website. It is not a violation of this section for a prime contractor to require a subcontractor to provide full Social Security numbers and last known addresses, telephone numbers, and email addresses to the prime contractor for its own records, without weekly submission by the subcontractor to the contracting agency.

(3) Statement of Compliance. Each certified payroll submitted must be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor, or the contractor's or subcontractor's agent who pays or supervises the payment of the persons working on the contract, and must certify the following:

(i) That the certified payroll for the payroll period contains the information required to be provided under paragraph 3.b. of this section, the appropriate information and basic records are being maintained under paragraph 3.a. of this section, and such information and records are correct and complete;

(ii) That each laborer or mechanic (including each helper and apprentice) working on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in [29 CFR part 3](#); and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification(s) of work actually performed, as specified in the applicable wage determination incorporated into the contract.

(4) Use of Optional Form WH-347. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 will satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(3) of this section.

(5) *Signature*. The signature by the contractor, subcontractor, or the contractor's or subcontractor's agent must be an original handwritten signature or a legally valid electronic signature.

(6) *Falsification*. The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under [18 U.S.C. 1001](#) and [31 U.S.C. 3729](#).

(7) *Length of certified payroll retention*. The contractor or subcontractor must preserve all certified payrolls during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

c. *Contracts, subcontracts, and related documents*. The contractor or subcontractor must maintain this contract or subcontract and related documents including, without limitation, bids, proposals, amendments, modifications, and extensions. The contractor or subcontractor must preserve these contracts, subcontracts, and related documents during the course of the work and for a period of 3 years after all the work on the prime contract is completed.

d. *Required disclosures and access* (1) *Required record disclosures and access to workers*. The contractor or subcontractor must make the records required under paragraphs 3.a. through 3.c. of this section, and any other documents that the contracting agency, the State DOT, the FHWA, or the Department of Labor deems necessary to determine compliance with the labor standards provisions of any of the applicable statutes referenced by § 5.1, available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and must permit such representatives to interview workers during working hours on the job.

(2) *Sanctions for non-compliance with records and worker access requirements*. If the contractor or subcontractor fails to submit the required records or to make them available, or refuses to permit worker interviews during working hours on the job, the Federal agency may, after written notice to the contractor, sponsor, applicant, owner, or other entity, as the case may be, that maintains such records or that employs such workers, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available, or to permit worker interviews during working hours on the job, may be grounds for debarment action pursuant to § 5.12. In addition, any contractor or other person that fails to submit the required records or make those records available to WHD within the time WHD requests that the records be produced will be precluded from introducing as evidence in an administrative proceeding under [29 CFR part 6](#) any of the required records that were not provided or made available to WHD. WHD will take into consideration a reasonable request from the contractor or person for an extension of the time for submission of records. WHD will determine the reasonableness of the request and may consider, among other things, the location of the records and the volume of production.

(3) *Required information disclosures*. Contractors and subcontractors must maintain the full Social Security number and last known address, telephone number, and email address

of each covered worker, and must provide them upon request to the contracting agency, the State DOT, the FHWA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or other compliance action.

4. Apprentices and equal employment opportunity (29 CFR 5.5)

a. *Apprentices* (1) *Rate of pay*. Apprentices will be permitted to work at less than the predetermined rate for the work they perform when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship (OA), or with a State Apprenticeship Agency recognized by the OA. A person who is not individually registered in the program, but who has been certified by the OA or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice, will be permitted to work at less than the predetermined rate for the work they perform in the first 90 days of probationary employment as an apprentice in such a program. In the event the OA or a State Apprenticeship Agency recognized by the OA withdraws approval of an apprenticeship program, the contractor will no longer be permitted to use apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(2) *Fringe benefits*. Apprentices must be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits must be paid in accordance with that determination.

(3) *Apprenticeship ratio*. The allowable ratio of apprentices to journeyworkers on the job site in any craft classification must not be greater than the ratio permitted to the contractor as to the entire work force under the registered program or the ratio applicable to the locality of the project pursuant to paragraph 4.a.(4) of this section. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in paragraph 4.a.(1) of this section, must be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under this section must be paid not less than the applicable wage rate on the wage determination for the work actually performed.

(4) *Reciprocity of ratios and wage rates*. Where a contractor is performing construction on a project in a locality other than the locality in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyworker's hourly rate) applicable within the locality in which the construction is being performed must be observed. If there is no applicable ratio or wage rate for the locality of the project, the ratio and wage rate specified in the contractor's registered program must be observed.

b. *Equal employment opportunity*. The use of apprentices and journeyworkers under this part must be in conformity with

the equal employment opportunity requirements of Executive Order 11246, as amended, and [29 CFR part 30](#).

c. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. 23 CFR 230.111(e)(2). The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeyworkers shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract as provided in 29 CFR 5.5.

6. Subcontracts. The contractor or subcontractor must insert FHWA-1273 in any subcontracts, along with the applicable wage determination(s) and such other clauses or contract modifications as the contracting agency may by appropriate instructions require, and a clause requiring the subcontractors to include these clauses and wage determination(s) in any lower tier subcontracts. The prime contractor is responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section. In the event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and may be subject to debarment, as appropriate. 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract as provided in 29 CFR 5.5.

9. Disputes concerning labor standards. As provided in 29 CFR 5.5, disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility. a. By entering into this contract, the contractor certifies that neither it nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of [40 U.S.C. 3144\(b\)](#) or § 5.12(a).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of [40 U.S.C. 3144\(b\)](#) or § 5.12(a).

c. The penalty for making false statements is prescribed in the U.S. Code, Title 18 Crimes and Criminal Procedure, [18 U.S.C. 1001](#).

11. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#);

b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#);

c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#); or

d. Informing any other person about their rights under the DBA, Related Acts, this part, or [29 CFR part 1](#) or [3](#).

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

Pursuant to 29 CFR 5.5(b), the following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchpersons and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek. 29 CFR 5.5.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph 1. of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages and interest from the date of the underpayment. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or

mechanic, including watchpersons and guards, employed in violation of the clause set forth in paragraph 1. of this section, in the sum currently provided in 29 CFR 5.5(b)(2)* for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph 1. of this section.

* \$31 as of January 15, 2023 (See 88 FR 88 FR 2210) as may be adjusted annually by the Department of Labor, pursuant to the Federal Civil Penalties Inflation Adjustment Act of 1990.

3. Withholding for unpaid wages and liquidated damages

a. *Withholding process.* The FHWA or the contracting agency may, upon its own action, or must, upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor so much of the accrued payments or advances as may be considered necessary to satisfy the liabilities of the prime contractor or any subcontractor for any unpaid wages; monetary relief, including interest; and liquidated damages required by the clauses set forth in this section on this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract subject to the Contract Work Hours and Safety Standards Act that is held by the same prime contractor (as defined in § 5.2). The necessary funds may be withheld from the contractor under this contract, any other Federal contract with the same prime contractor, or any other federally assisted contract that is subject to the Contract Work Hours and Safety Standards Act and is held by the same prime contractor, regardless of whether the other contract was awarded or assisted by the same agency, and such funds may be used to satisfy the contractor liability for which the funds were withheld.

b. *Priority to withheld funds.* The Department has priority to funds withheld or to be withheld in accordance with Section IV paragraph 2.a. or paragraph 3.a. of this section, or both, over claims to those funds by:

- (1) A contractor's surety(ies), including without limitation performance bond sureties and payment bond sureties;
- (2) A contracting agency for its procurement costs;
- (3) A trustee(s) (either a court-appointed trustee or a U.S. trustee, or both) in bankruptcy of a contractor, or a contractor's bankruptcy estate;
- (4) A contractor's assignee(s);
- (5) A contractor's successor(s); or
- (6) A claim asserted under the Prompt Payment Act, [31 U.S.C. 3901](#)–3907.

4. Subcontracts. The contractor or subcontractor must insert in any subcontracts the clauses set forth in paragraphs 1. through 5. of this section and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor is responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs 1. through 5. In the

event of any violations of these clauses, the prime contractor and any subcontractor(s) responsible will be liable for any unpaid wages and monetary relief, including interest from the date of the underpayment or loss, due to any workers of lower-tier subcontractors, and associated liquidated damages and may be subject to debarment, as appropriate.

5. Anti-retaliation. It is unlawful for any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, or to cause any person to discharge, demote, intimidate, threaten, restrain, coerce, blacklist, harass, or in any other manner discriminate against, any worker or job applicant for:

- a. Notifying any contractor of any conduct which the worker reasonably believes constitutes a violation of the Contract Work Hours and Safety Standards Act (CWHSSA) or its implementing regulations in this part;
- b. Filing any complaint, initiating or causing to be initiated any proceeding, or otherwise asserting or seeking to assert on behalf of themselves or others any right or protection under CWHSSA or this part;
- c. Cooperating in any investigation or other compliance action, or testifying in any proceeding under CWHSSA or this part; or
- d. Informing any other person about their rights under CWHSSA or this part.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System pursuant to 23 CFR 635.116.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" in paragraph 1 of Section VI refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions: (based on longstanding interpretation)

- (1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;
- (2) the prime contractor remains responsible for the quality of the work of the leased employees;

- (3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and
- (4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract. 23 CFR 635.102.

2. Pursuant to 23 CFR 635.116(a), the contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. Pursuant to 23 CFR 635.116(c), the contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract. (based on long-standing interpretation of 23 CFR 635.116).

5. The 30-percent self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements. 23 CFR 635.116(d).

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR Part 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract. 23 CFR 635.108.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and

health standards (29 CFR Part 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704). 29 CFR 1926.10.

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR Part 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 11, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT (42 U.S.C. 7606; 2 CFR 200.88; EO 11738)

This provision is applicable to all Federal-aid construction contracts in excess of \$150,000 and to all related subcontracts. 48 CFR 2.101; 2 CFR 200.327.

By submission of this bid/proposal or the execution of this contract or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, subcontractor, supplier, or vendor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal Highway Administration and the Regional Office of the Environmental Protection Agency. 2 CFR Part 200, Appendix II.

The contractor agrees to include or cause to be included the requirements of this Section in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements. 2 CFR 200.327.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200. 2 CFR 180.220 and 1200.220.

1. Instructions for Certification – First Tier Participants:

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction. 2 CFR 180.320.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default. 2 CFR 180.325.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances. 2 CFR 180.345 and 180.350.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900-180.1020, and 1200. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction. 2 CFR 180.330.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 180.300.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. 2 CFR 180.300; 180.320, and 180.325. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. 2 CFR 180.335. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov>). 2 CFR 180.300, 180.320, and 180.325.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default. 2 CFR 180.325.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.335;.

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property, 2 CFR 180.800;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification, 2 CFR 180.700 and 180.800; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default. 2 CFR 180.335(d).

(5) Are not a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(6) Are not a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability (USDOT Order 4200.6 implementing appropriations act requirements).

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal. 2 CFR 180.335 and 180.340.

* * * * *

3. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders, and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200). 2 CFR 180.220 and 1200.220.

a. By signing and submitting this proposal, the prospective lower tier participant is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which

this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances. 2 CFR 180.365.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180, Subpart I, 180.900 – 180.1020, and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated. 2 CFR 1200.220 and 1200.332.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold. 2 CFR 180.220 and 1200.220.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov>), which is compiled by the General Services Administration. 2 CFR 180.300, 180.320, 180.330, and 180.335.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily

excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment. 2 CFR 180.325.

* * * * *

4. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

a. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals:

(1) is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency, 2 CFR 180.355;

(2) is a corporation that has been convicted of a felony violation under any Federal law within the two-year period preceding this proposal (USDOT Order 4200.6 implementing appropriations act requirements); and

(3) is a corporation with any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability. (USDOT Order 4200.6 implementing appropriations act requirements)

b. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant should attach an explanation to this proposal.

* * * * *

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000. 49 CFR Part 20, App. A.

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or

cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

XII. USE OF UNITED STATES-FLAG VESSELS:

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, or any other covered transaction. 46 CFR Part 381.

This requirement applies to material or equipment that is acquired for a specific Federal-aid highway project. 46 CFR 381.7. It is not applicable to goods or materials that come into inventories independent of an FHWA funded-contract.

When oceanic shipments (or shipments across the Great Lakes) are necessary for materials or equipment acquired for a specific Federal-aid construction project, the bidder, proposer, contractor, subcontractor, or vendor agrees:

1. To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels. 46 CFR 381.7.

2. To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, 'on-board' commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b)(1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Office of Cargo and Commercial Sealift (MAR-620), Maritime Administration, Washington, DC 20590. (MARAD requires copies of the ocean carrier's (master) bills of lading, certified onboard, dated, with rates and charges. These bills of lading may contain business sensitive information and therefore may be submitted directly to MARAD by the Ocean Transportation Intermediary on behalf of the contractor). 46 CFR 381.7.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS
PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY
SYSTEM OR APPALACHIAN LOCAL ACCESS**

ROAD CONTRACTS (23 CFR 633, Subpart B, Appendix B)
This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.